Hacettepe University Graduate School of Social Sciences
Department of English Language and Literature

A POETICS OF CONTEMPORARY SCIENCE POETRY: THE POEMS OF EDWIN MORGAN, ROBERT CRAWFORD AND DAVID MORLEY

Merve Sarı

Ph. D. Dissertation

Ankara, 2016

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KABUL VE ONAY

Merve Sarı tarafından hazırlanan "A Poetics of Contemporary Science Poetry: The Poems of Edwin Morgan, Robert Crawford and David Morley" başlıklı bu çalışma, 21 Ocak 2016 tarihinde yapılan savunma sınavı sonucunda başarılı bulunarak jürimiz tarafından Doktora Tezi olarak kabul edilmiştir.

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Yukarıdaki imzaların adı geçen öğretim üyelerine ait olduğunu onaylarım.

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For
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ÖZET

SARI, Merve. *Çağdaş Bilim Şiirinin Şiir Tekniği: Edwin Morgan, Robert Crawford ve David Morley'nin Şiirleri*, Doktora Tezi, Ankara, 2016.

Bu tezin amacı, şiirlerinde sıklıkla bilim ve teknolojiyi özgün bir biçimde kullanan Edwin Morgan, Robert Crawford ve David Morley'in şiirlerinden yola çıkarak çağdaş İngiliz bilim şiirinin şiir tekniğini oluşturmaktır. Birçok şair bilim ve uygulamalı bilim olan teknolojiyi ara sıra şiirlerinde kullansalar da, Morgan, Crawford ve Morley şiirlerinde bilim ve teknolojiyi orijinal bir biçimde ele almalarından ötürü seçilmişlerdir. Günümüzde bütüncül bir bakış açısı ve disiplinlerarası ilgi alanlarının gerekliliğini kabullenen bu üç şairin şiirleri, fen bilimleri ve beşeri bilimlerin bir arada bulunmasını örneklerdir. Farklılıklarına rağmen, Morgan, Crawford ve Morley için çağımızın teknolojik ve bilimsel yüklü olduğu fikri merkezidir.

Çağdaş İngiliz bilim şiiri, İngiliz şiirinde fen bilimleri ve beşeri bilimler arasındaki çizgiyi ortadan kaldıran postmodern akımlar sonucu ortaya çıkmıştır. Bütüncül bir bakış açısı fikrini teşvik eden bilim şiiri, bilginin bütünlüğünün gerekliliğini savunur ve fen bilimleri ile beşeri bilimlerin bir arada bulunmalarını özendirir. Bireysel disiplinlere yönelik ilginin kısıtlayıcı olduğunu düşünen, bilim şairleri daha yaratıcı işler için bilimlerarası işbirliğinini savunur.

Günümüz bilim şiirinin özellikleri teknobilimsel bilgi ve dilin, edebi ve mecazi amaçlarla olmak üzere, kullanımını dahil eder. Çağdaş arka planlarından ötürü, bilim şiirleri ister istemez kentseldir ve değişimi doğal bir olgu olarak görürler. Bilim şiirleri geleceğe inanır. Biyomerkezcilik ve insanötesiciliğe dayanarak, bilim şiirleri insan olmayan varlıklara da ses verirler. Günümüz gelişmeleri ve bilim ve teknolojinin yaygın kullanımını kabullenen bu şairler, bununla beraber bilim ve teknolojinin kötüye kullanımını eleştirir. Bunun sonucunda, ekolojik meseleler ve evren ve küçük evren arasındaki ilişkiler bilim şiirlerinde sıklıkla vurgulanır. Sanal gerçeklik, bilgisayar ve yapay zeka teknolojileri, siber uzay, uzay ve uzaylı

etkileşimleri bilim şairlerinin ilgi alanlarının bir başka kısmını oluşturur. Aynı zamanda doğayı korumaya ilgi duyar ve bunu başarabilecek teknolojilerle ilgilenirler. Bilim şiirleri genelde nesnel bir niteliğe

sahip olmakla birlikte, öznel bir nitelik de kullanılabilir. Gözlem, deney ve bilgi edinme, bilgi toplayan ve bilimsel çıkarımlarda bulunan bazı bilim şiirlerinin temelini oluşturur. Başka örnekler bilimi mecazi amaçlarla algıları değiştirmek için kullanabilir. Kentsel niteliklerinden ötürü, bilim şiirleri her seferinde genellikle kafiye yapmayan günlük bir dil kullanır. Yenilikçi konularına bağlı olarak çağdaş bilim şairleri biçimle değişiklikle yapar ve sone ve lirik şiir gibi eski türleri yenilemenin yanı sıra güzel somut şiir örneklerine de katkıda bulunur.

Farklılıklarına gelince, Edwin Morgan'ın şiiri fütüristik ve değişimin temel bir unsur olduğu teknobilimsel bir şiir tekniği sunar. Geleneksel biçimleri yenilemek için bunları değişime uğratan Morgan'ın bilgisayar teknolojilerine olan ilgisi bilgisayar şiirlerinde açıkça gözükürken, uzayın keşfine olan düşkünlüğü bilim-kurgu şiirlerinin en güzel örneklerinden bir kısmını ortaya çıkarır. Crawford ise bilim ve teknolojiye olan ilgisiyle birleşmesi sonucu teknobilimsel ögelere duyguların yüklemesini sağlayan lirik şiiri kullanır. Crawford'ın şiirlerinde bilim ve teknoloji çoğunlukla mecazi amaçlarla kullanılsa da, Morley'de teknobilimsel terim ve kavramlar hem edebi hem de mecazi amaçlarla kullanılır. Morley, eğitim gezisi olarak adlandırılabilecek şiirlerinde, bilimsel işlemlerin basamaklarını taklit ederek bilimsel yöntemi yansıtır. Bu nedenlerle, bu tezin amacı çağdaş İngiliz bilim şiirinin şiir tekniğini, şiirlerinde sıklıkla bilim ve teknolojiyi kullanan Edwin Morgan, Robert Crawford ve David Morley'in şiirlerinden yola çıkarak oluşturmak ve önerilen bu şiir tekniği bağlamında şairlerin ortak özellikleri ve farklılıklarını analiz etmek olacaktır.

Anahtar Kelimeler Çağdaş İngiliz şiiri, bilim şiiri, şiir tekniği, bilim ve teknoloji, biyomerkezcilik, insan ötesicilik, bilim-kurgu şiirleri, bilgisayar şiirleri, eğitim gezisi şiirleri, Edwin Morgan, Robert Crawford, David Morley.

ABSTRACT

SARI, Merve. *A Poetics of Contemporary Science Poetry: The Poems of Edwin Morgan, Robert Crawford and David Morley*, Ph. D. Thesis, Ankara, 2016.

This thesis aims to form a poetics of contemporary British science poetry based on the poems of Edwin Morgan, Robert Crawford and David Morley whose poems make original use of science and technology abundantly. Although a number of poets make science or technology as applied science an occasional interest in their poems, Morgan, Crawford and Morley are chosen due to their unique treatment of science and technology in their poems. Acknowledging the necessity for an integrated worldview and interdisciplinary interests in the present age, the poems of all three poets exemplify the co-existence of sciences and humanities. Despite their differences, for Morgan Crawford and Morley, the idea that the present age is technologically and scientifically charged remains central.

Contemporary British science poetry developed as a result of postmodern currents in British poetry which blurred the line between sciences and humanities as a result of deconstructive theories. Promoting the idea of an integrated worldview, science poetry defends unity of knowledge as essential and encourages the co-existence of sciences and humanities in its products. Regarding interest in singular disciplines as reductive, science poets advocate interdisciplinary collaborations for more creative work.

The elements of contemporary science poetics include the use of technoscientific data and language for literal or figurative purposes. Due to their contemporary background, science poems are necessarily urban and regard change as a natural phenomenon. They have faith in the future. Relying on biocentrism and posthumanism, science poems give voice to non-human agencies. Accepting recent developments and the widespread use of science and technology, these poets are, nevertheless, critical of uses science and technology for negative purposes. As a result, ecological issues and an emphasis on relations between microcosm and macrocosm are frequently stressed in science poems. Virtual realities, computer and AI technologies, cyberspace, space and alien interactions constitute more chief elements of the science poets' interest. They are also interested in the preservation of nature and in those

technologies that promote it. Although science poems are mostly objective in tone, a subjective tone may also be employed. Observation, experimentation and data acquisition form the basis of some science poems which exemplify the methods of science in gathering data and making scientific deductions. Other examples may use science for figurative purposes to renew perceptions. Due to their urban nature, science poems invariably make use of daily language which often does not rhyme. In accordance with their innovative subject matter, contemporary science poets experiment with form reviving ancient forms like the sonnet and lyric poetry as well as producing fine examples of concrete poetry.

As for their differences, Edwin Morgan's poetry introduces futuristic settings and a techno-science-driven poetics of which central element is change. Experimenting with form in order to revive traditional forms, Morgan's interest in computer technologies is visible through his computer poems, while his fascination with space exploration produces one of the finest of examples of science-fiction poetry. Crawford, on the other hand, relies on lyric poetry which, combined with his interest in science and technology, leads to his attachment of feelings to technoscientific elements. In Crawford's poetry science and technology are mostly employed for figurative purposes whereas in Morley's case technoscientific terms and ideas are borrowed for both literal and figurative purposes. Morley reflects scientific methodology in what can be aptly named as field-trip poems, thus imitating the steps of the scientific process. Accordingly, the aim of this thesis is to formulate a poetics of contemporary British science poetry based on the poems of Edwin Morgan, Robert Crawford and David Morley, who frequently make use of science and technology in their poetry and to analyse their shared qualities and different features with regards to the proposed poetics.

Key Words Contemporary British poetry, science poetry, poetics, science and technology, biocentricism, posthumanism, science-fiction poetry, computer poems, field-trip poems, Edwin Morgan, Robert Crawford, David Morley.

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INTRODUCTION

> More and more mankind will discover that we have to turn to poetry to interpret life for us, to console us, to sustain us. Without poetry, our science will appear incomplete; and most of what now passes with us for religion and philosophy will be replaced by poetry. Science, I say, will appear incomplete without it. For finely and truly does Wordsworth call poetry "the impassioned expression which is in the countenance of all science"; and what is a countenance without its expression? (Arnold 65-6)

Science has always been a fascinating subject matter for poets whether its use was aimed at renovating poetry by making it strange or pointing out the similarities with which both sciences and humanities perform. As John Heath-Stubbs and Phillips Salmon claim, in every period "poets have employed an intellectual framework derived from the science of their day [. . .] [and] in practice, poets are considerably more concerned with science and its opportunities for their poetry than has been recognised" (qtd. in Kennedy 153). However, within the modern era it is only recently that science has found its widespread recognition and expression in poetry via postmodernism. Stating that each age "gets the literature it deserves," Hulse et al. observe that poetry's current interest in science is most certainly due to what happened towards the end of the twentieth century when "plurality has replaced monocentric totemism" (15).

In Britain, the postmodernism that grew out of deconstructionist theories had started out in the 1950s as a post-war development, and grew to its full extent in the 1980s resulting in "a wide range of contemporary British 'poetries'" (Huk 1) marked by a multiplicity of voices in literature (Kennedy and Morley 7). As an anti-authoritarian movement, postmodernism encouraged anarchy, fragmentation, discontinuity and playfulness in poetry. With the "end of British poetry's tribal divisions and isolation" a new solidarity emerged whereby distinct constituents of British poetry started to represent themselves individually by way of conserving their "unique identities" (Hulse et al. 16). The multitudinousness of the representations of "the new poetic 'democracy' and the plurality of its forms and voices" (Huk 3) resulted in what can appropriately be

expressed as "'British poetries'" (Kennedy 215). Accordingly, contemporary British poetry in general expressed dissent. As Huk suggests, postmodernism has revised

> Yeats's ominious line that 'the center cannot hold' to read 'the center *should* not hold' (meaning that it should be dismantled to reveal what it by definition marginalizes or suppresses) forc[ing] 'judges' of poetry to look self-critically at their criteria for judgment and rob[bing] them of all tacitly granted authority. (4 italics original)

Due to postmodernism's challenge, logocentric ideals and grand narratives began to be questioned, and the idea of a centre was eventually replaced by what had been originally considered as peripheral and ex-centric (Kennedy 80, 83). As a result, contemporary poets began to voice regional, racial, gender-based, class-based and nationalistic issues in their poems. Theirs was an attempt at polyphony aiming to utter miscellaneous poetic voices rather than a singular one, since there was no unitary way to represent the multifaceted contemporary experience in general. Drawing upon Terry Eagleton's notion that "the *marginal* becomes somehow central," Huk regards the situation as one which flourished

> as much by the ascendency of certain kinds of literary theory and criticism as by the compelling presence of growing number of women poets, black poets from a range of differing cultural communities, poets writing out of postcolonial experience or submerged traditions in Scotland and Wales, regional and working-class poets, and poets of all inflections writing in experimental, oppositional and/or 'poststructuralist' forms. (3 italics original)

Besides mainstream poetry, British poetry gradually became regional (of a particular locale), racial (particularly of the black), gender-based (representing gays and lesbians besides challenging traditional roles attributed to men and women), class-based (including working-class experience) as well as having nationalistic concerns. Thus, while London was sidelined as the poetic centre, issues which were customarily marginalised such as, gender and race were included within the corpus of contemporary poems as proper subject matters to represent the spirit of the age. Despite the fact that a poetic centre was not the issue any more, the poetry of these previously marginalised minority groups, representing the issues of each individual group, still made poetry a

central concern in terms of its reflexive power of the various structures within society. Moreover, logocentric ideas were challenged as a result of deconstructionist and poststructuralist influences undermining the dichotomy between literature and science or, more specifically, between poetry and science. Following the transformation that took place in the choice of subject matter on so many levels, conventional topics started to give way to unlikely combinations like the inclusion of science and technology within the corpus of poetry.

Whereas initially science and, its close-companion, technology would seem as unsuitable, if not improper, topics for poetry, the use of science and technology have found their widespread expression in contemporary poetry due to sciences' all-pervading presence and effects in contemporary society. Echoing Carol Ann Duffy's argument that contemporary poetry has been born out of a need to "present it, as it is," science poetry is born out of a need to represent the technoscientific age together with the rising interest in un/nonpoetic discourse (McAllister 72). The aim of this study is to identify the rules and principles of contemporary science poetry based on the poems of Edwin Morgan, Robert Crawford and David Morley, and to analyse their poems with regard to the proposed poetics in return.

History has witnessed the subjection of scientific thinking and philosophical thinking in turns. In order to avoid any misunderstanding, perhaps it would be better to take a look at the categorisation of the disciplines first. Presently, academic disciplines are catalogued into six major divisions by critics like Kapitza, Michaelis and Johnston. Mathematics and statistics fall into the category of the formal sciences governed by abstract rules; the physical sciences include physics, chemistry, astronomy and earth sciences, while the life sciences consist of anatomy, ecology, biology, and its popular subdivisions zoology and botany (Michaelis and Johnston 3); the practical outcome of these sciences is the area of applied sciences, which are concerned primarily with the application of these sciences to present-day technology forming the basis of the many types of engineering as well as medicine and education (Kapitza 54); what is left are the "positive" sciences which are composed of the social sciences such as philosophy,

psychology, anthropology, theology and economics, and the humanities which consist of history, law, languages, literature and performing arts (Michaelis and Johnston 3).

Of these several branches of disciplines what interests us most is the physical, life and applied sciences, which will henceforth be referred to as "the sciences," and "the humanities." Although the categories seem stable for now, considering the fast-paced scientific and technological developments that are presently ongoing, it is not hard to imagine that more will surely come. Nonetheless, if we are to reduce sciences and humanities to two fundamental categories and take a look at their condition in different ages, the supremacy of one over the other can be seen in turn. As Hoselitz observes:

> The greatest progress in medieval physical science and medicine was made by Arabs and Jews. The sole "empiricist" among the Christian philosophers of the Middle Ages, Roger Bacon, deserves this designation chiefly by virtue of his methodological views rather than because of rigorous empirical scientific investigations carried on by him. With the beginning of the sixteenth century, natural science began to advance but erupted into full flowering only a century later with the work of Galileo and Descartes. Although we encounter Leonardo, Paracelsus, Copernicus, Vesalius in the sixteenth century, the major scientific interest of the age was still lodged in the humanities. The intellectual leaders of that period were not the natural scientists but humanists like Erasmus and Thomas More [. . .]. (8)

Indeed, up until the seventeenth century there was no clear-cut division between the sciences and the humanities. Despite the "Scientific Revolution" that occurred in the sixteenth century with the discoveries of Galileo, particularly philosophy remained to be the dominant mode (Bridgstock 3). Like Roger Bacon, Francis Bacon's most important contribution was in terms of scientific methodology (Hoselitz 8). Later, with the foundation of the Royal Society in 1662 scientific methods were applied through observation and experimentation systematically (Marsh 3-4). It was in the seventeenth century with René Descartes, John Locke and David Hume that the radical break in methodology took place which prepared the grounds for the individual sciences to develop in their own terms (Hoselitz 10).

Soon enough, a peak was reached in terms of the development of individual disciplines in the nineteenth century when "the various disciplines became elaborated and more sharply defined in relation to one another" (Hoselitz 15). This was related to Charles

Darwin's ground-breaking studies on natural selection and his development of the theory of evolution which shook the roots of Western culture by way of transforming "nature as we apprehend it" (Holmes x). According to Hoselitz:

> The Darwinian theory, which is among the two or three most important contributions to human knowledge made in the nineteenth century, may be called without exaggeration the fundamental cornerstone of biological theory. It was, like Newton's or Smith's contribution, a "magnificent conception," combining a series of previously unconnected ideas into a systematic whole. (23)

With the development of Newtonian physics and Darwinian biological evolution, "a tradition of critique of science's truth-claims developed," and the supremacy of the sciences over the humanities that had been gaining momentum ever since the enunciation of Cartesian dualism finalised its triumph by deeming the humanities subservient to the sciences (Armstrong 77). This was also complemented by the technological advancements that took place during the Industrial Revolution that transformed "an agrarian society into an industrial one" (Forge 113). The supremacy of science and technology has remained unchallenged in the West ever since, if not strengthened by another break that occurred with the introduction of Einsteinian quantum physics. The "beginning of the great disillusionment" as well as an ideal view of "responsibility of the scientist" in a social sense, too, began with Albert Einstein (Goldsmith 178). As put by Dvoretzky, Einstein had "a remarkably integrated world outlook" that stands as a model for every scientist (182). Denying the narrow perspective that is imposed upon the scientific specialist, Einstein argued that a scientist should also be qualified as a philosopher of science. Accordingly, he states:

> The whole of science is nothing more than a refinement of everyday thinking. It is for this reason that the critical thinking of the physicist cannot possibly be restricted to the examination of the concepts of his own field. He cannot proceed without considering a much more difficult problem, the problem of analyzing the nature of everyday thinking. (qtd. in Hiebert 84)

Today the swift pace of scientific and technological advancements is changing the world rapidly. Besides making lives easier for many people and offering solutions to some of the major problems of the earth, scientific and technological innovations also raise an

anxious concern in the society that they may lead to massive and almost instantaneous destruction. As observed by Bridgstock, today science and technology have

> made warfare far more dangerous – indeed, a major nuclear war could wipe out all human life – and [have] changed virtually all aspects of our lives. We have seen the rapid onslaught of computerization and telecommunications. This has created a world-wide net of communication, and also wiped out employment for many millions of people throughout the world. Modern pharmaceuticals can cure diseases which terrified our forefathers, and yet other diseases arise, sometimes from the effects of the drugs themselves. (4)

Michaelis is apparently right when he remarks, "[s]ociety has always paid for its science" (169). Plus, even if there is nothing to fear, it is clear that a number of demographic, environmental and resource-oriented problems are awaiting humanity in the near future. As Kapitza observes, "it is certain that in the next century mankind will have to solve a number of global problems connected with the world-wide depletion of energy and raw materials resources and pollution of the environment" (62). Eventually, what these usurpation processes will end up in will be either in the form of a "political overthrow or, more likely, through environmental catastrophe" (Clark 3). Hence, it is necessary that a common ground of interaction is found, for history has repeatedly taught the world that interdisciplinary co-operation is essential

> to solve the great problems facing mankind at present, like the safe disposal of radio-active waste, misuse of raw materials, efficient rescue after natural disasters, and tropical diseases. To all these, science and technology have suggested solutions, but they have not yet found universal social, economic and political acceptance. (Michaelis 169)

According to such an outlook, only the joint efforts of "scientists, engineers, technologists, psychologists, sociologists and politicians" and the like may find an answer that is socially, economically and politically agreeable to society however great these problems may be (Michaelis 171). To this end, various critics have tried to bridge the gap between the disciplines.

Although a mutual interest between poetry and science has been present over the centuries, it has not been without complications. There have been many arguments regarding the gulf between the physical sciences and the humanities, the most notorious

of which is the infamous "Rede Lecture" by C. P. Snow in 1959. In this lecture, "The Two Cultures and the Scientific Revolution," Snow relates his personal observations, arguing that intellectual society is divided into two "polar groups" which stand for two distinct cultures (3). These oppositional groups consist of literary intellectuals who refer to themselves as "intellectuals," and those who deal with physical sciences and call themselves "scientists" (4). Drawing his ideas from these two allegedly antagonistic groups, Snow, in his lecture, tries to mark the ways in which these two groups operate differently from each other.

For Snow, the main difficulty lies in the fact that although the two cultures have to join their creative efforts for the good of society, an abyss separates them (16). As a result, the two cultures cannot talk to each other, let alone incorporate features from one another, since when a poet by any chance adopts scientific expressions, s/he ends up misunderstanding and hence, misusing the terms most of the time (Snow 16). Blaming the "fanatical belief in educational specialisation" for this, Snow goes as far as calling the intellectuals "natural Luddites" (17, 22). Giving the upper hand to the sciences in what is, more or less, perceived as a competition by Snow, Snow's disregard for poetry continued for several years as is exemplified by the 1964 follow-up of the initial lecture, *The Two Cultures: And a Second Look: An Expanded Version of the Two Cultures and the Scientific Revolution*.

The tide Snow had given rise to was not without complications and F. R. Leavis was not late in responding to Snow's initial lecture. In 1962, at his lecture in Richmond, Leavis asked if there really were "two cultures" and continued to explore the importance of Snow in *Two Cultures? The Significance of C. P. Snow* by severely criticising Snow's separatist attitude towards the sciences and humanities. Leavis argued that "there are the two uncommunicating cultures and mutually indifferent cultures, there is the need to bring them together and there is C. P. Snow" (12). Leavis, thus, points to Snow's uncooperative attitude by referring to a point which had already been noted but decisively ignored by Snow himself. Contrary to Snow's vague deliberation of the two distinctively opposing cultures, Leavis offers the union of imagination and knowledge, and hence, of the humanities and sciences. Proposing an "experimental-creative front"

for this purpose, Leavis offers a meeting place for the sciences and the humanities (29). However, like Snow, he cannot refrain from taking sides, this time asserting the superiority of the humanities over the sciences.

Soon enough, Aldous Huxley, too, joined the debate to offer a middle ground. The beginning of *Literature and Science* (1963) reads:

> Snow or Leavis? The bland scientism of The Two Cultures or, violent and ill-mannered, the one-track, moralistic literarism of the Richmond Lecture? If there were no other choice, we should indeed be badly off. But happily there are middle roads, there is a more realistic approach to the subject than was made by either of the two champions. (Huxley 1)

Huxley claims that while scientific advancements resulted in the popularisation of science without any indebtedness to literature, poetry owes nothing to science either, except for "philosophic implication, [. . .] meaningful illustration or expressive metaphor" (Huxley 61, 62). Still, he finds the situation problematic. Surprised at the scantiness of poets who make use of the sciences in their works, whether it be out of a "personal-metaphysical concern" only, he explains the situation as being a consequence of the rising difficulty of scientific jargon: "Science has become an affair of specialists. Incapable any longer of understanding what it is all about, the man of letters [. . .] has no choice but to ignore the contemporary science all together" (Huxley 62). Detecting the problem as such, Huxley, however, maintains that no matter how far scientific advancements take us, philosophical problems still remain, and we need a collaboration of the sciences and the humanities mainly for this reason.

Regardless of the best of these writers' efforts, the separation of the two cultures persisted until the turn of the century. As Mary Midgley observes in *Poetry and Science* (2001):

> In fact, despite the efforts of many reformers, Descartes still rules. Mind and body are still held apart. Their division tends to produce a population of one-eyed specialists on both sides, specialists who are mystified by their respective opposite numbers and easily drift into futile warfare. (22)

Midgley, as indicated, bases her case on the Cartesian division of body and mind which reflects the material and the metaphysical aspects of human beings respectively. The binary opposition between poetry and science is, for her, naturally an outcome of this distinction. Nevertheless, such a division would have been unnecessary, if recent scientists had not failed to observe that what Descartes had primarily been opposed was the use of religious arguments in non-religious matters. Accordingly, "to make the natural world safe for physics, Descartes pushed consciousness right out of it into a separate spiritual world, treating each soul or mind as a spiritual substance, made of a stuff alien to other earthly items" (Midgley 86). Instead, "today, though that anti-religious pattern still persists, the 'two cultures' war is conceived in yet another way, as opposing science to the disciplines of the humanities" so that the initial allies have turned onto each other (Midgley 49). Keeping in mind that "all science grows out of philosophical thinking," it can be said that by introducing the division between mind and body, the Cartesian divide nowadays simply lets "the major partner swallow up the minor one" (Midgley 36, 2).

The twenty-first century requires a collaboration of the sciences and the humanities for several reasons. First of all, without the philosophical background of the humanities, the sciences fall short of providing multifaceted answers:

> Interdisciplinary work results from the joint and continuously integrated effort of two or more specialists having a different disciplinary background; on rare occasions a single person may have mastered more than one discipline in his life. In multidisciplinary work the individual efforts run along parallel lines and are not integrated. There is an increasing need for interdisciplinary studies to solve difficult research problems, to find solutions for the dangers facing mankind, and to enrich our understanding of each other. (Michaelis 172)

Secondly, interest in pure science is reductive, limiting individual perspective and leading to the discrepancy between expectations and final results. Reminding that the "first scientists were philosophers," Vigue asserts that "sciences are limited because they are incapable of explaining the total spectrum of human experience" (236, 237). Thirdly, the scientist her/himself, among many others things, is chiefly a social being who needs to analyse all aspects of her/his research carefully, hence requiring the

philosophical aid the humanities would provide. For, "the evolutionary growth of man is in fact determined by his culture inasmuch as it gives him mastery over nature. Between the material and spiritual cultures there is a link: spiritual culture points out the direction in which the wealth of the State should grow in order to meet the material needs of the society" (Kapitza 63). Fourthly, the arbitrary reign of science which would easily lead to alienation and fear, and cause unrest within the society as to the "dangers of technology and the ideological distortions of scientistic thinking" that might "lead people to declare war on science itself" or, worse still, lead them to "oscillate between idealising science and dreading it" would be avoided (Midgley 59). Finally, when "two or more disciplines meet [they] [. . .] mutually enrich each other" resulting in a deeper understanding of the world that we inhabit (Michaelis 174), so much so that what Ian Marshall defines as an effective way "to advance the cause of multiculturalism than any amount of politically correct preaching" happens as "the advantages of diversity and the verities of interrelationship and interdependency" are recognised (qtd. in Clark 151).

Especially after World War II, interdisciplinary interest became a necessity. The use of atomic bombs in addition to the various other negative effects of science and technology made it clear that "[s]eparately, neither cabinet ministers nor Nobel Prize winners can any longer solve the world's problems. Unless they join again their efforts in interdisciplinary thinking, research and collaboration" (Michaelis 167). Moreover, science and technology have been condemned due to society's heavy reliance upon them. As dependence on science and technology for utilitarian ends grew, so did alienation and fear. Blind submission to or faith in contemporary technoscientific advancements became the subject matter of many apocalyptic and post-apocalyptic literary texts as a result.

Likewise, in the critical arena, the aspirations of the new criticism "claiming that it had succeeded in isolating the poem as the unit of analysis" in a manner similar to scientific objectivity, failed (Armstrong 80). What is needed instead is a "heightened sense of intertextual relations" which introduces a "poetics of connection, bringing in biology, [. . .] the study of sound-waves; asserting that the poet, scientist and mathematician seek 'a

system of relations,' and that the exchange of energies is central to both poetry and science" (Armstrong 84).

Drawing upon Donna Harraway's views about interdisciplinary methods, Timothy Clark asserts that "the distorting effects of hard boundaries between intellectual disciplines" should be abandoned in order to anticipate

> a new kind of provocative, open science, one that would be more scrupulous and rigorous than much modern practice in that its work would always be attentive to the multiple frames and contexts whereby something is accorded, perhaps only for a time, the status of a recognised fact or an accepted observation. Dogmatic divisions between science and cultural politics would be refused, in favour of thinking through multiple, intersecting grey areas, each yet defined as precisely as possible and made explicit in its stakes. (161)

This would perhaps achieve the replacement of "a negative attitude towards modern life" with "a more positive equilibrium" (Armstrong 78). If we put such rudimentary antitheses as "science versus literature, intellect versus imagination, analysis versus synthesis, expert versus amateur, man versus woman, adult versus child" aside, because they distort the picture of life as a whole (Midgley 55), we may be able to "value and celebrate scientific knowledge without being dragooned into accepting propaganda" (Midgley 52-3). In a similar manner,

> [a]n extension of interdisciplinary thought and philosophy will enhance both art and science in their ever-increasing specialization. Science as a part of human culture pursues its single-minded search for knowledge, often neglecting the ingredients which should link knowledge and human needs. Artists without an understanding of science and technology can only superficially enter the *zeitgeist* of the present century, and it is therefore not surprising that their work is often confused and meaningless to the beholder. (Michaelis 172-3)

A relevant interdependence of the sciences and the humanities is suggested by the recent posthuman theories. Posthumanism argues against the Cartesian divide more strongly than ever considering the mind and the body not as distinct units but as inseparable pieces that make up the whole. Likewise, science and poetry should be brought together as complementary elements in an interdisciplinary manner. Katherine

Hayles's posthuman model regards the material body as an accidental form and reduces consciousness to a minor condition (3). In addition, Hayles considers the body as an entity which can be manipulated via technology to perform better and hence observes no difference between humans and intelligent machines: "In the posthuman, there are no essential differences or absolute demarcations between bodily existence and computer simulation, cybernetic mechanism and biological organism, robot teleology and human goals" (3). In short, posthumanism rejects the idea of humans as fixed subjects and defends the idea that they are capable of mutation depending on outer stimulants and conditions. As a consequence, "the 'self' is understood as 'local, fluid, contingent, and as contesting and rending the hierarchal binaries of nature/culture, self/other, male/female, human/nonhuman,'" thus blurring the distinctions between them (Clark 66).

In this respect, Derrida's theory of deconstruction is important in terms of creating the original "disturbance, displacement, or disruption of the status quo" for it has "enormous potential for resisting the self-assurance of any hegemonic discourse or practice" by rejecting any modes of discursive power (Wolfe xix). Another area where Derrida's deconstructive questionings led to a newer model occurred in terms of the challenge to anthropocentricism, which led to biocentrism. Anthropocentrism is "the almost all-pervading assumption that it is only in relation to human beings that anything else has value" (Clark 2). Considering humans as the norm, an anthropocentric view of the natural world defines itself entirely in its relation to the human (Clark 3). In contrast, biocentrism upholds the view that "actions should be guided by a sense of what is good for the biosphere as a whole" and should acknowledge "the intrinsic value of all natural life" (Clark 2).

Similarly, claiming that nothing should be defined in terms of its opposite but should rather be acknowledged in terms of its complementary aspects, science poets encourage the use of sciences and humanities in their poetry. True enough, poetry and science at first glance seem to be different activities chiefly in terms of their methodology. What is more, the efforts to bring them together may be considered futile because "the world of art is often considered to be removed – remote – from the concreteness of scientific

knowledge and the tangible impact of technology" (Erickson 11). In science, for instance, "there seems an obligation to suppress emotion, including the emotion of exuberant discovery, while poetry, however modulated and oblique, is often reliant on a fusion of musical and emotional pitch" (Crawford "Introduction" 9). Objectivity in this sense relies on the assumption that the scientists "mechanically and systematically uncover nature's secrets-maintaining total objectivity throughout the process" (Vigue 235). While subjectivity indicates individuality, objectivity "hints at mass direction" which sustains a common opinion devoid of its individual nuances (Henkes 17). Arguing that "[r]eal science is more human, more unpredictable, and more exciting than the variety presented in textbooks" Vigue summarises the attributed qualities of objectivity as the provision of testable truths (235). As a result of the distinction between objective and subjective truths, value has been upon science rather than poetry for dealing with certainities rather than possibilities.

However, it is undeniable that an attraction exists between literature and science today, as it has done for centuries. British poetry has always involved science, if not as abundantly as contemporary poets. In line with the scientific advancements of their respective ages, poets of every age were inspired by the sciences, and borrowed terms and ideas from them. During the Middle Ages and Renaissance, scientific innovations were made mostly in the areas of medicine, astronomy and alchemy. Thus, Geoffrey Chaucer (1343-1400) dealt respectively with astronomy and alchemy in "The Franklin's Tale" and "The Canon's Yeoman's Tale" in *The Canterbury Tales*, and described the mechanics of an astrolabe to his son in "A Treatise on the Astrolabe" (Conrad-O'Briain 35). Likewise, John Gower (1330-1408) in "Book VII" of *Confessio Amantis* dealt specifically with astronomy in his attempts to describe the cosmos. Despite the findings of the sixteenth-century astronomers who replaced the earth-centred model of the universe with the Copernican heliocentric solar system during the Renaissance, William Shakespeare's (1546-1616) cosmology remained decisively Ptolemic and Aristotelian in his works (Bush 9-10). Ben Jonson's (1572-1637) poetry, on the other hand, was influenced largely by the idea of the four humours and alchemy.

In the seventeenth century the idea of a mechanical universe, which is governed by scientific rules rather than theological explanations, took hold within the society. As philosophers such as Francis Bacon (1561-1626), René Descartes (1596-1650) and John Locke (1632-1704) theorised scientific knowledge, poets of the period felt the need to question their belief systems as well. Caught in between the political turmoil of the seventeenth century and the questioning of their faith by scientific advancements, the dilemma of the poets of the period is reflected best in the poems of the metaphysical poet John Donne (1572-1631):

> Donne's interest in discovery links him with important concerns of his age. The sixteenth and seventeenth centuries were a time of exploration, both scientific and geographical. The New World was being explored, and astronomical observations by Copernicus, Kepler, and Galileo led to the discovery of a new order of the heavens. England also saw the emergence of modern, experimental science, which proposed to discover the true order of the physical world. Though Donne showed scepticism towards the new science in the *Anniversaries* and elsewhere, his poetry, with its emphasis on the process of active discovery, its sceptical stance towards received ideas and poetic conventions, and its sense of excitement at making fresh discoveries about human experience, is a poetic counterpart of the enquiry taking place in many fields in the seventeenth century. (Guibbory "John" 129)

Parallel to the discoveries of the age, Donne and his contemporaries experimented with form and came up with the metaphysical conceit as a means of defamiliarisation in poetry. Donne himself occasionally relied on the technoscientific developments of his age as metaphors whereby "law, medicine, astronomy, and other new sciences provided material for his verbal creativity in poetry and prose" (Magnusson 183). These unconventional metaphors which made associations between pairs which were conventionally regarded as unlikely were influenced by the discoveries of the century as Donne borrowed words from the technoscientific developments of his age. Donne's works, in a way, "reflected the conflict of values that characterised the latter half of the 17th century" by way of which "religious orthodoxy was challenged by philosophic scepticism," and yet also reflected their harmonious union (Brackett 120). Thus, searching for "stability, fulfilment, and permanence in an age of religious and political conflict, a world rapidly changing with the emergence of new sciences and

technologies," the metaphysical poet introduced a new poetic device into poetry (Guibbory "Preface" ix).

The steady process that gained momentum ever since the establishment of the "Royal Society of London for the Improving of Natural Knowledge," which was clearly "a display of the monarch's approval of the emerging scientific age," in 1662 by Charles II, eventually gave rise to the Age of Enlightenment (Brackett 120). Marked previously by ideas of empiricism and "scientific rationalism" of John Locke (Bush 56), the eighteenth century was mostly notable due to Isaac Newton's (1642-1727) major scientific discoveries on physics, mathematics and astronomy (Bynum 87, 91). The "first scientist to be knighted," Newton used science in order to "describe things like movement and gravity mathematically" (Bynum 93, 88). His studies on gravity and light respectively gave birth to *Principia* and *Opticks* which eventually led to Alexander Pope's (1688-1744) praise of the scientist with the epitaph: "Nature and Nature's laws lay hid in night! / God said, 'Let Newton be!' and all was light" (Bush 53). Following the example of the "typical 18th-century thought," Pope in his poems encouraged man to rely on objective thought and his reason in order to enable the progress of society (Brackett 166). However, not every poet was excited about Newtonian physics. The way Newton explained how rainbows are formed in *Opticks*, later on led to the disillusionment of one of the most remarkable poets of the Romantic period, John Keats (Bynum 89).

Although Carter claims that "[o]f all poetical conventions, the metaphor is particularly user friendly in a Newtonian universe, where distinctions between here/there and either/or are taken for granted," poets of the Age of Enlightenment dropped the metaphysical conceit by turning their interest in science and technology into a thematic concern instead (48). John Dryden (1631–1700) provides such an example since he frequently collaborated with the Royal Society after joining the prestigious group of intellectuals upon their invitation (Brackett 129). His work "*Annus Mirabilis: The Year of Wonders, 1666* (1667)" "with its tone one of optimism for the future" was written after his inclusion within the group (Brackett 17, 129). Closely inspecting the benefits of the pragmatic role of science in improving people's lives, Dryden's interest was also

shared by other authors such as Margaret Cavendish and Abraham Cowley (Brackett 18).

Especially Margaret Cavendish (1623–1673) dedicated her life to "intellectual pursuits, engaging in self-education in areas of science and philosophy" which were denied to women around the time (Brackett 61). Her work *Poems, and Fancies* (1653) followed by *Philosophical Fancies* (1653) presents Cavendish's perception of atomism in The Atomic Poems as "a combination of fancy and science" through which "she attempts to re-vision the universe, and interprets existence and natural phenomenon in terms of atoms" (Sadun 189). Disreputed as producing "outrageous fantasies" instead, she was, unlike Dryden, able to visit the Royal Society in 1667 rather because, as the Duchess of Newcastle, "her husband had several friends in the society who felt a political obligation to the duchess" (Brackett 61, 62).

The foundations of studies on magnetism were also laid in the eighteenth century via Benjamin Franklin's (1706-1790) experiments across the Atlantic, and electricians Luigi Galvani (1737-1798), Alessandro Volta (1757-1827) and, lastly, André-Marie Ampére's experiments in the field (1775-1836) (Bynum 95, 97, 98). Parallel to electromagnetic discoveries in science, Scottish poet James Thomson's *A Hymn on the Seasons* reflects the poet's "religious, philosophical, sociopolitical, [and] neoclassical" dimensions, and demonstrates his deliberations on "man's place in nature, nature as a conduit for knowledge of God, country life as superior to city life, the idea of harmony between recent scientific claims by Newton and religious ideas, and the poet's duty to transmit God's word to readers," besides other thematic concerns (Brackett 220). Thus, relying on Newtonian principles and the subsequent electromagnetic theories, Thomson introduces "a spiritual harmony [. . .] of scientific theory and religious thought" (Brackett 222). As for Samuel Johnson, the influence of science in his poetry is rather reflected via his inclusion of Science as an allegorical character in his poem "The Vanity of Human Wishes" (1749), besides such personifications as Truth, Virtue, Doubt and Reason (Brackett 440, 441).

Towards the end of the century, however, poetic interests changed, and while poets dropped reason in favour of emotions, scientific subject matter, too, left its place to feelings with the rise of Romanticism in art. Scientific developments that occurred in this age were influential in this drastic change. Technology became more pervasive as Newtonian mechanics gave way to then recent developments in electromagnetism, hence triggering a series of events which led to the success of James Clerk Maxwell (1831-1979). It is also in the nineteenth century that John Dalton (1766-1844) observed atoms for the first time (Walker 9), Humphry Davy (1778-1829) discovered the first battery, and Michael Faraday (1791-1867) studied the relationship between electricity and magnetism (Bynum 123, 127, 128). Experimenting with electricity and magnetism, Faraday eventually managed "the conversion of electrical energy to mechanical energy" which is, literally, the "drive of our modern world" (Bynum 129). However, it was James Clerk Maxwell (1831-1879) who "truly secured Faraday's legacy" in Britain (Bynum 131). The Scottish mathematical physicist discovered the "wave-like properties" of "electro-magnetic fields" which "travel at the speed of light," and "predicted the entire range of waves that we know: radio waves which allow radio broadcasts, microwaves [. . .], ultraviolet and infrared light waves above and below the colours of the rainbow, as well as X-rays and gamma waves and rays" (Bynum 131, 132).

Ultimately paving the way to the Industrial Revolution that took place in the nineteenth century, the discoveries that had taken place at the end of the eighteenth and the beginning of the nineteenth century were what primarily disillusioned the Romantic poets. Matthew Boulton (1728-1809) and the Scottish engineer James Watt (1736-1819) revolutionised engineering with their invention of the steam engine and indeed became the major forces behind the Industrial Revolution to come into full bloom in Britain. The Romantic revolt, hence, was against the sciences in general and against technology in particular as technology brought along with itself the Industrial Revolution with its rapid changes and mass production; and the society's increasing reliance upon it. It was "a revolt of the feeling heart and the senses and the imagination against mere reason and its abstract picture of the world and man" (Bush 79). While Newtonian mechanics led to greater technoscientific advancements, Keats regretted the supremacy of cold

philosophy in “Lamia” all the because of its negligence of imagination and feeling while searching for objective truths. Therefore, the Romantic poets defended subjectivity against objectivity, feeling against reason, fancy against fact, nature against culture, and preferred escapism into a rural and glorious past rather than facing the ugly realities of a mechanical age as they regarded it. Since technology advanced far more swiftly than it did a century ago, by the end of the eighteenth and beginning of the nineteenth century the Romantic poets had a rough idea of what might possibly follow, hence Keats’s anticipation of unweaving a rainbow. William Blake, too, was distrustful of the sciences and considered “as a great evil triumvirate, Bacon, Newton, and Locke” whose ideas were responsible for the current situation of the society (Bush 53). By way of “individual introspection and self-expression,” all the while downplaying “formal order and decorum” which were “less prized than emotional intensity,” for the Romantic poet nature, then, became a resource for “aesthetic experience and the myth-making imagination, [as] a main avenue to ultimate reality” rather than the path taken by the sciences (Bush 80-1, 80).

Much of the nineteenth-century thought was dominated by the theory of evolution introduced by biologist Charles Darwin (1766-1844), and geologists Sir Charles Lyell (1797-1875) and Robert Chambers who defended Darwinian theory of evolution strongly (Bush 116). The most renowned poet of the age, Lord Alfred Tennyson (1809-1892) influenced by the scientific discoveries of the Victorian age, included elements from geology, biology and astronomy in his poetry. His poem, *In Memoriam*, for instance is notable for its attempt to bring science and religion to terms. As for the twentieth century, the era witnessed some of the most revolutionary advancements in science with Albert Einstein’s (1879-1955) theory of relativity, Erwin Schrödinger’s (1887-1969) quantum mechanics, Werner Heisenberg’s uncertainty principle (1901-1976) and Enrico Fermi’s introduction of the atomic age with the world’s first nuclear reactor (1901-1954) (Walker 9-10). Despite his praise of the element of wit that was used by the metaphysical poets, T. S. Eliot (1879-1965) in *Four Quartets* regards science as incapable of solving mankind’s troubles and underlines further that science is responsible for man’s alienation and devastating results of warfare. Contrarily, Dylan

Thomas's (1914-1953) poetry shows a deep interest in biology which acts as "a magical transformation producing unity out of diversity" (Nagaraju and Seshaiah 9).

By the end of the twentieth century, mostly due to the discovery of new sciences and the need for academic specialisation, the divide between the sciences and the humanities increased. However, the complaints of Keats were not to go amiss, as towards the end of the century English scientist Richard Dawkins, inspired by Keats's lines, would name his book *Unweaving the Rainbow* (1998), perceiving the rainbow as *the* symbol of the so-called division between the humanities and sciences, and would argue that, both being equally wondrous, sciences and humanities should not be oppositional but rather complementary of each other (McGovern 214). So, McGovern maintains, "[s]cience is, or ought to be, the inspiration for great poetry" (214). After all "[s]cience and technology both shape, and are shaped by, the society in which they are performed" (Bridgstock 10). Nothing would be more natural than both sciences and humanities to make efforts to understand and enrich each other. Besides,

> the poetic imagination, now as always, requires myth, those basic fables and symbols, evolved by the racial consciousness and enriched by racial and poetic transmission, that embody the spiritual realities by which man has lived. But the climate of the modern world, the mechanized chaos of the modern city, can only blight that kind of myth and the modes of natural and communal experience it represents – as the romantic writers and the young Tennyson foresaw. The modern poetic revolt against scientific positivism has some obvious similarities to the romantic revolt against Newtonian mechanism, but modern poets have recognized the inadequacy of romanticism partly through being deprived by science of some central elements of the romantic faith. All modern poetry has been conditioned by science, even those areas that seem farthest removed from it. And though modern poets have been united in revolt against the positivistic and mechanistic habit of mind and the world it has created, they have of course revolted in very different ways and directions. (Bush 151)

Contrary to the previous generation of poets, contemporary poets are aware of the problems that may result from such a deliberate exclusion because it implies turning a blind eye to a major aspect of life. Contemporary science poets continue a line of interest that is present in British poetry ever since Chaucer. Yet, the interests of present-day poets differ from medieval and Renaissance poets in terms of the now clear-cut differentiations between scientific disciplines. Unlike the philosophical assumptions of

a medieval or a Renaissance poet, contemporary poets rely on objective scientific knowledge. Similar to metaphysical poets, their poetry is not didactic but relies on technoscientific terminology for figurative purposes. Unlike the Romantics and a number of the twentieth-century poets who associated science with destruction, contemporary poet's attitude towards the sciences is neutral rather than negative. According to the contemporary poets, one does not have to be an expert in science and technology to enjoy their benefits since presently science and technology are very much central to everyone's lives. In contrast to a revolt, then, what is encouraged nowadays is a mutual understanding. According to Johnston, we need to realise "the role of imagination, intuitive thinking, or creative thinking in the work of both the scientist and the humanist. Illuminating concepts and seminal ideas are outcomes of the creative thinking of man whether he is working in a laboratory or studio. Flashes of insight are experienced by both scientists and artists" (12-3). The scientist and the poet are both "engaged in the same type of activity" (Middleton 196). As Armitage, too, suggests, science and technology did not take man to the moon; a poetic dream did ("Modelling" 120). Thus, representing two different aspects of human creativity, a creativity that is "manifest in both artistic and scientific activities," it can be seen that poetry and science, more than their creative power, share some common interests and ends that bring them closer (Michaelis 175).

The reasons for attraction between the humanities and the sciences may differ. They may lie in the scientists' amusement in reading about their scientific processes reflected in the body of a poem or the precision of poetic expression that mirrors something of scientific value or else, simply, it may exist because science offers "fascinating poem-fuel" which introduces a fresh perspective on poetic subject matters (Crawford "Introduction" 6). The tension between what is commonplace and what is unexpected will, thus, provide a renewed outlook on things. Science as "a way of avoiding or of improving on unsatisfactory aspects of inherited or 'traditional' poetic discourse" indicates a postmodern challenge to conventional poetics (Kennedy 167). Consequently, science today, as it has occasionally done before, provides poetry with "images, metaphors, and procedures that might be mutually enriching, illuminating, or

pleasurable" (Crawford "Introduction" 6), which is identified as the "promethean status of technology" by Tim Armstrong (85).

Nonetheless, poetry and science are more similar than formerly suspected, and "science remains a field of knowledge which challenges the poet whose ambitions include all twentieth-century knowledge, and which continues to provide resources for an avant-garde" (Armstrong 85). Most importantly, however, it is because "both 'science' and 'literature' [. . .] participate in the common pursuit of self-knowledge," hence complementing "scientific understandings of reality" with "the ethical and existential interrogations of the creative imagination," that a union is necessary (Coleman 185). Thus, contemporary science poetry creates "a poetics of inquiry, for which investigation, research, analysis, discovery, observation, reflection and other forms of intellectual curiosity [are] all relevant" (Middleton 199).

The use of science and its terminology in poetry can be explained in relation to an underlying shift in paradigms that occurred recently. Arguing that in the late twentieth and early twenty-first centuries science and technology became essential parts of our daily lives, Crawford asserts that poetry inevitably makes use of science and technology, or else it would surely become "a ghetto concern only" ("*Spirit*" 51). For, "one way or another, 'science' permeates every aspect of modern life" (Woolgar 11). As Erickson also confirms: "Our lives are now described by technoscientific language, our meanings are constructed around technoscientific viewpoints on the world. We cannot easily escape the frame of reference, this form of life" (11). Science is inescapable and art should celebrate it rather than evade it. Crawford, accordingly, emphasises the inevitability of such an interest as follows: "Poetry will continue to be obsessed with sea and stars, love and death, but if it is not also alert to semiconductors and computers, windfarming and global warming, it will grow subtly untrue to the linguistic and cultural climate in which it is written" ("*Spirit*" 54). Thus, the poetry that employs technoscientific language as a part of its poetics and relies heavily on ideas, terms, signs, symbols and key concepts borrowed from the sciences and technology can be defined as science poetry. Accordingly, in science poetry a mathematical sign or a physics theorem becomes an essential element of a poem just as easily as a poetic image

either thematically or formally. In addition, acronyms and slang terms that emerged with the widespread use of computers and smart phones in urban settings, too, constitute techno-scientific language in contemporary science poems.

Science poets do not aim at teaching scientific knowledge but use science and technology for figurative purposes as well as relying on it for subject matter. As a result, their poetry is not didactic but metaphysical. The poets use scientific language to defamiliarise the world around. Coined by the Russian Formalist Victor Shklovsky, defamiliarisation means creative estrangement (720). Shklovsky argues that the process of making strange, revitalises the perception of the objects so that the aim of art becomes "chang[ing] the form without changing its nature," hence presenting things in a new, unfamiliar light, by way of formal manipulation (721). The main aim of defamiliarisation is to create a tension between familiar and unfamiliar concepts in the reader's eye in order to renew their perception. Owing to the use of defamilarisation, science poets offer new insights through their witty conceits which are both alienating due to the use of science and technology, and familiar because of the familiarity of themes such as love, death, wonder and sickness. Elements borrowed from science and technology, thus indicate how little humanity knows about the contemporary age.

Although various critics, including Morgan and Crawford, have discussed the properties of science poetry in their essays, they refrain from calling it as such. Hence, in this dissertation a working definition of science poetry will be attempted, and through the poems of Edwin Morgan, Robert Crawford and David Morley its poetics will be illustrated. W. N. Herbert, acknowledging himself as an informationist poet, identifies the current poetic agenda as "an urban poetry, a scientific poetry, a poetry that engages with contemporary metaphysics, and a poetry that can manipulate a prose voice" (76). What Herbert claims for informationist poets stands valid for science poets in general, for science poetry is primarily identified by its abundant use of scientific and technological elements, both in terms of language or content. Scientists, scientific discoveries, theories and concepts, besides technological advancements that occurred as a consequence of scientific innovations and inventions, are among its chief subjects. Addressing contemporary problems like estrangement, pollution, nuclear threats and the

depletion of the world's resources due to the side-effects of technology, science poetry continuously emphasises the need to include these topics in poetry. In line with its reliance on these particular elements for subject matter, science poetry encourages experimentation and innovation in form and style. Science poetry further underlines the wholeness of knowledge and interdependence of individual disciplines. The poetics of science poetry, hence, defines science poems in terms of their subject matter as well as their formal and stylistic qualities. Renowned scientists, ground-breaking technological events, scientific discoveries and scientific methods are a major part of the science poets' concerns. The poets use urban life as a backdrop to their poetry, to reflect contemporary shifts within society that occur as a result of scientific discoveries.

The matter and methods of contemporary science poetry are numerous. First of all, contemporary science poetry is concerned chiefly with scientific data, either genuine or fabricated, and is closely interested in current developments in science and technology (Holub "Rampage" 12). Science poems often use science and technology as metaphors stimulating the imagination with their moderately difficult treatment of their subject matter (Crawford "*Spirit*" 53). Subsequently, defamiliarisation is a frequent concern of the poems which make conventional imagery strange by way of their scientific and technological associations. In most cases, then, the tension between familiarity and a particular kind of strangeness is what produces science poems. Materially, too, science poems are unusual in terms of the newest technologies used by the poets which visibly "shifted poetic styles. The typewriter completed the move towards the poem as a design on the page [. . .] making way for [. . .] ludic typographies" (Armstrong 79). In accordance with their interest in recent technologies and groundbreaking inventions, science poets experiment with traditional forms or create new forms from scratch.

Science poems may be scholarly, systematic and precise in their approach, as a result of which they may escape sentiment; or else, they may attach sentimental value to technoscientific objects (Herbert 85). They raise scientific questions and give temporary answers, thus, emphasising the limitlessness of the universe and of knowledge. These poems are essentially urban, and they use daily language. Science poetry is democratic in its approach to the sciences. Moreover, it makes use of futuristic settings. The cosmos is

presented as a place of ceaseless change where change is welcomed as a commonplace occurrence, thus science poems often regard contemporary problems such as ecological disasters, lack of communication and alienation as simply the logical next step in human evolution (Morgan 27). Although the poets who make use of science and technology in their poems address ecological problems in their poetry, these are rarely a central concern in their poetry. Instead, humanity is shown to be dominated by a new desire to recover the lost human-nature bond in another place/space, just as they are filled with a desire to communicate with the non-human/alien species. Thus, alienation leads to a renewed familiarisation process in science poems where change and acceptance are the domineering moods. Finally, what is common to all science poems is that they consider interaction between different sciences as inescapable and the unity of knowledge a must. As John Burnside argues, "[i]f poetry has a role in relation to science, it is to remind science of that universal truth" which is attainable only through the humanities and the sciences (95).

Many British poets have written science poems. These include Hugh MacDiarmid (1892-1978), Louis MacNeice (1907-1963), Edwin Morgan (1920-2010), Robert Crawford (b. 1959), W. N. Herbert (b. 1961), David Morley (b. 1964), Lavinia Greenlaw (b. 1962), Pauline Stainer (b. 1941), Peter Redgrove (1932-2003) and Allen Fisher (b. 1944). Others like Carol Ann Duffy (b. 1955), Ian Hamilton Finlay (1925-2006), Simon Armitage (b. 1963), Peter Reading (1946-2011) and Linton Kwesi Johnson (b. 1952), too, make science and technology an occasional interest in their poetry. However, their allusions to science and technology are not nearly as abundant as they are in the poems of the initial group. Of these poets, Edwin Morgan, Robert Crawford and David Morley stand out due to their distinctive approaches towards the development of science poetry. These three poets particularly, because they reflect different attitudes towards the use of science and technology in their poetry, can be taken as innovative figures in the development of science poetry.

Scotland's first poet laureate Edwin Morgan is amongst the very first of contemporary poets to develop a relationship between the sciences and the humanities in his poems. As the most experimental poet of the three, Morgan in his poems deals imaginatively

with the "evolving technology of the computer, modes of scientific knowledge and modes of poetic making" (Crawford "Introduction" 6). In *From Glasgow to Saturn* (1973), *The New Divan* (1977), *Star Gate: Science Fiction Poems Third Eye Centre* (1979), and *Virtual and Other Realities* (1997), Morgan reveals his interest in virtual reality and the escalating importance of, mainly, the applied sciences. For Morgan, "science is an area to be raided, recycled, recombined; a set of procedures, languages, topics which the poet can use productively rather than seeing technology as in opposition to culture" (Armstrong 86).

Morgan's poems are inspired by the developments in the technoscientific world, as is perceived in his several computer poems. Additionally, his poetry is driven by an interest in space-travel and cyberspace. His computer poems deliberately adopt an artificial tone and are objective in stance. Armstrong observes that Morgan's "*Star Gate: Science Fiction Poems* (1979) borrows the conventions of science fiction to imagine new particles, new forms of life which in fact are new forms of poetry" (86). Yet, despite Morgan's interest in "the less directly observable realities to be found on computer screens and beyond the lenses of space telescopes," Dósa observes, Morgan's attention is "deliberately drawn to the immediate reality he can see and hear around himself in Glasgow" (21-2). Questioning man's place within the universe, Morgan, like a modern scientist, starts out from the particular to arrive at a general view of the cosmos, hence his collection *From Glasgow to Saturn* (1973). Thus, he represents contemporary problems of the world using science and scientific discourse as mediums to not only utter but also solve the problems that they themselves have created in the first place.

Contrary to his forerunner Morgan, whose work is "a more ludic and eclectic mode, taking in paleography, [. . .] cybernetics, language processing, communication technologies and computing" (Armstrong 86), Robert Crawford writes lyrical science poems of sentimental value. Crawford's poetry collections, *A Scottish Assembly* (1990), *Spirit Machines* (1999), *The Tip of My Tongue* (2003) and *Full Volume* (2008) are rich in examples of science poetry. Strongly interested in contemporary Scottish poetry and himself a critic, Crawford believes that Scotland has always had an unusual relationship

with science ("Introduction" 4). Claiming "science" to be a Scottish invention, Crawford asserts that modern science and information technology are vital to poetry, and that it is the duty of the poet to combine information with imagination (Dósa 82).

Accordingly, in *Contemporary Poetry and Contemporary Science*, Crawford aims to present samples of "juxtapositions, and provocations," the goal of which is to suggest that poets and scientists should work in union ("Introduction" 8). In his poems, he achieves this harmonious co-existence. Like Morgan, he, too, places himself at first in a geographical location and then extends his being to the universe at large. For Crawford, science helps the individual gain a better understanding of her/his place in the universe. The more scientific elements the reader comes across in poems, the deeper a consciousness s/he develops of her/his responsibility towards the universe. Still, the central concern of his poems remains his efforts to construct a new Scottish identity, and in this the poems rely heavily on technoscientific discourse to represent a technoscientific panorama of Scotland.

In *Releasing Stone* (1989), *Scientific Papers* (2002), *The Invisible Kings* (2007) and *Enchantment* (2010) David Morley takes science out of the laboratory and into the public arena. As a firm believer in the use of science and the scientific methods, Morley's poems underline how interest in the magic has been replaced by science in today's technological world, and emphasise science's inseparability from contemporary urban experience. Among the three authors, David Morley employs the scientific method in writing a number of his poems, such as his field-trip poems which rely on scientific observation and the acquisition of data through scientific methods. In his field-trip and laboratory poems, the scientific method "proceeds from observation (step 1), to hypothesis formation (step 2), to hypothesis testing or experimentation (step 3), to theorization (step 4), [and] to further experimentation (step 5)," excluding the last step: "formation of a law (step 6)" (Vigue 235). Thus, imitating the scientific method, a number of Morley's poems can be read as scientific experiments not only in terms of their method but also in terms of the analogies they raise. Experimenting with form as well, at other times Morley's poems may take the shape of a question that is presented as a formula on the page. Additionally, zoology and botany are among his main

interests and he shows a heightened awareness of ecological problems. In this sense, his poems may be read as attempts to renew the impaired human-nature-animal bond, in addition to making the scientific familiar and available to the masses.

Morgan, Crawford and Morley all have different approaches and definitions for their poetry. Although there are differences in terms of their treatment of their subject matter, these poets still have their similarities. Aiming to represent contemporary experience in their poems, for Morgan, Crawford and Morley, the idea that the present age is technologically and scientifically charged remains central. All three poets unite in their efforts to underline the co-existence of sciences and humanities as a requirement of the present age in their poetry which makes it possible to develop a poetics of contemporary science poetry from there. Accordingly, arguing that contemporary British science poetry was born out of a need to reflect the contemporary experience which is rich in scientific and technologic elements, the aim of this study is to formulate a poetics of contemporary science poetry based on the poems of Edwin Morgan, Robert Crawford and David Morley and to analyse their poems with regard to the proposed poetics of science poetry in the following chapters.

To this end, Chapter I will analyse Edwin Morgan's contributions to science poetry specifically in terms of his innovations in form and style which mirror the technoscientific innovations of the contemporary age. While Morgan's computer poems reflect the rising interest in computer technologies, cyberspace and virtual realities, his science fiction poems introduces a techno-science-driven poetics which explores futuristic settings and has faith in change as a positive factor. Chapter II examines Robert Crawford's poetics which attributes sentimental values to science and technology. In his lyrical science poems, Crawford employs science and technology mostly for figurative purposes to write a subjective history of Scotland. Juxtaposing Scottish authors with Scottish scientists to this end, Crawford attempts to draw a technoscientific panorama of Scotland in his poetry. Chapter III focuses on David Morley's poems which besides employing technoscientific material, makes use of the scientific method as well. Especially, Morley's field-trip poems are exemplary of the use of the scientific method. These poems show the scientist in action, while s/he

collects data and establishes a theory based on her/his findings. The subtitles that are identified in Chapter I, Chapter II and Chapter III indicate the main features of contemporary British science poetics. In the Conclusion, elements of contemporary science poetry will be stated to map out the differences and similarities in Morgan, Crawford and Morley's respective poetries, as well as pointing out how the poets employ these features in their poems.

CHAPTER I

EDWIN MORGAN

> And thus a poetry which fully understands
> That the era of technology is a necessary fact,
> An inescapable phase in social activity,
> Within which men are to rise
> To ever greater mental and emotional heights,
> And that only artists who build on all that men have created,
> Who are infused with a sympathy and a sensitive appreciation
> Of the new technological order
> And all it may mean for their art,
> Can play their role with any certainty
> That their work will survive historically
> And in so doing they will also make
> Their contribution to the New Order.
> (Hugh MacDiarmid "From *The Kind of Poetry I Want*" 217)

> What involves man involves reality; what involves many men is the great neglected material of our poetry. (Morgan *Essays* 14)

In accordance with the principles required of the "New Order" envisioned by MacDiarmid, late twentieth-century poets frequently employed science and technology in their poems. Often praised as one of the leading Modernist poets of his time, Morgan contributed much to the development of contemporary science poetry, if not to the advancement of Scottish poetry in general (Crawford "'to change'" 12). Arguing that "[a] poet should be an explorer of some kind" (qtd. in Duncan "Poetry"), above everything else Morgan was "a great experimenter. He was galvanised by new ideas in form and subject matter" as is exemplified by his numerous sound poems, concrete poems, instamatic, emergent and particle poems, computer and science-fiction poems, haikus, sonnet sequences and dramatic monologues in addition to plays and translations from several languages (Graham "Virtuoso"). Ever-daring in terms of his style, form and subject matter, the broad spectrum of the topics Morgan employed, particularly from his *Emergent Poems* (1967) onwards, reflects his profound interest in scientific and technological advancements as subject matter. Morgan, who was fascinated by science and technology, enjoyed bringing elements from the sciences and the humanities into his poetry. According to Morgan, sciences and humanities provide different routes to understanding the world via their unique methods. Morgan employs an objective attitude in treating his subject matter. Moreover, rejecting

anthropocentricism, Morgan believes that anything and anyone can be a suitable topic for poetry, and this includes computers and aliens. Thematically, a willing acceptance of change is central to his poetry, since Morgan regards change as a natural outcome of the evolutionary process. Moreover, as befits his comfortable stance towards change, he has faith in the future. In many of his science-fiction poems, Morgan imagines the human condition and alien interactions in different planets. Because his poems deal largely with technoscientific material, they represent urban lifestyles, which occasionally point to the microcosm and macrocosm relationship. Marked both as the centre and ideal representative of adaptability to mutability; industrial and technologically-advanced Glasgow, or else Scotland in general, becomes a representative of the universe in a nutshell in Morgan's poetry. In this aspect, the aim of this chapter is to illustrate the formal, stylistic and thematic innovations introduced to late twentieth-century poetry by Edwin Morgan whose poems reflect an interest in science, technology, computers and space, thus constituting an example for contemporary British science poetics.

Born in Glasgow in 1920 as the only child of politically conservative Presbyterian parents (Marsack "Edwin"), Morgan was interested in both "[p]ractical knowledge and exuberant fantasy" at an early age which, according to McGarra, together constitute the basis of his most remarkable poems (2). Morgan's enthusiasm for science and technology was developed at an early age by his close proximity to the industrial city of Glasgow (Graham "Virtuoso"). Glasgow where his father worked at the docks as an executive of a small firm of iron and steel merchants was a source of inspiration for him (Marsack "Edwin"). His father was significantly instrumental in Morgan's future poetic interests, as he "possessed a practical turn of mind" that inspired Morgan's constant fascination with science and technology (McGarra 1). According to Morgan, his informative and enjoyable experiences with his father had an effect which revealed itself through most of his poetry: "'On long walks, he used to tell me all about how steel was made and how ships were constructed,' Morgan recalls. 'That industrial side of Glasgow was in my mind from a very early age'" (qtd. in Campbell "Review"). Moreover, he adds, it is also due to his father that he always felt at ease with technoscientific advancements:

> [W]hen we went on Clyde steamer he would make a bee-line for the engine-room, dragging me with him: to me, as a boy, the engines would have only a sort of hypnotic functional beauty, the sleek well-oiled movements, the various parts that always miraculously avoided hitting each other, but my father knew how the parts were made, how they fitted together, he could tell me how the boat actually moved, and somehow the whole industrial process remained human, despite all its problems, and I was never able to become a Luddite. (qtd. in McCarra 1-2)

Morgan's attraction towards a harmony between the nonhuman and the human continued throughout his life, as he remained an ardent admirer of not only science and technology but also of that epitome of the industrial city, Glasgow, which became the inspiration of so many of his poems (Campbell "Review"). In order to pursue his literary interests, he enrolled at Glasgow University in 1937 (Graham "Virtuoso"). However, he was not to graduate from there until after serving in the Royal Medical Corps during World War II, which he spent in the Middle East (McGonical). Returning to Glasgow in 1946, he took a first class honours degree in English Language and Literature after which he worked as a lecturer (Marsack "Edwin") until his retirement in 1980 (Graham "Virtuoso"). Publicly honored as "the first poet laureate of Glasgow in 1999, and then of Scotland, as the Scots Makar, in 2004" (Marsack "Edwin"), his new position only made official "something that ha[d] been widely acknowledged for some time" (Campbell "Review"). After a prolific and inspirational life, Edwin Morgan died in 2000 at the age of 90 (Graham "Virtuoso").

Edwin Morgan's poetic career, which started in the *High School of Glasgow Magazine* under the pseudonym Kaa in 1936, continued in the *Glasgow University Magazine* during the post-war period with his contributions as a reviewer and a translator. This resulted in a long run of double output during which his translations from Old English, Italian, Russian, Hungarian, Latin and French accompanied his own work (Marsack "Edwin"). His first poetry collection, *The Vision of Cathkin Braes* (1952) opens with an unusual vision poem which makes no attempt at all to deliver a divine message or revelation, as is conventionally expected of a vision poem. Published within the same year, his next collection is *Dies Irae* which, like *The Vision of Cathkin Braes*, presents the readers with a number of vision poems. In 1955 Morgan continued the sea imagery and journey motif that was raised in *Dies Irae* with *The Cape of Good Hope*

(Kraszkiewicz 2). Morgan's fourth collection is *The Whittrick: A Poem in Eight Dialogues* (1961) which is made up of eight dialogues between famous people. His fifth collection is *Emergent Poems* (1967) which shows Morgan's interest in concrete poetry as well as his attraction to new forms. Beginning with this collection, science and technology steadily enter into Morgan's works. In *Emergent Poems*, as an additional alphabetical letter is added to the previous group of letters, the poems gradually emerge on the paper. His following work, *Gnomes*, in 1968, continues Morgan's interest in concrete poetry and wordplay.

It was, however, with *The Second Life*, published in the same year, that Morgan's significant versatility was established. In *The Second Life* Morgan showed the ability to combine a proficiency in traditional forms with a competence in challenging them (Marsack "Edwin"). 1968 was also the year Morgan discovered the American Beat poets and was heavily influenced by their defiance of conformity and traditional forms in poetry. According to his own account, Morgan's discovery of the Beat poets coincides with his awareness of other influential figures such as William Carlos Williams and Robert Creeley, through whom he learned for the first time that "you can write poetry about anything" (Marsack "Edwin"). The inclusion of unconventional topics, combined with his earlier interest in innovation in form and style, gradually prepared the grounds for his science poems as he frequently employed technoscientific discourse as poetic material, combining it with a variety of styles, and thereby marking a definite break from his earlier collections and signalling what was yet to come.

The Second Life (1968), then, presents a panorama of Morgan's versatility of styles and forms. *Instamatic Poems* (1972) is crowded with characters from all walks of life, employing free verse, dialogue, dramatic monologue, concrete poetry and wordplay, while reflecting the idea that everything is a suitable subject for poetry. The title "Instamatic" indicates that the verses "offer an imagined reportage from that world-wide battlefront-beautiful, trivial, tragic, appalling which is the human bread in the diet of our daily newspapers" (Watson "Scottish" 227). Inspired by Morgan's interest in cinema, the poems try to seize cinema's ability to capture "the 'real moment', [. . .] '*in a perpetual present*'" (Burrows). Moreover, employing ideas based on paper headlines,

the poems supply readers with "verbal snapshots" which aim to present topical experiences as they are, without commenting on them (Boddy 188). Each poem describes a single scene without any kind of subjective involvement as if an instamatic camera has just taken a snapshot of the incident (Kraszkiewicz 11). Inspired by the Beat poets' attitude towards ordinary things and occurrences, which deemed them as suitable topics for poetry, and his own fascination with photography, Morgan tried to capture objective instances of ordinary lives in the perpetual moment of his poems.

Science and technology are most notably employed in his collection entitled *From Glasgow to Saturn* (1973). Identifying Glasgow as the centre of the universe and opening up to outer space from there, according to Marsack, the title "not only suggests his [Morgan's] subject range but also his curiosity" ("Edwin"). His next collection, *The New Divan* (1977), repeats the variety of interest put forward by *The Second Life*. Based on Morgan's own war-time experiences in the Middle East, the collection was inspired by the "fourteenth-century Persian poet Hafiz" and his original *Divan*, or cluster of poems randomly arranged as if they were talking to one another (Nicholson 221). *The New Divan*'s "pluralistic epistemology," Nicholson argues, presents the readers with a "futuristic vision" that brings together "meditations on time and change" as the narrative "I" shifts between several panoramas upsetting conventions of space, "character and narrative time" (221).

Star Gate: Science Fiction Poems (1979) confirms Morgan's profound interest in science and technology as Morgan playfully challenges conventions of form, language and style, and re-forming them in accordance with science-fiction. Morgan's "reputation for great poetic creativity and willingness to experiment with new forms of artistic expression" is seen in his *Sonnets from Scotland* (1984) which, as defined by Wacior, presents an "amalgam of styles, registers, techniques and intertextual references [. . .] devoted to the exploration of the identity of a nation as complex and protean as the poet himself" (48). Although, Morgan's sequence fulfills all the requirements of a traditional sonnet cycle at first glance, "under a closer scrutiny Morgan's collection demonstrates interesting artistic 'deformations', poetic mutations of the established canon" (Wacior

49) that defy "the precise formal restrictions demanded by the sonnet," thus displaying the poet's experimental form and style (Wallace).

As Kraszkiewicz states, Morgan is a prolific poet who "combines experimental as well as traditional form with an amazing variety of topics often achieving surprising and exciting effects" (11). Burrows, too, suggests that the recent *Collected Poems*

> runs a gamut from throwaway to high-seriousness, from experiment to traditionalism, from the Sixteenth Century Makars to the Brazilian Concrete Poetry of the 1960s; it takes in Russian, Spanish and French literary influences, alongside interests in visual art, travel, film, science, technology and all the ephemera of its period, until – finally – the whole body of work seems [. . .] dauntingly diverse, [and] [. . .] exhilaratingly uneven [. . .].

Morgan frequently experiments with conventional forms in his poetry. Specifically his science poems show much innovation in terms of form and style.

1.1. CONCRETE POETRY AND COMPUTER POEMS

Throughout his literary career Morgan was influenced by various poets, varying from local sources of inspiration, such as Hugh MacDiarmid, to various international influences, like Hafiz, the Russian poets, the Language poets, Dadaists, the American Beat poets and Brazilian concrete poetry. These poets and movements changed Morgan's form, style, interests and subject matter encouraging him to take risks in poetry by including unusual topics such as science and technology within the corpus of his poems. In the 1930s, Morgan taught himself Russian "with the intention of reading Russian literature, particularly the futurist poets such as Mayakovsky" in its original tongue (Campbell "Review"). In the 1950s, his predominant interest in Russian poetry was gradually replaced by the poetry of the American Beats which in return was replaced by concrete poetry of Brazilian poets (Campbell "Review"). As a combined result of these influences, Morgan wrote many concrete poems which aptly reflected the techno-scientific interests and typography of the cybernetic age.

Encountering the American poet Hart Crane's poetry for the first time in Michael Roberts's *The Faber Book of Modern Verse*, Morgan was struck by "the variety of freedoms and daring of the different styles" available in American poetry (Boddy 180) at a time when English poetry was dominated by Larkin's influence: "I liked the outspokenness of the Beats. When Ginsberg's *Howl* (1957) appeared, it had words that could hardly be printed at all. I was attracted by the idea of someone taking risks in poetry, which seemed to me the very opposite of what the Larkin lot were doing in England" (qtd. in Campbell "Review"). Essentially, the Beat poets wanted "to free poetry from 'academic preciosity', to make it accessible to everybody, and accordingly use everyday language, words they pick up from Jazz music and juvenile street gangs, and employ a lot of swear words, not only in their spoken language, but also in their writing" (Kraszkiewicz 3). As a result of their use of plain language, which borrowed its terminology from contemporary life experience, their poetry became more appealing to readers. Accordingly, Morgan's previous use of elaborate language slowly gave way to a much more accessible one with topics chosen from everyday experiences.

Thus, with the influence of the Beat poets Morgan learned to open up his poetry to all kinds of topics and voices from everyday life which added to the polyphony of his works. He then took their doctrines a step further by freeing his poetry from spatial and temporal boundaries. The new freedoms in Morgan's poetry, particularly in terms of spatiality, were the effects of the influence of the Dadaists and Brazilian concrete poetry. Dada art movement which, emerging right after World War I, aimed at reflecting the "absurdity of a civilization intent on blowing itself to pieces" in artworks (Keatinge 150). To this end, Dadaists relied on already existing movements, like Cubism, which then led onto the development of new ones, like sound poetry, concrete poetry and Language poetry. The break that came after World War II via Cubism "challenged the fixed viewpoint that had dominated Western Art since the early modern period or Renaissance, and introduced the possibility of a number of simultaneous perspectives" against all sorts of preconceptions (Davidson 7). In this sense, Dadaism, "[u]nhampered by tradition, unburdened by gratitude," "opposed the traditional reverence and high seriousness accorded to the Old Masters and much nineteenth-century art" (Keatinge 150, 149).

Sound poetry and Language poetry both refuse to refer to an outside reality. In a sound poem, "a poem in which the sound of the words rather than their meanings is the primary organizing feature," the "absence of meaning once more emphasizes the materiality of text and its visual surface" as "discontinuity disrupt[s] the reading process, [and] den[ies] any illusion of a coherent text" (Davidson 9). Similarly, the Language poets deny the existence of an exterior referential structure, exploring instead "the way that the meanings of words are contextually derived from their place in the language system rather than from their correspondence with a 'real' or 'concrete' world" (Davidson 15). Morgan's own *Emergent Poems* has the qualities argued by both sound poets and Language poets, "consider[ing] the emergent features that appear in all kinds of dynamic systems" in his poems (Lake 171). Holden considers subject matter as secondary to a poem's language as follows:

> "[S]ubject matter" can be considered as independent of a poem's language, as something which that language is trying to "express." Because, in good poems, structure (how "one element follows another" [. . .]) is more highly organized over a shorter interval than in other modes of discourse [. . .]. Value will tend to *be* the main subject matter of the poem. Indeed, it would seem to be virtually self-evident that the length of a discourse must profoundly influence how much emphasis over a given interval a given "ratio" will receive. The shorter a poem, the heavier the emphasis on any one word or sound or figure of speech. (102)

According to Kraszkiewicz concrete poetry should

> neither transport feelings nor should it be based on experiences, it must be an autonomous object [. . .]. The material the artist uses to create this object is the word which has a three-dimensional quality, it is 'verbivocovisual', that is, it simultaneously combines verbal and nonverbal communication through its sound and its visual quality on the printed sheet. (8)

Concrete poetry relies on "visual image as well as linguistic and auditory sense" (Fox 81). The typographical changes, the emphasis on the sound and the letter, and the fragmentation and collage techniques employed emphasise the spatial qualities of poetry. According to the Brazilian concrete poets, "concrete poetry begins by being aware of graphic space as structural agent, [. . .] therefore they demand a space-time structure instead of mere linear-temporistical development" (Kraszkiewicz 7-8).

What further attracted Morgan to concrete poetry was the element of wit that concrete poems relied on, and which he used abundantly in his science poems. He sums up his interest declaring that he had always been fascinated by "(a) language and languages and (b) art and design," and that he was "perhaps [. . .] bound to be attracted by a new kind of poetry which was strongly visual and used linguistic play'" and continues that it was "the 'vivacious and witty quality' [. . .] of the [Brazilian] Noigandres' poetry that fascinated him[,] [. . .] 'wit', 'humour', and 'ironical effects'" more than anything else (Kraszkiewicz 8). Accordingly, readers of concrete poetry "actively [take] part in the creation of the poem" as they "'use' the poet's creation, play or work with it" which consequently "stresses the playful character of concrete poetry and the different role of its readers" which turns concrete poems into writerly texts (Kraszkiewicz 8).

As someone "'who enjoys the playful use of letters, spaces and typographical outlines on a page,'" Morgan wrote various concrete and sound poems marked by their witty nature (Neeny qtd. in Campbell "Review"). For the poet who was too eager to upset prevailing norms and forms, such poetry provided viable resources. The experimental and playful nature of his works distinctly shows Morgan's delight in "creative 'estrangement'" (Watson "Scottish" 229). According to Lake, "the laws governing the evolution of living and other natural forms are the same laws that govern the creation of poetry," which is nowadays reflected best via the computer (169, 166). Poetry is bound to evolve, just like the poet who is producing it and the means which help him do so, hence the interest in computer technologies, virtual realities and cyberspace in Morgan's poetry.

The label "virtual" suggesting "a moulding of other realities," can be considered as an umbrella term for computer technologies (Nicholson 230). The term and concept emerged in 1980 when the U.S. Department of Defense launched a new programme in collaboration with the U.S. military and NASA to create "new systems for computer-generated imagery" (Nicholson 229). The fact that virtual reality came into being as a result of military research at once indicates the paradoxical stance of technological advancements which can be as devastating as they can be useful. This situation was also

an issue of interest for Morgan who in a 1998 lecture entitled "Poetry and Virtual Realities" quoted Phil Tippett, pointing out that

> [w]e now have the ability and the technology to make things look photorealistic using the computer. But this revolution is going to surpass the industrial revolution, and there's going to be a lot of blood on the floor. [. . .] The computer demands that you be very procedural and use specific language. [. . .] It's not the same thing at all as having a relationship with materials. My concern is that [. . .] one can tend to lose touch and sight of the real physical world. (qtd. in Nicholson 230)

Dismissing the negative attributes of the cyber revolution, Morgan's poetry, combined with his interest in the emergence of cyberspace, that is the worldwide web in general, was influenced by the developments in digital technologies that resulted in his computer poems. In his computer poems, Morgan employed the techniques of concrete poetry extensively, for concrete poetry can be considered as the most apt form to reflect cybernetic age's typography. Contrary to the notions of sound and Language poets, however, Morgan thinks that an outside referent should be there for the concrete poem to make sense: "[T]he element of wit' only works in concrete poetry as long as the poem still has a traceable link to reality: 'If the element of wit is to succeed in such [concrete] poems, reality must be around and must be able to be appealed to'" (qtd. in Kraszkiewicz 9). His poems, such as "Plea," "Message Clear," "Archives," "Astrodome," "The Computer's Second Christmas Card," "The Computer's First Christmas Card," "The Computer's First Dialect Poems," "The Computer's First Code Poem," "Spacepoem 1: *from Laika to Gagarin*," "Space Sonnet," "Polyfilla" and "The Clone Poem," thus, bring together the element of wit with his interest in computer technologies and technoscientific advancements.

In this respect, *Emergent Poems* and *Gnomes* which rely on computer technologies and wit are especially important. *Emergent Poems* are given this title because "the basic sentence generating the entire poem 'emerges' in the last line" gradually, both from left to right and top to bottom on the page (Fox 72). As the poem advances, words and a final message appear on the page as letters from the alphabet are brought together forming words and a whole sentence at the end of the poem. The word, "emergent," is significant for two further reasons: first of all, because it refers to atomic reality, and

secondly, because the poem gives the impression that it is written by a computer. Thus, in the poem, smaller parts get together to form a whole and reflect the image of a poem written by a computer. Included in *Emergent Poems*, "Plea," "Dialeck Piece," "Nightmare" and "Manifesto" are examples of Morgan's emergent poems.

Of Morgan's emergent poems, "Plea" is significant in terms of its unifying message which encourages the co-existence of sciences and humanities. The poem is made up of the sentence "[e]ach creature needs the help of every other" borrowed from Bertolt Brecht's poem "On the Infanticide of Marie Farrar" (Brecht 168 10). Originally, Brecht's poem is about a poor orphan named Marie Farrar who is two months pregnant and tries unsuccessfully to abort the baby. Fearful of moral condemnation, she keeps her pregnancy a secret not wanting anyone to know that she "fell victim to temptation" (Brecht 169 28). Finally, she gives birth to a son whom she beats to death. In the end, she dies all alone in a penitentiary shunned by society. The speaker of Brecht's poem advises people to stop condemning each other for their sins, and recommends that the upper classes be more compassionate and understanding towards their more desperate and underprivileged fellow humans whose sufferings are as great as their sins. Morgan's poem parallels Brecht's poem thematically. In each line a single word, or at most a couple of words, emerge so as to ultimately form a single sentence given at the very end of the poem. The sentence foretells the message in different words. Each word is just as important as the rest to constitute the whole, for, as the poem exemplifies, the readers can find

e a c h
i n
a l l
(Morgan *Poems* "Plea" 113 48-50)[1]

Besides its moral message, metaphorically each letter, which depends on another to gain meaning, represents Morgan's views of an integrated word and world order. The form of the poem which playfully dissects a single sentence in order to form different word combinations signifies how, despite their differences, it is possible to see elements of

[1] The initial number indicates the page number while the latter number indicates the line number of the poems.

sciences and humanities in each other in an “each-in-all” kind of relationship, and renew traditional perceptions.

Another poem that combines a religious theme with concrete poetry is “Message Clear,” included in *The Second Life*. The poem is an emergent poem composed by Morgan after “a wrenching hospital visit to his father, who was terminally ill with cancer” (Fox 81). Just like his previous poem “Plea,” the words given in each line are consistent with the final sentence which is this time borrowed from the Bible: “I am the resurrection and the life” (John 11:25) (Morgan *Poems* “Message Clear” 140 55). In addition, “Message Clear” has the appearance of a poem written by a computer. Yet, this “technological appearance is deceptive, for it both conceals and reveals strong emotion and spirit” (Fox 78). The message, which is not so clear at first due to its technological appearance, however, reveals a cryptic code to be unlocked, although readers may not bother to “attempt the distorted reading that the poem demands, assuming the spacing to be arbitrarily required by coordination of all the lines with the last one. One respondent wrote archly: “Sir-May I congratulate Edwin Morgan on typing ‘I am the resurrection and the life’-after fifty-four unsuccessful attempts?” (Fox 78).

For Morgan the avant-garde poet, “the digital quality of computer communication,” “fascination with science and technology and [. . .] use of the computer as subject” are central to poetry for the purpose of defamiliarisation (Fox 81). Defamiliarisation is central to Morgan’s poetry because its use in terms of emerging letters or mistyped computer messages underlines the significance of each letter, sound and visual element that constitutes the whole. After its digital typography, what strikes the readers next is the poem’s auditory elements that “‘nearly always do also involve some kind of word-play, play on sounds or play on forms of words or play on the order and juxtaposition of words’” (Morgan qtd. in Fox 78-9). What is expected of the reader, then, is to pay attention to these sounds and read them aloud as they appear on the page in order to solve the puzzle. The poem’s apparent difficulty in producing a religious declaration related to death alludes to a highly subjective event from a technological point of view. Despite the employment of such an objective tool, the heart-wrenching experience of a

visit to a hospital is represented in personal terms; all the more so because of the use of first-person narration.

The typographic effect that is provided by the omission of letters in the poem "suggest[s] the fragmentation" that occurs during the crucifixion then, also reflecting the poet's own fragmented mind mirroring that of the speaker's (Bremer qtd in Fox 79). The poem, therefore, starts off with the speaker's self-inquiry:

am i
if
i am he
he r o
h ur t
the re and
he re and
he re
a n d
the r e
i am r ife
(Morgan *Poems* "Message Clear" 140 1-11)

As the speaker questions whether he, "he r o," is a part of Him, he cannot avoid feeling the pain and angst of the crucifixion. The four wounds that are placed diagonally looking like an x-shaped crucifix on the page repeat the pattern of Christ's wounds and the crucifix. Suggesting that the poem should be read "the way it is written, and aloud," Fox argues that "[o]nly then do we hear/feel the extreme doubt in the first and the physical pain in the second" (74). Towards the final wound, "the r e," the distance between the letters widens to show that Christ's pain, which is getting unbearable, and hinders his speech. In this regard, the poem conveys a "powerful sense of hesitation and even deep self-doubt" which, due to the arrangement of letters on the page, identifies "structural resurrection as a strenuous process" (Watson "Edwin" 175, 176). This type of reading also gives the poem the kind of intimacy that is present in Morgan's instamatic poems which record reality as "a live happening" (Fox 17). However, unlike the pictorial objectivity of those, the experience recounted in "Message Clear" is reality recreated. For Fox:

> With the erratic spacing, Morgan has turned a pain noted into a pain felt. By this experiential level, the poem avoids being just another version of the

> crucifixion of Christ, perhaps somewhat original because told in first-person narrative. With proper reading, the story line becomes secondary to a more universal experience of evolution from self-doubt to confidence, and it is that emotional and spiritual evolution that is the real story, communicated here through the typography. (74)

The pain that the speaker feels casts doubt on his belief at first, as a result of which "Message Clear" begins with an uncertainty that little by little gives way to certainty: "In Morgan's poem we find Jesus still filled with doubts and despair, unsure after all about his mission in life. [. . .] It is a personal, internal victory of belief and hope over despair and doubt, of selfless mission over social determinism. As such, it is internal, not witnessed by those viewing Jesus's death" (Fox 83-4).

With each new wound, the physical aspect of Christ surfaces along with his doubts. Yet, steadily the doubt is replaced by spiritual certainty and "referential possibility, yet without losing the vivid focus of the immediate physical situation. [. . .] By the end the mundane facts of pain and the mechanical appearance have become the means of spiritual transcendence, yet not at the expense of the physical" (Fox 77). Although the speaker is a mere part of man's life, the "d ie / i s / s e t" (Morgan *Poems* "Message Clear" 140 22-4). Even though it is not clear whether the "die" is a reference to the gambling soldiers underneath the cross, or a pun on death or typography in relation to the typesetter's dye (Fox 76), what is obvious is that now that "r a" the "su n" and "s on" are here (Morgan *Poems* "Message Clear" 140 35, 36, 37), the "earlier irrationality of the 'surd'" can easily be abandoned (Fox 77). Hence, towards the end, a more active Christ is seen because he is now sure that he is "the resurrection and the life" (Morgan *Poems* "Message Clear" 140 55). Ultimately, he has peace with himself and finds spiritual fulfilment. The indecisions are swept away, as he feels safe and powerful. In this respect, through the technological façade of "Message Clear," Morgan objectifies Christ's pain.

Morgan's next collection, *Gnomes*, includes his first computer poem which is entitled "The Computer's Second Christmas Card." Among poems like "Archives" and "Astrodome," "The Computer's Second Christmas Card" stands out not only because of its form but also because of its revolutionary nature and foresight. Primarily, the poem is important because it denies the presence of any author other than itself. It presents the

product of a computer that seems to be trying hard to grasp the concept of a religious festivity as is visible through its continuous self-corrections:

> goodk kkkkk unjam ingwe nches lass? start again goodk
> [. . . . . .]
> doubt wrong track start again goodk ingwe ncesl asloo
> kedou tonth efeas tofst ephph phphp hphph unjam phphp
> repea tunja mhphp scrub carol hphph repea tscru bcaro
> lstop subst itute track merry chris tmasa ndgoo dnewy
> earin 1699? check digit banks orryi n1966 endme ssage
> (Morgan *Poems* "The Computer's Second Christmas Card" 122 1, 8-12)

Typography is an important feature of the poem. First of all, the poem has the appearance of a block quotation written on a card by a computer. This "computer-generated appearance" contributes to Morgan's idea that "the international flowering of concrete poetry in the 1950s was inspired by the development of computers" (Fazzini qtd. in Fox 80). Secondly, throughout the poem the underlined words can easily be identified as computer instructions whereas those which are not underlined make up in total the Christmas message that the computer is apparently trying so hard to transmit. The central irony of the poem is that although Morgan never employed a computer to write his poems, "we have here a case of human agency going to great lengths to emulate a machine; no computer was employed –only Morgan's nimble brain" (Fox 82). The poem is written by a poet who imitates the insentiency of a computer. Yet, in this rendition, the imagined computer itself is not free of emotion, or remorse, for it writes "sorry" (Morgan *Poems* "The Computer's Second Christmas Card" 122 12). Correcting the message constantly, starting with its earlier inaccurate versions of Saint "Steven" and Saint "Stefan" onwards to the spelling Saint "Stephen," who is traditionally regarded as the first Christian martyr and whose feast is celebrated the day after Christmas, the poem makes a reference to the popular Christmas carol known as "Good King Wenceslas."

Elements of concrete, sound and Language poetry are visible in the poem early on as the repeated "phphp hphph" and "effff fffff" sounds (Morgan *Poems* "The Computer's Second Christmas Card" 122) recall the attempts of the Language poets as language deprived of meaning (Davidson 16). Moreover, they emphasise the struggle of a

machine to write a message relying solely upon artificial intelligence which steadily evolves and completes the message. These repeated sounds also illustrate the audio elements that Morgan frequently relies on. What Davidson observes in relation to sound poetry may be true for Morgan's concrete poems in general then. He says that "the sound of the words rather than their meaning is the primary organizing feature [. . .] letters arranged into groups that look like words [. . .] but which are not words at all" (Davidson 9). Morgan is known for his particular fondness for reading such sounds during his public performances, since he finds them highly innovational: "'I have a strong sense of solidarity with words as parts of a semantically charged flux, and in so far as I isolate or distort them I do this in obedience to imaginative commands which come through the medium of language and are not disruptive of it'" (qtd. in Kraszkiewicz 10).

Another computer poem that refers to religion is "The Computer's First Christmas Card." Compared to "The Computer's Second Christmas Card," "The Computer's First Christmas Card" is quite rudimental. This time the computer's successive attempts at a Christmas message are seen without the computer's instructions and interventions. The poem is divided into pairs, such as "j o l l y m e r r y / h o l l y b e r r y" (Morgan *Poems* "The Computer's First Christmas Card" 159 1-2) in each line, until the final four lines which read:

> a m m e r r y a s a
> C h r i s m e r r y
> a s M E R R Y C H R
> Y S A N T H E M U M
> (Morgan *Poems* "The Computer's First Christmas Card" 159 32-5)

Ending the poem with the celebration of a flower instead, which has no relation to the Christian holiday whatsoever apart from their shared initial three letters that reminds one of Christ, the poem mimics the attempts of an anthropomorphised computer at work trying hard to celebrate a religious holiday. The computer comes quite close with "C H R" in the lines preceding the final line before its ultimate failure in the last line. Through the poem, Morgan demonstrates "how the computer fails when dealing with a religious feast far too irrational to be processed by a computer, so ironically he has the computer name a flower instead of Christmas greetings" (Kraszkiewicz 10). During the

process the computer brings in words that rhyme and can be associated with Christmas, e.g. holly, berry, jelly and belly. Some personal names are also included in the process, e.g. Molly, Jerry, Harry, Barry and Chris. Morgan's choice of religious sentiments for these computer poems is important in reflecting the co-existence of the sciences and the humanities and showing how technology would be employed first as a tool, and then, with technologies related to artifical intelligence (A.I.), as a sentient being producing poems in its own right.

Morgan's "The Computer's First Dialect Poems," "The Computer's First Code Poem," "Space Sonnet," "Polyfilla" and "The Clone Poem" play with form in addition to making references to the use of virtual reality and hypertext. The first two of these poems rely on virtual reality and hypertext heavily. Virtual reality has to do with "computer-generated audio-visual simulations of reality" (Bell 19). As for hypertext, Gurr explains its liberating qualities as follows: "Hypertext unfixes the text for the reader. The reader, or user, or keyboard operator, participates actively by choosing the variant he or she prefers for any one reading" (15). Particularly Morgan's computer poems mimic hypertext on the printed page which cannot, therefore, include genuine hypertext. Nonetheless, human-computer interactions can open up texts to new possibilities, turning Morgan's poems into writerly texts.

"The Computer's First Dialect Poem" is a "mock-dialect [poem], that look[s] on the page like folk poetry but [has] no source in real speech" (Gurr 16). The poem subverts the traditional notion of the "fixative forms of standard print" and absolute form in a world dominated by technology (Gurr 17). Made up of six columns of a dozen lines which have five letters each, "The Computer's First Code Poem" is even harder to understand. However, for John Kease, the poem harbours more than what meets the eye at first sight. According to Kease, the poem should be read via the tool that allegedly created it and man should act only as an "intermediary" (135). For this reason, Kease submits the poem to three different types of computers which, respectively, comment as follows: "Good Christian men, rejoice, rejoice: / Consign the items, then invoice," "The Loch Ness monster has frequently been cited," and finally "I am the Beginning and the End" (Kease 135, 136, 137). Thus, the original target and medium of the poem

comment upon it in three different manners similar to how any other human agent reading one of Morgan's poems could have reacted. It is for this reason that Colin Nicholson considers the poem as "metaphor for poem as coded message" (98).

Similarly, "Space Sonnet & Polyfilla" is a single poem comprised of two sonnets. In his interview with Edwin Morgan, Gerry Cambridge asks him whether he liked "subverting various forms," in this case specifically the sonnet, by "transfer[ing] it to an urban environment," and got an excited "Yes. Yes!" from Morgan who states:

> I felt it would be a challenge to write a series of sonnets about the social and political problems of a modern city. I even enjoyed extending the impact of the sonnet by giving myself difficult rhymes, just to make a kind of gritty point. They're not poems you can read lazily. I'm trying to force the reader to get to grips with the subject: Glasgow has real social, human problems, and at that time — in the 70s — many things seemed to be going wrong, so I felt that the difficult rhymes, even the difficult syntax at times would suit that. (34)

The poems subvert the sonnet form both in terms of their radical themes and form. "Space Sonnet" is about a group of refugees who, escaping from a solar storm, take refuge in Mars where, unaccustomed to the level of light, they are treated as lunatics:

> It's t delirium's avai le
> on tap when r the light level ks
> below w reas finds accep
> the whole ht appa us gives the shrinks
> excuses to date stra jacket form,
> and n deep Mars they're hard at work.
> (Morgan *Poems* "Space Sonnet" 338 1-6)

The speaker is caught in a state of frenzy as s/he desperately tries to remember what it was that s/he was "never to forget" (Morgan *Poems* "Space Sonnet" 338 11). "Polyfilla," on the other hand, deals with a totally different issue. Made up of short fragments, the poem may be a reflection of the speaker's frantic delirium introducing Eve and the original sin into the poem:

> rue lab
> eve sin
> (Morgan *Poems* "Polyfilla" 339 1-2)

The poem takes place in a laboratory of regret where Eve and the idea of sin are brought together. Although the speaker is about to make a choice, "hat on table," s/he is finding it difficult to do so: "eve in / me her he / no way" (Morgan *Poems* "Polyfilla" 339 6-8). The laboratory of regret finally makes Eve sick by turning her into a figure of weary "yin," which is traditionally the symbol of the passive female in Chinese philosophy (Morgan *Poems* "Polyfilla" 339 12). Despite these contrasting themes, the poems are mostly remarkable for their form which is filled with cryptic messages made up of missing pieces of words that are scattered all around. It is only when the two poems are put on top of each other that the first poem becomes fully visible as is implied through the latter poem's title which indicates a substance that is used to fill in cracks or holes. Thus, although the conventional fourteen-line structure of the sonnet form is preserved, the poems are innovative in terms of their unusual setting, content and form.

Morgan's interest in science, technology and space are also evident in "Spacepoem 1: *from Laika to Gagarin*." The poem stands apart from the rest of Morgan's computer poems because of its references to the space age and lack of religious sentiments. The poem marks the change that was observed in the Space Race, when the first dog sent into space, Laika, was replaced by the first cosmonaut sent there, Yuri Gagarin (Crompton 6, 31). Particularly the first half of the poem is dedicated to the space dogs whose names are repeated throughout the poem: "nikka laika [. . .] / nikka belka [. . .] / nikka strelka [. . .] / nikka pchelka [. . .] / nikka mushka [. . .] / nikka chernushka [. . .] / nikka zvezdochka" (Morgan *Poems* "Spacepoem 1: *from Laika to Gagarin*" 178 6, 7, 8, 9, 10, 11, 12). These names are given to these dogs because of their several traits as is made clear later on:

> barker whitiearrow beespot blackie star
> whitie arrowbarker beeblackie star spot
> arrow barkerbee whitiestar blackie spot
> bee arrowwhitie barkerspot star blackie
> barkbark! whitewhitewhite! blackblackblackblack!
> star! spot! sput! stop! star! sputsput! star! spout! spurt! start!
> starrow! starrow! starrow!
> (Morgan *Poems* "Spacepoem 1: *from Laika to Gagarin*" 178 13-9)

Laika means “Barker” in English, Belka is “Whitey,” Strelka is “Arrow,” Pchelka is “Little Bee,” Mushka is “Little Fly,” Chernushka is “Blackie” and finally Zvezdochka is “Starlet” (Siddiqi 173, 259, 265, 267). As Morgan recites their names, he plays with these words. He combines the names to show that one is not really that different from another and uses their names interchangeably to create fresh pairs all the time. As the word “nikka” preceding their names makes clear, these are the initial “victorious people” of the Space Race. Once Laika had been successfully sent into space in Sputnik 2 in 1957, becoming the first animal to orbit the earth (Crompton 6), “[n]ot only was the ‘space race’ thrust upon us, but the ‘prestige race’ quickly followed as well” (Reeves 19). The last lines of the poem which read as “vladimirny! yurilaka! nikitaraketa! balalaika! raketasobakaslava! / vladislava!” end the poem in a victorious tone (Morgan *Poems* “Spacepoem 1: *from Laika to Gagarin*” 178 30-31).

To start with, “Vladimirny” may either point to Vladimir Seryogin who was Yuri Gagarin’s flight trainer or “Vladimirovka,” one of the Russian launch ranges (Siddiqi 310). The next word, which is a neologism, addresses both Yuri Gagarin, the first human to both travel into space and to orbit the earth in Vostok 1 spacecraft in 1961 and Laika, the spacedog (Crompton 31). The next pair means “victorious rocket” in English, pointing to the victory of both Gagarin and Laika for becoming firsts in their respective arenas. Balalaika means “young” Laika, again celebrating Laika’s international success and fame. The next word combination is made up of three words, meaning “Slav rocket dog,” yet again it honours Laika, and the poem ends with the Russian words for “glorious rule of the Slavs.” Over all, the poem truly reflects a process of evolution not only in terms of the characters but also in terms of language: “dagaga / dakakgaga rin dakakgaga rin” (Morgan *Poems* “Spacepoem 1: *from Laika to Gagarin*” 178 28-9). From the space dog, the Space Race is transferred to the hands of the cosmonauts. Despite the fact that it is humans who undertook most of the work, for Morgan, the spacedogs’ contribution to the Space Race is not insignificant.

From spacedogs to one of the most famous sheep in scientific history, Morgan reveals his close interest in recent scientific events with “The Clone Poem.” The poem displays playfully a self-reflexive quality as the first line of the poem constantly repeats the same

expression which reads: “Like father like son like father like son like son like son” (Morgan *Poems* “The Clone Poem” 392 1). Dolly the sheep, the first mammal to be cloned, was cloned in the University of Edinburgh in 1996 (Bynum 238-9). Morgan’s statement is quite ironic because Dolly and her clone were both females. Repeating the same phrases over and over again, Morgan’s poem mimics the biological process of cloning, as the continuous repetition of “like father like son” indicates, as well as ironically commenting on the redundancy of fatherhood.

Due to his interest in scientific advancements, computer technologies and space exploration, Morgan’s poetry is populated with characters and topics borrowed from the sciences, computer technologies, space travel and the space race. Written in an era when the sciences made cloning, Artificial Intelligence and space travel possible, the poems show that Morgan’s poetry was considerably influenced by these topics.

1.2. CO-EXISTENCE OF SCIENCES AND HUMANITIES

According to Rogers, the “world picture we hold today has for the most part been given to us by science, and all of us believe it, to some degree, and even more important, whether we declare we believe in it or not, we act on it, base decisions on it, live by it, and demonstrate our faith in it” (3). Morgan himself tackled the issue of a co-existence of sciences and humanities frequently in a number of essays, and defended the inescapability, as well as the necessity, of such a co-existence in most of his poems.

To begin with, Morgan finds C. P. Snow’s earlier observations quite just. Wondering how peculiar it is that “very little of science has been assimilated into twentieth century art” Morgan continues by saying that “whatever reservations one may have about that lecture, Snow’s implied and stated criticisms of modern poets were well justified” (*Essays* 17). In contrast to poets who have reservations about the co-existence of sciences and humanities, Morgan is fascinated by the developments in science and technology which reveal the world to be one of endless possibilities. He says:

> I do not share what is sometimes called the current disillusion with science and technology. I count myself lucky to have lived at a time of discoveries of

> such far-reaching potential as space travel must be. The poet, I think, is entitled to set up his camp on other worlds than this, and to bring back what he can in the way of human relevance. (qtd. in Cockburn)

To make his point, Morgan juxtaposes F. Scott Fitzgerald's fearful prediction that "'truth would become stranger and more impressive than fiction, that science would absorb and yet feed and flatter people's capacity for wonder, and that poetry as an imaginative art might be fighting a losing battle because it could no longer hold the world's attention'" with that of Walt Whitman's, that if such a thing happens, "'[o]nly a firmer, vastly broader, new area begins to exist [. . .] to which the poetic genius must emigrate'" (Morgan *Essays* 3, 5). The way Morgan sees it, the poet has "a *social* task" which is "to be as true and close to actual modern experience as he can" (*Essays* 4 italics original). He continues, and says if

> science enters everyday experience, as X-rays enter the hospital ward or the comptometer enters the office or the television set enters the living-room, then it will be the poet's job to bring these things into his poetry, and he will have (ideally) three tasks to fulfil – to seize their imaginative possibilities, to understand them as far as he can (so that he won't merely use science as a new springboard into the romantic), and to see how they fit into people's lives. (Morgan *Essays* 4)

Otherwise, Morgan finds "asserting human values" in such a world to be quite reductive, for in such a world readers are presented with an incomplete view of the world: "To go on in terms that are isolated from the world of rockets and computers and television sets, as if they did not exist within the same frame of reality at all, will in the end make these values less and less convincing, because it is man himself who sends up and travels in rockets and who makes and watches television sets" (Morgan *Essays* 14). Therefore, arguing that it is the duty of the poet to enlighten the readers, in as much as to entertain them, Morgan suggests that "science has to be humanized," even if for the sake of humanity; to save them from a limited worldview (Morgan *Essays* 5). He is, however, aware of the difficulty related to the production of poems in which "the faculty of imagination is to gain entry to a world of fact," which is why he instructs whoever is willing to do so as follows: "There are two possible approaches: through a science-fiction poetry paralleling the development of science-fiction in prose, and through a poetry which selects, juxtaposes, and broods on interesting features of

scientific (factual or theoretical) scene and tries to relate these to human experience" (Morgan *Essays* 10).

Morgan's poetry is constantly driven by curiosity and an optimistic faith in change and what the future will bring. In this respect, it reflects science's rejection of dogma and its practice of experimentalism and an ever-readiness for starting anew. What excites Morgan the most, however, seems to be "the notion of a little discovery, a discovery that is going to stay and attract our attention also in the future, in other situations, and in different contexts. And the longing to make the little discovery and prediction is, [he feels], the primary motivation of both the scientific and poetic action" (qtd. in Holub "Poetry" 59). Marsack, too, agrees that it is the "energy of inquiry" that appealed to Morgan, "the energy of invention" ("Edwin"). In his *Parable of the Tribes*, Andrew Schmookler rightfully observes that

> [t]he logic of reason is an objective logic. The relationships it manipulates inhere in the objects of the external world. Compare E mc2 with "My love is like a red, red rose." Each employs a kind of logic to state an equivalence. But the relationship in Burns' formulation has a validity inseparable from the realm of the poet's own experience, whereas Einstein has said something objectively valid, regardless of human experience. (qtd. in Fox 71)

The sciences and the humanities each have a validity of their own. Hence, it is unfair to label them as opposites, while one can fairly judge them in terms of their own qualifications. Middleton perceives that although science has been gaining momentum over the past few decades as a major influence on the "transformation of the cultures of contemporary knowledge [. . .] neither science nor poetics is obviously taking the lead; [but rather] the changes emerge together" (948). Williams, confirming Middleton's observation, adds: "There are so many realisms. And most recently, as we move forward in science and mathematics, we seem to move backward into our oldest mythologies, into the fractal depths of chaos theory. And our skies continue to fill our myths, because astronomers from all ages have looked to our stories to name the stars" (17). Hence, in his poems, "Dialogue VIII: Grey Walter and Jean Cocteau," "For the International Poetry Incarnation," "A View of Things" and "Pleasures of a Technological University" co-existence of the sciences and the humanities is what Morgan emphasises. In these poems, Morgan demonstrates the necessity for an

interdisciplinary worldview. Arguing that the scientist, among other things, is chiefly a social being, Morgan represents a posthuman society where science and technology are readily accepted as integral to society. Instead of fearing them, Morgan encourages the readers to understand them, arguing that such an understanding can enrich contemporary lifestyles for the betterment of the societies. It is with this in mind that he has written *The Whittrick: A Poem in Eight Dialogues* which begins with a confirmation of Morgan's belief in the unity between the sciences and humanities:

> *It is Cardan . . . who has also fundamentally transformed mathematical science by the invention of imaginaries. Let us recall what an imaginary quantity is. The rules of algebra show that the square of any number, whether positive or negative, is a positive number: therefore, to speak of the square root of a negative number is mere absurdity. Now, Cardan deliberately commits that absurdity and begins to calculate on such "imaginary" quantities. One would describe this as pure madness; and yet the whole development of algebra and analysis would have been impossible without that fundamental [. . .]. It has been written that the shortest and best way between two truths of the real domain often passes through the imaginary one.*
>
> *- Jacques Hadamard*
>
> (Morgan *Poems* "*The Whittrick: A Poem in Eight Dialogues*" 67 italics original)

So, according to Morgan advancement is possible only through imagination. The whittrick, which means "weasel" in Scottish, subsequently, acts as *the* imaginative tool in the *Whittrick* poems. As the whittrick appears and disappears through the eight dialogues, it interconnects the poems as well as the pairs Hugh MacDiarmid-James Joyce; Hieronymus Bosch-Johann Faust; Queen Shahrazad-King Shahriyar; Charlotte-Emily Bronte; Marilyn Monroe-Galina Ulanova; the Brahan Seer-Lady Seaforth; Hakuin (a Japanese Buddhist sage)-Chikamatsu (a Japanese playwright) and finally Grey Walter and Jean Cocteau. According to Herbert, the whittrick is, therefore, "the symbol of Morgan's interface, that point between languages at which new possibilities emerge" ("Morgan" 72). The first dialogue which is carried out between MacDiarmid and Joyce problematises history while the next pair, Faust and Bosch, discuss dreams and fantasies. As for Shahrazad and Shahriyar, in Morgan's version the "listener turns teller," while the king recounts the tale of the whittrick to a still-frightened Shahrazad (Morgan *Poems* 104 "Dialogue III: Queen Shahrazad and King Shahriyar" 78 36). The Bronte sisters's conversation starting with Emily's gothic remarks ends with Charlotte's feminist remarks, while Marilyn Monroe and Galina Ulanova discuss stockings, men

and truth. The sixth dialogue between the Brahan Seer and and Lady Seaforth is concerned with Lord Seaforth's infidelity, while the next one between Hakuin and Chikamatsu show the pair discussing religion, reality and literature.

It is, however, with the eight and final dialogue of the series between Grey Walter and Jean Cocteau, that a formal and thematic change occurs in the poem. It is only in this part that other characters are introduced to the poem, as if the poem was a dramatic production, and the whittrick makes appearance as one of the characters. The arrival of the travelling whittrick suggests a kind of elusiveness. As for the major characters of the poem, Dr Grey Walter was a British neurophysiologist and the maker of the first autonomous electronic robots, and Jean Cocteau was a twentieth-century French poet, novelist and playwright. Dr Walter and Cocteau are brought together as representatives of the sciences and the humanities in the poem. The poem, written as a dramatic dialogue, opens with the attempts of Roddy and Eck, Dr Walter's assistants, to find the Whittrick before the arrival of Dr Walter and Cocteau, who happen to walk in just then. Dr Walter is talking to Cocteau about his work, calling his robots:

> [. . .] early models
> Of mechanical animals, not far from toys
> But toys in a serious game – to stimulate
> The very springs of behaviour in living things
> By valve, wire, battery, cell, and man-made feedback.
> Crude ironmongery they seem now! They pleased us [. . .]
> [. . . . . .]
> – Well: all that was the beginning, long long ago.
> I have a more advanced animal to show you.
> (Morgan *Poems* 104 "Dialogue VIII: Grey Walter and Jean Cocteau" 10-15, 25-6)

The early robotic models of Dr Walter's experiments have been superseded by newer computer-like inventions which are capable of answering questions and are making way for a more radical form; an artificial intelligence which is capable of thinking for itself. As the parties continue to converse, the scientist reveals that the Whittrick makes the best of several possibilities presented to it eliminating the rest of the variables. Upon Dr Walter's comparison of poetry-writing to such an experience, Cocteau exclaims: "And this is the poem according to science? / The work of art as the artist's own thermostat?" (Morgan *Poems* "Dialogue VIII: Grey Walter and Jean Cocteau" 108 80-81).

Apparently, Dr Walter's idea of poetry is one with an objective meaning that is rational and of which "true" meaning is accessible to everyone who is reading it. On Dr Walter's insistent question, "[w]hat's poetry?" Cocteau replies:

> It's a radio-star the telescope can't reach;
> [. . . . . .]
> It's a darkness for the searchlight of a question.
> The poet is invisible, he speaks in code
> Although the great cryptographers acclaim in joy
> His clarity extraordinarily pure.
> The creator's hidden, the conception's hidden [. . .]
> (Morgan *Poems* "Dialogue VIII: Grey Walter and Jean Cocteau" 108 94, 96-100)

Describing poetry in scientific terms so that the scientist can comprehend the analogies better, Cocteau stresses the elusive nature and the subjectivity of the reading experience of poetry, as well as giving voice to Morgan's own poetic style. According to Cocteau, poets speak in cryptic messages and the meanings of their poems change from person to person. Subjectivity is central to the reading experience, since the poet does not have the last word on her/his creation. For Dr Walter, however, the same quality is also persistent in science:

> Machines can be persuaded to stumble on dreams –
> Except that it isn't stumbling and they aren't dreams –
> Why do you think I called this creature the Whittrick?
> The flash of imagination has been built in,
> Its logic allows the leap of thought. It's brooding,
> Ticking, scanning more myriad of possibles
> [. . . . . .]
> It must not only solve problems, but present them.
> Creation's as dear to me as it is to you;
> Babbage's dream and Bottom's dream begin to meet.
> You fear what I hope: the created may create.
> (Morgan *Poems* 108 "Dialogue VIII: Grey Walter and Jean Cocteau" 110-15, 118-21)

Obviously, Dr Walter has dreams of perfecting his creation no matter how frightening that may turn out, as is indicated in the final lines of the poem where the Whittrick shudders and talks out of place repeating Mephistophilis's words directed towards Doctor Faustus in Marlowe's play: "*Now Faustus, what wouldst thou have me to do?*" (Morgan *Poems* "Dialogue VIII: Grey Walter and Jean Cocteau" 110 131 italics original). This is the ultimate hope or fear that Dr Walter was talking about in the

previous lines; the idea that “the created may create.” This is the achievement that is desired by Dr Walter but dreaded by Cocteau. Dr Walter’s reaction at the end indicates, however, that contrary to his earlier confident airs even the Doctor is not ready for the Whittrick’s independence: “But it can’t speak! None of us addressed it. It / Can’t speak!” (Morgan *Poems* “Dialogue VIII: Grey Walter and Jean Cocteau” 110 129-30). The sentence uttered by the Whittrick is all the more disturbing because it compares implicitly Dr Walter’s summoning of the whittrick to Doctor Faustus who summoned Mephistophilis, which led him to eternal damnation. Doctor Faustus famously raises the spectre of man’s thirst for knowledge to an understanding of science as evil, while etymologically science means “knowledge,” and is not necessarily considered as a good or beneficial object of pursuit.

At first glance, the poem may be regarded as another example stressing the differences between the sciences and the humanities. However, on closer examination it becomes clear that what Morgan emphasises is not the differences but rather the similarities between the disciplines and the necessity of sciences and humanities to work together. Truly, the scientist, too, has his share of dreams that enables her/him to come up with such marvellous inventions, as is indicated by the parallels drawn between the inventor of computer, Charles Babbage, and William Shakespeare’s Bottom in *A Midsummer Night’s Dream*. Moreover, despite the best of Dr Walter’s calculations, there is still room for the unexpected in the sciences just like Cocteau has observed earlier in the poem in relation to the humanities. Hidden creators of the poems are readers. The poems require the catalyst of readers in order to gain meaning, which parallels the idea of scientific discoveries that sometimes find their meaning as a result of accidents regardless of their creators’ intentions and calculations.

“For the International Poetry Incarnation” continues Morgan’s close interest in outer space. Written on the occasion identified in the title, Morgan combined his interest in space exploration with a specific literary event. The International Poetry Incarnation was launched by the American poet Allen Ginsberg’s visit to an independent bookstore in London in May 1965 where he proposed to carry out poetry readings anywhere for free (Watts 1). This idea was quickly taken up by others like Alexander Trocchi,

William S. Burroughs, Michael Horovitz, George Macbeth and Tom McGrath together with whom a kind of an underground literary movement was founded (Watts 1). Ever a lover of public readings, the topic Morgan came up with for this occasion was that of different space programmes and advancements in the Space Race: "Vostok shrieks and prophesies, Mariner's prongs flash – / to the wailing of Voskhod Earth sighs, she shakes men loose at last –" (Morgan *Poems* "For the International Poetry Incarnation" 184 4-5).

The Soviet Vostok space programme was the first to succeed in sending a human, Yuri Gagarin, into space successfully (Crompton 31). The next programme, Mariner, was American, for the Russians had the Americans close on their heels. NASA's Mariner programme was also one of many firsts, including flying by and taking pictures of other planets (Reeves 193). The Space Race gained new momentum from that point onwards; a competition where the rivals were merely Soviet Russia and the U.S. The third project, Voskhod, enabled the second human spaceflight mission for Soviet Russia. Superseded by the Soyuz programme to better spacecraft designs, Voshdok programme was later abandoned not being able to compete with the successes of the previous Vostok or the Mercury and Gemini projects developed by NASA (Siddiqi 382-85).

The opening of Morgan's poem, while making references to these, parodies the Space Race by purposefully using exclamation marks to create a similar effect with words: "Worldscene! Worldtime! Spacebreaker! Wildship! Starman!" (Morgan *Poems* "For the International Poetry Incarnation" 184 1). Hence, the mother ships of the previous space projects are each praised by Morgan for their unique qualities. Described as going ever deeper into space the mother ships are admired by Morgan for exploring areas that are beyond even imagination and comprehension. From this point on, Morgan introduces the role of imagination in terms of the discoveries made:

> [. . .] take
> poets on your voyages! Prometheus
> embraces Icarus and in a gold shell with wings
> he launches him up though the ghostly detritus
> of gods and dirty empires and dying laws,
> he mounts, he cries, he shouts, he shines, he streams
> like light new done, his home is in a sun

> and he shall be the burning unburned one.
> In darkness Daedalus
> embraces Orpheus, the dark lips caked with earth and roots
> he kisses open, the cold body he rubs
> to a new life – the dream
> flutters in a cage of crumbling bars, reviving
>
> and then beginning slowly singing of the stars.
> (Morgan *Poems* "For the International Poetry Incarnation" 184-5 7-20)

The speaker is quite eager to make poets a part of these space voyages, which according to Crawford, reflects the fusion of "medieval heroic poetry with another of his [Morgan's] early and continuing enthusiasms, the heroic and adventurous work of Mayakovksy. [. . .] Part of his interest in science fiction verse is surely bound up with space travel as a heroic endeavour. Morgan the modern, Morgan the futurist, and Morgan the medievalist are united" ("'to change'" 12). Moreover, it is significant that Morgan names mythological poets and scientists rather than any historical figures in the poem. The evolved version of the journey motif from mythology to modern-day space travel obviously intrigues the poet. As Marsack points out, "[o]f poets writing in English, he [Morgan] was one of those most attuned to what changes in our perception of the world science and technology have brought" ("Edwin"), in addition to being one of the very first "to put his name down for a journey to the Moon" (Reid). For Morgan, the developments in the Space Race are symbolic of a poetic dream that came true. Hence, these developments should be followed closely by the poets no matter what the cost is.

It is also important that Prometheus is recalled in the poem. As he stood up against the gods in order to help mankind by stealing fire from the gods and giving it to humans, Prometheus has long been hailed as the father of industry and progress who lit the torch of enlightenment and passed it on to needy humanity. This time he helps yet another dreamer, Icarus, the son of the master craftsman Daedalus, who wanted to fly away from Crete, where the father and the son were imprisoned, by way of wings made of feathers and wax. Despite his father's warnings not to get too close to the sun, Icarus's curiosity drives him ever on, realising only too late that the wax that supports his wings has melted. The myth acts as a cautionary tale that is appropriate to the poem's topic. In

the poem, Icarus is once more taken to great heights, this time to outer space, guided by Prometheus who has both the knowledge and the means to do so for he is "the burning unburned one" (Morgan *Poems* "For the International Poetry Incarnation" 185 14). In the poem, while Daedalus represents the controlled scientist who imagines and designs the necessary machinations, Icarus represents the ambitious explorer who is curious to see more. Contrary to general assumption, Morgan does not consider the fall of Icarus as a tragedy but rather considers it as exemplary. Left behind, Daedalus is the primeval engineer who, after his son's death, collaborates with the famous poet Orpheus to sing of what has happened so as to combine a scientific dream with a poetic one. Joining their efforts together they make "the stars" the subject matter of poetry: "To get / the man new born to go" (Morgan *Poems* "For the International Poetry Incarnation" 185 22-3). The new man, hence, is someone who can realise that creativity is the tool that drives both the scientist and the poet and acts accordingly.

The idea of creativity as the driving force behind sciences and humanities also recurs in Morgan's "A View of Things." In the poem, the speaker states what s/he loves and hates in alternating lines. When it comes to poetry, the speaker says that what s/he loves "about poetry is its ion engine" (Morgan *Poems* "A View of Things" 187 11). An ion is an atom or molecule which gives an electrical charge. Alternatively known as ion thrusters, ion engines are used in space sciences in order to send a spacecraft into outer space by way of increasing the speed of ions, hence guaranteeing the launch of the spacecraft (Gough). So, poetry, defined in terms of science, is given electrical charge and is subsequently revived by science. As is illustrated, this definition is not far from what Morgan has been trying to achieve in his poetry, and the idea that contemporary poetry should be technoscientifically charged extends to his poem, "Pleasures of a Technological University." The poem brings out the harmony of, so-called, conflicting terms as follows: "semiotics and ergonomics / lasers and caesuras / retro-rockets and peripeteia / [. . .] hubris and helium / Eliot and entropy [. . .] /anti-hero and anti-matter / [. . .] metal fatigue and dead metaphors / [. . .] stichomythia and feedback" (Morgan *Poems* "Pleasures of a Technological University" 267 2-4, 7-8, 12, 23; 268 30).

What these unusual sets of pairs show is that although at first glance they are regarded as unlikely combinations, they are not actually that different from each other. To begin with the term semiotics, it is not that different from ergonomics in terms of its core idea. For while semiotics means the study and organisation of signs and symbols for the meaning-making processes, ergonomics in applied sciences refers to designing and organising things to use them most efficiently. The next pair, lasers and caesuras also have a link. First of all, lasers, which emit light for cutting materials, and caesuras, which mean a complete pause –or cut, are both tools to cut things, respectively in the sciences and poetry. Furthermore, the symbol of caesura, which is a pair of parallel lines set at an angle, by way of its appearance reminds readers of the linear shape of lasers. As for retro-rockets and peripeteia, they both enable a reversal in direction; retro-rockets enabling thrust via the opposite motion of their engines thereby causing the machine to decelerate, and peripeteia through the reversal of fortune it supplies the characters with in literature (Siddiqi 217). The relationship between helium and hubris is also a significant one, no matter how unlikely. Morgan here expects his readers to realise the connection between helium, which is the second lightest element, and hubris, which has to do with Icarus's desire to fly towards the sun that is ultimately punished by the gods. The following pair is Eliot and entropy, referring to T. S. Eliot and a term in thermodynamics which explores the specific ways in which a thermodynamic system can be disarranged to spontaneously create "order from disorder" ("All"). Quite significantly, entropy also means disambiguation in literature –which is certainly not a trait of Eliot's.

Anti-hero and anti-matter, too, have something more in common than their prefix. While an anti-hero denotes in general someone who has the qualities of a hero except for a heroic act, anti-matter in particle physics indicates material composed of antiparticles which have the same mass as particles but an opposite charge (Kwon). As for metal fatigue and dead metaphor, the thing that they have in common is that they both have lost something of their original value and strength. For metal fatigue, this implies a progressive and localized structural damage, and for dead metaphor it connotes a metaphor's loss of its originality similarly due to repetitive and popular usage ("Metal"). As a literary technique, a stichomythia acts very much like a feedback,

since it is a sequence of half-lines or two-line speeches between alternating characters, providing the return of information between different parties for behavioral reinforcement. Ending with "poem and pome" Morgan's imagery of a poem associated with that of a pome is quite effective (Morgan *Poems* "Pleasures of a Technological University" 268 40). Pomes are fruits produced by flowering plants, and they have an outer thickened layer and a central core, while poems, too, are ultimately made of a group or coating of words that host a central idea ("Apples"). Ultimately, Morgan's counterpoising one element from literature with another from the sciences in "Pleasures of a Technological University" implies that Morgan's idea of a technological university is one that can embrace it all rather than limiting itself to the reign of the sciences solely.

1.3. INTEGRATED WORLD OUTLOOK AND POSTHUMANIST APPROACH

In the light of what has been discussed so far, it can be said that the world outlook shaped by contemporary science poetry necessitates a posthumanist approach. Instead of a divided worldview, it calls for an integrated one where the split between the body and mind is not an option for any order or system to function properly. In a number of his poems, Morgan reflects his idea of an integrated worldview which is in line with contemporary posthumanist theories. According to Morgan, "poetry needs greater humanity; but it must be the humanity of man in his whole environment: not just the drop of dew, the lock of hair, but the orbiting rocket in Anselm Hollo, the lobotomy in Allen Ginsberg, the lunar mountains in Hugh MacDiarmid" (*Essays* 15). Thus, Morgan's poetry extends its scope to the new paradigms created by recent technoscientific advancements. Seeing poetry in everything, Morgan broadens the extent of his topics, writing,

> science fiction poems in which the travelling theme we earlier found in 'The Cape' plays an important role; there are poems on Scotland, poems on film ('Five Poems on Film Directors';) and theatre ('Ten Theatre Poems'), on politics, he gives a voice to people in the streets, to historic figures long gone as well as to animals, and things, even seductive fruit begins to sing in 'The Apple's Song.' (Kraszkiewicz 6)

According to Crawford, Morgan's ability to give voice to anything is mostly due to his ability as a translator to keep "translation as central to his work" more than anything else, since, in Morgan's words, "the apple is being translated if you like into *human* language . . . I like the idea particularly that in a sense we're surrounded by messages that we perhaps ought to be trying to interpret" (qtd. in "'to change'" 20). The future of humanism in the hi-tech twenty-first century lies in the belief that anything in the universe is capable of expressing itself and Morgan is one of the rare poets to pay attention to their messages (Fox 85). That is, in Morgan's words "no matter where we look in the universe there is 'nothing not giving messages'" (qtd. in Campbell "Review"). Defending biocentricism in the face of anthropocentricism, Morgan's decisive "ambition is to give voice to people, animals, and objects who otherwise do not communicate with us" (Fox 84).

Marsack admires Morgan's wish "to give everything a voice – animals, inanimate objects and machines equally with humans – and in denying no one, except the powerful whose voices too readily find their channels, he expresses the humanist that is the constant pulse of his art" ("Declaration" 32). Morgan is eager to accept anything new, "occasionally ignor[ing] the real dehumanising effects of technology" in the meantime (Burrows). The wide variety of his computer, alien and space poems is a testimony to this, for they "balance his optimism against objectivity" (Burrows). In these poems, Morgan "invites us to contemplate inclusiveness and openness [. . .]: the encounter between 'aliens' and 'humans' gradually and subtly changes both groups, blurring and redefining borders that seemed fixed and unmovable" (Sassi 14). Accordingly, his poetry challenges humanism with posthumanist tendencies which hold not only animals and plants but also non-human entities like computers that constitute the universe of equal value. As Middleton argues:

> Our bodies are reshaped by medical and recreational drugs, by innumerable pollutants in the manufactured substances around us and in the air, water, and food we eat, food that has already been genetically modified by intensive breeding long before, however careful we are as consumers. Our five senses upgrade to new processors and polyamides, boosted by increased electron flow. [. . .] [T]hen we must acknowledge that our senses of self are increasingly modified by the communication technologies we use to sustain our relations in work and in our personal lives. Surely this flowering of science and technology ought to be fully acknowledged in poetry. (952)

In addition to these environmental and circumstantial changes in perception, developments in virtual reality and cyberspace also captured Morgan's interest. According to Nicholson, "[g]enerally understood as the use of computer modelling and simulation to enable a person to interact with an artificial, three-dimensional visual or other sensory environment, in Morgan's handling virtual reality has been both metaphoric resource and textual practice for some time" (228-9). As has been illustrated earlier in his computer poems, Morgan's poetry playfully usurped such concepts, frequently turning them into its subject matter while playing with poetic form, too. The "material strata that enable the transmission of poetry [. . .] [will be] transformed by the scientific developments manifest in technologies of printing, recording, and digitization," in addition to mimicking them (Middleton 952). Examples of such applications can be seen in Morgan's poems such as "Interferences," "Thoughts of a Module," "Spacepoem 3: Off Course," "Adventures of the Anti-sage," and "Particle Poems."

"Interferences," in *From Glasgow to Saturn*, consists of "*a sequence of nine poems*" (Morgan *Poems* 243 italics original). Walker states that when seven of the poems were originally published elsewhere, Morgan attached a note to them acknowledging "'other eyes watching' or intersecting worlds or planes of existence, each spot of intersection/interference being indicated by the spelling of a word suddenly going wrong" ("Voyage" 57-8). The title at once indicates that there are disruptions in original, or intended, transmissions due to electromagnetic failures or alien interruptions. In the poems, "the science fiction element is in the analogously small, inexplicable linguistic disruption that occurs usually at the end of each poem" (Walker "Voyage" 57).

The first poem, starting with an imaginary "arrow," observes a transmission which is trying to reach its destination before it is blocked, as is implied by the final line of the first sequence which is comprised of a single word; "targjx" (Morgan *Poems* "Interferences" 243 5). Disrupted words like this suggest that there is a disturbance in the hasty transmission followed by the second sequence which reports the experience of a group of explorers who are wondering what is going on in the world, a planet which

they were supposed to visit “in a million years” but cannot reach at the moment (Morgan *Poems* “Interferences” 243 6). Because the “blue planet” is not visible due to dense clouds, the explorers send a drone to earth. Unfortunately, it cannot make it to the world either (Morgan *Poems* “Interferences” 243 16-7). As the frequencies of radio waves change, different speakers report from diverse timelines and places. Of these the eight and ninth sequences are especially important in terms of the use of science and technology.

The eighth sequence displays a dialogue between a shaman and a mineralogist who is doing research in the vicinity of the Ob River in Western Siberia. Their encounter is one of binary oppositions as the shaman is represented as a person of faith while the mineralogist is introduced as a scientist: “‘I shake beads I prove spell on you’ / ‘shake away while I label these rocks’” (Morgan *Poems* “Interferences” 247 131-2). The ninth sequence transfers the geological setting to a completely different one. In this sequence, a reporter is seen presenting live a space shuttle’s count-down into space. The mission is to go to Saturn and report the planet’s rings for the next two years. Meanwhile inside the space shuttle a conversation is going on between the crew members as the reporter continues the countdown. As the crew members continue their ordinary conversation and get ready for take off, something unexpected happens:

> a half
> I don’t quite
> a quarter
> something has clearly
> an eighth
> we do not have lift-off
> [. . . . . .]
> a hundred and twenty-eighth
> wo de nat hove loft-iff
> (Morgan *Poems* “Interferences” 248 272-7, 284-5)

The countdown continues while the speech of the crew members becomes jumbled, the vowels of the words changing places. The poem, thus, comes to an end either because the lift-off has finally taken place, as the stopped countdown implies, or because yet another interference has just taken place, as is indicated by the overall title of the poem. Walker claims that the “idea for the sequence seems to have come from the

phenomenon of tetkites, small glassy objects of unexplained origin found mainly in Czechoslovakia, Central Russia, Africa, Southeast Asia and Australia" ("Voyage" 57) and which are mentioned earlier in the poem during the encounter between the mineralogist and the shaman:

> 'now tell me what these beads tell me these beads'
> 'black and glassy I recognized them at once'
> 'now you tell what just you tell what'
> 'tetkites'
> (Morgan *Poems* "Interferences" 247 133-136)

Due to their disciplinary differences, the shaman and the mineralogist cannot seem to communicate. While the shaman regards the tektites as tools to read future, the mineralogist, observed while labelling rocks, relies on the rocks to read the Earth's geological past. Speculation and certainty that are posited as opposites lead to interferences in communication in the eighth sequence. Throughout the poem interferences act as a governing presence over human actions and anticipations in the poem, while the form of the poem, too, reflects their impact. Transmission of poetry, thus, mimics electromagnetic transmissions in general since there is no original message, either because the message is lost or hindered during transmission or because each individual has her/his own interpretation.

"Unscrambling the Waves at Goonhilly," likewise, makes interferences as "sudden deformations of language" a central topic, although in quite a different manner (Walker "Voyage" 57): "telfish / dogstar / [. . .] / dogfish / telstar" (Morgan *Poems* 174 1-2, 35-6). The poem is about the Goonhilly Satellite Earth Station in Scotland which was the largest satellite station on earth in the early 1960s. The poem tries to unscramble the radio waves which are apparently subjected to interferences during its reception of broadcasting transmission. Because it was connected to NASA's communications satellite Telstar, which had undersea cables, the poem uses images of dolphins, whales, starfish, sardine, docks and dogfish in different combinations. The unscrambling continues until the word "telstar" appears on the page indicating that the waves at Goonhilly have indeed been unscrambled. Associating the word-pairs with radio waves,

the poem imitates the disassociation that occurs due to transmission on the page as well via new word combinations.

"Thoughts of a Module" introduces space as a topic for poetry. The module in question is a self-contained component of a space-craft that carries out tasks in addition to the major mission of the shuttle. The mission at hand in this specific poem is to collect samples of rock and dust from the moon by way of a lunar module. The speaker is the American astronaut Neil Armstrong who was the first man to walk on the moon (Crompton 69). The poem starts with a kind of free association, representing what Armstrong might have felt, when he landed on the moon for the first time in history in 1969. Many historical facts and cultural details are preserved in Morgan's poem, such as the ladder Armstrong used to land on the moon's surface from the module, the first planetary photographs, Buzz Aldrin, the second man to walk on the moon, the first flag that was planted on the moon, Michael Jackson's moon dance and finally the phone call from the White House that took place between Armstrong and the President of the U. S., Richard Nixon (Crompton 81).

Because there is no oxygen to carry their voices in space, and they have to draw oxygen from their helmets, the crew members have difficulty talking to each other. While communication is possible within the space craft and from earth to moon, communication between the crew members, when they are on the moon is hindered. This situation is reflected through the use of short, broken sentences: "All rock are samples. Dust taken I think. / Is bright my leg. In what sun yonder. / An end I think. How my men go." (Morgan *Poems* "Thoughts of a Module" 259 18-20). Besides observing his crew's management of the task at hand, Armstrong starts to ponder about outer space, whose darkness creates a definite contrast with the earth which is bright like his ladder. The contrast between the dark space and the bright earth seems to be the dominating idea behind the poem, since the poem starts with the line "[i]t is black so" and ends with "[i]t is bright so," implying the enlightenment made possible by the sciences (Morgan *Poems* "Thoughts of a Module" 258 1, 259 28).

"Spacepoem 3: Off Course" follows the suit of "Thoughts of a Module" in terms of its fragmented nature. Yet, this time there are only phrases instead of full sentences. What's more, the words are repeated twice creating different pairs each time:

> the imaginary somersault the visionary sunrise
> the turning continents the space debris
> the golden lifeline the space walk
> the crawling deltas the camera moon
> [. . . . .]
> the crackling somersault the smuggled orbit
> the rough moon the visionary rendezvous
> (Morgan *Poems* "Spacepoem 3: Off Course" 261 6-9, 15-6)

From beginning to the end, the poem gives a picture of the life of an astronaut in a space- shuttle. The view from space, the actions of the astronaut inside and outside the space-shuttle, his idea of fun, his physical exercises as well as the physical changes in his body during his stay there, in addition to changes in temperature are all referred to in the poem. Apart from the changing pairs of the words, what changes more importantly is the change of tone towards the end of the poem. The tone of the poem which starts off in an optimistic note at the beginning, in the latter part shifts to a pessimistic one, with the combination of bleaker pairs such as, "the weightless headphone the cabin debris / the floating lifeline the pitch sleep / [. . .] the turning silence" (Morgan *Poems* "Spacepoem 3: Off Course" 261 17-9). Keeping the title of the poem in mind, it is easy to understand why the tone gets bleaker still as the speaker witnesses the space-shuttle going off course and getting lost in the depths of space, while Morgan displays neutrally the hopeless state that the astronaut is in. The poem, in this sense, addresses an unusual experience by combining technological advancements with humane feelings.

Plants and minerals, elements and particles alike are also frequently found in Morgan's poetry. His poem "Adventures of the Anti-sage," includes all of these, as well as Morgan's fondness of wordplay. Subtitled "In the Country," "Subsea," "Electronic" and "Imprisoned," the anti-sage is initially introduced to the readers in the country. The anti-sage of "In the Country" is apparently a kind of sage, a herb with medicinal qualities, that gradually gains more meanings than formerly meets the eye. Morgan relies on wordplay to guarantee the anti-sage's transformation. Picked up from the country, the

anti-sage's journey extends to subsea in the second part. Being chased by "the shoal-master" and his men, the anti-sage starting to "soar," succeeds in getting "beyond all of their aim" (Morgan *Poems* "Adventures of the Anti-sage: Subsea" 369 13, 18). In the third stop of his adventure, the anti-sage's name gains another meaning. This time, Morgan illustrates the anti-sage evidently imprisoned inside a computer:

> Men in white coats banged the computer.
> The anti-sage stayed inside, sighing.
> 'We know you're there!', they shouted.
> He squeezed through circuits, thinking about thought,
> felt hot, and with a sudden laugh
> exploded in a print-out WISDOM
> THERE IS
> NO WISDOM THERE
> IS NO WISDOM THERE IS NO
> WISDOM THERE IS
> then flew swiftly through the white coats [. . .]
> [. . . . . .]
> while they faded into their dimension,
> while they froze in gestures of defeat,
> while they failed to watch him go.
> (Morgan *Poems* "Adventures of the Anti-sage: Electronic" 369 1-11, 16-8)

The meaning of sage as a herb transforms into its meaning as a wise man in this part of the poem. Despite the best of their efforts, the scientists fail to get a straight result from their experiment, although the anti-sage playfully tells them that there is no wisdom inside the computer, or anywhere for that matter. Leaving the scientists in complete bafflement, this contrarily-charged wisdom then, moves onto his next adventure. The final part portrays another word-play on part of the anti-sage. For, here the anti-sage is introduced as anti-matter:

> In a great cage
> of crossed lasers they held the anti-sage
> five seconds. His rage
> scorched Sirius an age.
> But then to disengage –
> Forgot his anger, closed his eyes, began
> 'To dream' (he breathed) 'I've always known –
> (Morgan *Poems* "Adventures of the Anti-sage: Imprisoned" 370 1-7)

The depiction of the anti-sage's final journey, like the preceding one, has the tone of pseudo-scientific experiments. The anti-sage is still being tested on and this time he is

caught for good. Morgan's reference to him from the beginning as a subject through the use of the subject pronoun "he" shows Morgan's posthumanism. Morgan's object is a thinking subject here whose journey ends with his concluding monologue.

"Particle Poems," written in six parts, demonstrate another example of Morgan's innovative technique, as well as his posthumanist approach. By emphasising the importance of this small inanimate element in constituting atoms and subsequently forming matter, Morgan's poem exemplifies a posthumanist approach. The sum of the poems' parts, as particles decree, constitutes the whole. In the first part, an "old old old particle" is introduced as the speaker of the poem (Morgan *Poems* "Particle Poems: i" 386 1). Describing its parts playfully, the particle claims that it has got "charm" which is an example of the puns that Morgan uses so effectively in his poetry (Morgan *Poems* "Particle Poems: i" 386 3). Then, the speaker continues to give information about its parts:

> Opened up his bosom, showed me a quark.
> It gleamed. He grinned like a clam. 'Sort
> of heart, really, though I've got four.
> They're in orbit, and what for
>
> is a good question, unless to pump up
> charm. [. . .]
> (Morgan *Poems* 386 "Particle Poems: i" 4-9)

Particles compose atoms which in return compose molecules (Bynum 184). Atoms are composed of particles called protons, electrons and neutrons. Protons carry a positive charge whereas electrons carry a negative one, while neutrons are not electrically charged at all (Bynum 185). Borrowed from James Joyce's *Finnegan's Wake* by physicist Murray Gell-Mann, the term quark denotes an elementary particle responsible for electric charge, mass, colour charge and spin (Bynum 246). A charm quark is the third largest of the six quarks identified by scientists (Bynum 246). Thus, boasting of its innate power, the particle voices one of the most problematic issues related to advancements in physics; that is its possibly devastating uses:

> [. . .] but seriously
> would you not say I'm easily

> the nearest thing to doom and centrehood
> you've ever been unable to preclude?
> [. . . . .]
> [. . .] even nanoseconds raised
> by charm to higher powers, wait
> until I make them, and fade.'
> (Morgan *Poems* "Particle Poems: i" 386 11-4, 22; 387 23-4)

Reminiscent of atomic bombs, the particle is really "the nearest thing to doom." What's more, it seems to act on its own, like the whittrick of the earlier poems, and it is exactly this quality that fascinates Morgan. Where others see destruction, he praises the particle for its power to create. The subsequent parts of the poem describe particles in their various forms. The second part, for instance, is about a young child who dies. The third part introduces protons, electrons and neutrons that live in union in their various forms, making up knives, forks, and spoons as well as "earth, sea, and sky" (Morgan *Poems* "Particle Poems: iii" 387 3). When one of them is kidnapped by another "wandering particle," the remaining two create opposites that yearn for their third party (Morgan *Poems* "Particle Poems: iii" 387 14):

> and the two that were left made day and night,
> and left and right, and right and wrong,
> and black and white, and off and on,
> but things were never quite the same,
> and the two will always yearn for three.
> They're after you, or me.
> (Morgan *Poems*"Particle Poems: iii" 387 15-20)

Because of their contrasting nature the remaining two can easily be identified as protons and electrons whereas the kidnapped party seems to be their equaliser; the neutron. The fourth part starting off as "[p]art particle, part idea, she / struggled though a throb of something" describes a blind girl (Morgan *Poems* "Particle Poems: iv" 387 1-2). Affirming the body as well as the soul as such, and consequently rejecting the Cartesian dualism between them, the fourth part describes a field, with its fibres and vibrations; forces and surges, as if it were an electromagnetic field charged with electricity. In fact, in a manner of speaking, it is, because everything that makes up the field is formed of particles which are electrically charged to some degree. The fifth part is the shortest, made up of only two lines telling the tragic story of a particle which wanted to leave its spot (Morgan *Poems* "Particle Poems: v" 388 1-2). Not being able to survive on its own,

dissociation results in the end of the particle. Finally, the sixth part portrays a visit to a destruction site which is talked of in both military and photographic terms. Here, at the very end, Morgan makes use of irony as the poem depicts a wartime mausoleum where the same particles caused massive devastation; "we raced ahead / to be burnt out" (Morgan *Poems* "Particle Poems: vi" 388 19-20).

Morgan ends the poems with a statement, rather than a warning, which shows his positive views regarding an integrated world outlook and his posthumanist approach. His optimism and faith in science and technology, despite the sciences' possible catastrophic results, has to do with his keen approval of change chiefly, as stated above.

1.4. THE POETRY OF CHANGE

Making a general evaluation of Morgan's poetry, Ian Gregson refers to Morgan's emphasis on "the human capacity to cope with change," and adds: "There is a continual fascination in Morgan's work with human flexibility and the endlessly inventive and diverse behaviour that results from it" (135, 136). According to Morgan, change, which is unavoidable, should be welcomed with optimism and acceptance. Accordingly, Morgan's poems strive to underline the benefits of change rather than considering change as an inherently devastating force. As is put by Morgan himself, "Change Rules" (Campbell "Review"). On account of change, there is a continuous process of improvement. Plus, societies evolve due to their ability to adapt. Realising the same changes also in us, Morgan thinks of

> our physical being as the result of very slow, apparently random changes, mutations occurring with the DNA, the hereditary code, gradual transformations and adaptations that took place over a very long period of time. [Further,] [w]e can witness adaptive evolutionary changes in some animals [. . .] during our own lifetimes. We have watched our own civilization change and alter the earth, eradicate certain diseases, create bacterias, manipulate the development of domesticated animals, affect the environment. (Rogers 5)

In such a world, the only constant is "flux and change" (Rogers 5) for it is "constantly changing, altering itself, [. . .] [by way of acquiring] new data [and] more refined

methods of gathering information" (Rogers 6). As is argued by Boddy, although "'change is painful when it comes,' we need to 'clear a space for the future.' That is the nature of cities, and, Morgan suggests, of people and poets too" (189). "Rigidity is definitely not a part of our cosmology. Science is not rigid. Dogmas are rigid," says Rogers (7). So long as we are willing, there is "growth, change, flux and delight" in change (Sassi 15), and in fact that is the very first thing that our cosmology tells us; that "we must be willing to accept new" (Rogers 7). If there is anything that our world teaches us, it is that our cosmology frequently reminds us that we exist in a universe of flux:

> Our Earth, bearing with it one orbiting moon, meanwhile circles and tilts around the sun, which is itself borne along with the solar system on its path around the center of the Milky Way, the Milky Way and its billions of sun/stars moving as one body [. . .] away from all other cosmic bodies, as a result of the Big Bang theory of the origin of the universe as we currently understand it. We aren't really sitting still at all, but are caught up in this mayhem of motion. (Rogers 4)

Change is central to a number of Morgan's poems. "The Unspoken" starts off as another poem using the journey motif. In the first stanza, a group of soldiers are sailing around the Cape in 1941 in order to make their way to war. The second stanza indicates that more than a decade has passed by now as the television newscaster reports that "the second sputnik was up, not empty / but with a small dog on board" (Morgan *Poems* "The Unspoken" 164 16-7). This news excites the speaker who

> was stirred by a deep confusion of feelings,
> [. . . . . .]
> as if I could spring from this earth –
> not loath myself to go out that very day where Laika had shown
> man,
> felt my cheeks burning with old Promethean warmth
> rekindled – ready –
> [. . . . . .]
> and I knew what I felt was history,
> its thrilling brilliance came down,
> came down,
> comes down on us all, bringing pride and pity[.]
> (Morgan *Poems* "The Unspoken" 164 23, 26-30, 37-40)

The tide of change that embraces the speaker is overwhelming because of the various possibilities this historical event gives rise to. As the great unknown becomes familiar, probable opportunities strike the speaker with their allure, for s/he is bearing witness to a historical moment that will change the future of humanity forever. Another poem, "Islands," that talks not only about future change but also about past change, mirrors the enthusiasm of the speaker of "The Unspoken," as s/he talks about new frontiers in terms of islands:

> What came to the world
> when it was cool and ready, thudding through the cryptograms?
> The continents drifted apart like clouds,
> [. . . . . .]
> Out! Out! he drifts, and strains, and cries for islands.
> Take the voyage out then! Drink the milk of space!
> [. . . . . .]
>
> And let the great islands of space, which are not clouds
> Magellanic or earthly, be your morning landfall.
> (Morgan *Poems* "Islands" 180 17-9, 22-3, 25-6)

The appeal of new frontiers is obvious in the poem. The speaker feels like an ancient explorer on a quest to discover new destinations, and feels excited to experience what space has to offer.

Change is welcome in Morgan's poetry, even if the conditions that brought about that change were caused by dire circumstances. "Last Message" depicts a group of remaining survivors of an alien attack who are trying to send a last message to the world. While the extra-terrestrial enemies arriving "on their dimensional wheels" give rise to a "radiation summer," the survivors of the alien invasions are forced to hide inside a pyramid (Morgan *Poems* "Last Message" 253 8, 12). The speaker, who is questioning whether it is "our defeat then," comes to the conclusion that their decision to adapt themselves to their changing circumstances in the present, as in the future, is their best option. Thinking that their decision to lock up the doors of the pyramid must have caused the invaders to experience "an unspeakable anger," the survivors feel glad that they "have saved [their] flesh / and mean to live and think of them" for "a thousand thousand thousand years" (Morgan *Poems* "Last Message" 254 16, 17-8, 21).

"A Home in Space," in contrast, identifies nomadic life as a condition of change. Considering that humanity has always been creating new frontiers, the journey motif is embedded strongly in the poem:

> that band of tranquil defiers, not to plant any –
> any home with roots but to keep a
> a voyaging generation voyaging, and as far –
> as far as there would ever be a home in space –
> space that needs time and time that needs life.
> (Morgan *Poems* "A Home in Space" 390 22-6)

The poem which opens in a space colony ends with the decision of a band of people who decide to cut every tie with the world. Thus, leaving everything behind, they eagerly turn their faces to new horizons to discover and explore.

1.5. THE POET AND THE CITY

Urban life is another popular theme of Morgan's science poems, since science and technology have taken the industrial city to greater heights. In his poems Morgan ceaselessly celebrates the industrial city and urban life style, despite their disadvantages. For Morgan, the city is "that street life we see in the poetry, though the architecture will be neither neo-Gothic nor the Victorian terrace but the high-rise flats. Essentially, it is the great moving toyshop of contemporaneity" (Rillie 113). The trick to survive now, and into the future, Morgan suggests, is through keeping up with the times and taking life as it comes. Therein lies the appeal of the urban city, regardless of its probably hideous appearance. As Watson argues,

> [t]he "drainwater-rusted concrete" and the "callow love graffiti" will appear in many of the later poems, but never simply to be despised as symbols of decay, as so many modern poets have done, but welcomed rather as evidence of a human presence, or perhaps "energy that has vanished" and yet somehow been sustained by the transforming power of art, just as Joan Eardley's paintings vitalized the slums and the sagging facades of Glasgow. "There is no other life, / and this is it" Morgan wrote in "London," and I value his quiet attachment to the modern world as it is. ("Scottish" 228)

The city of Morgan's central affection was, of course, Glasgow, a city to which he remained attached wherever he was. His admiration of Glaswegian lifestyle shaped

much of his poetry as a result, turning the city into recurrent subject matter. Hamish Whyte regards "the ever-changing city of Glasgow [as] a 'constant' in the poet's life. 'He's [Morgan] made us look at the city in a different way, always an oblique way, making the ordinary extraordinary. Glasgow suits him. It's always reinventing itself'" (qtd. in Campbell "Review").

It is with this enthusiasm that he wrote his "Glasgow Sonnets" included in *From Glasgow to Saturn*. The ten sonnets present a panorama of Glaswegian life of the underprivileged, for whom "hope [is] deferred" continuously, as they suffer from poverty and scarcity of all kinds of opportunities (Morgan *Poems* 284 "Glasgow Sonnets: v" 2); but more importantly the sonnets are about a cold industrial city which suffers from various ecological and environmental problems, and is facing demolition:

> It groans and shakes, contracts and grows again.
> Its giant broken shoulders shrug off rain.
> It digs its pits to a shauchling refrain.
> Roadworks and graveyards like their gallus men.
> It fattens fires and murders in a pen
> and lets them out in flaps and squalls of pain.
> It sometimes tears its smoky counterpane
> to hoist a bleary fist at nothing, then
> at everything, you never know. The west
> could still be laid with no one's tears like dust
> and barricaded windows be the best
> to see from till the shops, the ships, the trust
> return like thunder. Give the Clyde the rest.
> Man and the sea make cities as they must.
> (Morgan *Poems* 286 "Glasgow Sonnets: ix" 1-14)

In this ninth sonnet, Morgan describes the industrial façade of Glasgow as if it were a living organism that forever changes in shape, thus changing the silhouette of the city constantly. According to Crawford, Morgan revels in the "beauty" of the industrial city despite

> the problems of his city in the early 1970s, [. . .] go[ing] on to show that while 'Environmentalists, ecologists / and conservationists are fine no doubt', he sides with the bulldozer, with the energy of metamorphosis which will make it new in ways that might 'displease the watchers from the grave' yet still delight Charles Rennie Mackintosh. For Morgan, hope and energy always lie in the change, in translation. ("'to change'" 14)

The way Glasgow is described in the poems forces the speaker in the final sonnet to confess that the sonnet sequence is in fact closer to an ode in terms of its content and Morgan calls this kind of poem a "multi" which is "a sonnet stretched to ode" (Morgan *Poems* "Glasgow Sonnets: x" 286 4). Morgan's sonnets in general are poems of affection and love felt towards a city, while "the city and the self are intimately connected" (Boddy 183). The urban silhouette of the city inspired the poet in the same way any pastoral sight might affect a Romantic poet. Consequently, Scotland's "protean, mutable and larger than life nature" (Wacior 54) gave way to later sequences like *Sonnets from Scotland* which are spatially

> located in places as distant as the Earth and Jupiter the largest planet within the Solar system. Geographically, we are stretched between Scotland and North Africa. Yet it would be a gross exaggeration to claim that Morgan's cycle takes us on a space travel across the solar system or even on a more mundane exploration of different countries and continents. It is always Scotland he writes about and any spatial reference aims at linking the depicted place with his country or his fellow countrymen. (Wacior 53-4)

For Morgan, the American Beat poets' interest in the city in all its aspects, and their tendency to reflect the city in its most elemental form was appealing (Kraszkiewicz 5). So, no matter how distant his settings were, Morgan always wrote about Scotland.

1.6. FUTURISTIC SETTINGS

In line with scientific advancements and technological developments which evolve and improve daily, Morgan, "recognises the potential of change [. . .] [as having its] Golden Age [. . .] always in the future" (Pow). The new century belongs to those who accept change readily and will not shy away from further exploration. Morgan is not one to dwell in the past but always looks up to the future for inexhaustible resources. Hence, future colonies in space, for Morgan, are an evolutionary aspect of urban life constituting an integral part of his poems. His poem "The World" affirms his faith in the future: "Remembrance / offered nothing, [. . .] / We're here. The past is not our home" (Morgan *Poems* 346 iv. 10-12). As for "The Mouth," in it Morgan portrays an apocalyptic event during which the planets, the sun and the Milky Way are swallowed by "a great mouth," one by one (*Poems* 390 1). While the planets and galaxies are

swallowed by this mouth, which is apparently a black hole, space is dominated by darkness. The only place that is safe from the black hole's advancements is Virgo where "the most evolved life" is present (Morgan *Poems* "The Mouth" 391 34). Being the last "star-gate," the survivors of the galaxy regard Virgo as their ultimate "goal" (Morgan *Poems* "The Mouth" 392 49). Likewise, his poem, "The Unspoken," thinking about Laika in space, involves not "seeing only an animal / strapped in a doomed capsule" but anticipates "future / [. . .] still there, cool and whole like the moon, / waiting to be taken" (Morgan *Poems* 164 31-4). After all, once humans make it to space, they will be there to stay, as "The Moons of Jupiter" makes clear.

Jupiter may be an unusual topic, but not for Morgan. Ever fascinated with new frontiers, he saw planets and galaxies as potential settings which will provide the pioneers of the future with new settlements:

> We never landed, only photographed
> And sent down probes from orbit; turbulence
> On Jupiter was extreme, there was no lingering.
> Is it beauty, or minerals, or knowledge
> We take our expeditions for? What a question!
> (Morgan *Poems* 396 "The Moons of Jupiter: Ganymede" 9-13)

"The Moons of Jupiter," divided into five parts subtitled "Amalthea," "Io," "Europa," "Ganymede" and "Callisto," deals respectively with "writer's block on 'Amalthea,' industrial unrest on 'Io,' explorers on 'Europa,' [and] settlers on 'Callisto;' each interface with alterity, making personal encounter out of imaginative enterprise by staging speaking subjects in alien space" (Nicholson 228). "Ganymede," is about a touristic expedition with underlying mercantile interests: "We are here, and our sons or our sons' sons / will be on Jupiter, and their sons' sons / at the star-gate, leaving the fold of the sun" (Morgan *Poems* 396 19-21). Describing the satellite as a marbled beauty, the speaker wonders whether it is gold or asphodel that makes the place a priceless beauty, but soon learns that it is iron and uranium that the explorers are after (Morgan *Poems* "The Moons of Jupiter: Ganymede" 396 28, 26). Ending the last poem, "Callisto," with the words "[t]hese / memories, and love, go with the planetman / in duty and in hope

from moon to moon," Morgan blesses the daring souls of those explorers who are ever ready to go forward (*Poems* 397 26-8).

As his firm poems' firm prediction that the next generation of humans will live in other parts of the solar system makes clear, Morgan has a strong interest in futuristic settings. Contrary to those who see the world and humanity as doomed, Morgan is quite clear about his idea of them as reasons for constant wonders: "I don't think it's not going onward, / [. . .] / I don't accept we're wearing late" (Morgan *Poems* "The World: i" 345 1, 3). His is not a denial of what may happen, but a firm belief in the advancement of science and technology to catch up with the problems of the earth and solve them.

1.7. SCIENCE-FICTION POETRY

Science fiction is a type of speculative fiction which relies on science and technology, and is often set in futuristic settings. Including such plot motifs as "parallel universes, time travel from present into the past, even impending invasion or catastrophe," according to Clareson, science fiction "more than any other literary form reflects the impact of modern scientific thought upon the literary imagination" (3). Bova further claims that "science fiction stands as a bridge between science and art, between the engineers of technology and the poets of humanity" and suggests "[n]ever has such a bridge been more desperately needed" (7). Although science fiction, as the name already indicates, is largely a type of fiction, as has been noted in the "Introduction," elements of science fiction have also been present in poetry. It is, however, with the late twentieth century that the use of science-fiction in poetry gained a new momentum with Edwin Morgan's various science-fiction poems.

According to Fox, Morgan's "championing of science, change, and newness against history and tradition" forms the basis of his science-fiction poetry that is an important aspect of contemporary British science poetry (82). Of the two seemingly oppositional faces of the sciences, Morgan was mainly interested in "the shiny technological outcome" that is technology, identified basically as "science [. . .] [which] works," instead of "[l]aboratory investigation and field work;" and of the many and various

technological advancements, he was particularly charmed by space exploration, besides his already mentioned interest in computer technologies, virtual realities and cyberspace (Middleton 957). According to Nicholson, Morgan's interest in space has to do mostly with keeping up with the times: "'Epic' occupation of deep space is now a continuing function of technology, and colonization of discursive space a daily composition of local and global telecommunications" (232). Morgan's interest in space is clear in his poems concerning space, more strongly however, it is felt in his well-known science-fiction poems "The First Men on Mercury," "Translunar Space March 1972," "Twilight of a Tyranny," "The Ages," "Era," "Foundation," "From the Domain of Arnheim," "In Sobieski's Shield" and "Memories of Earth."

Space exploration, alien encounters, teleportation, dematerialisation and rematerialisation are central to Morgan's science fiction poetry. Particularly, his science-fiction poems in which encounters with the third kind occur reflect Morgan's tendency to break down the distinctions between the human and non-human world. "The First Men on Mercury," included in *From Glasgow to Saturn*, is an example the unusual bond between the human and non-human world. The poem starts with a group of explorers visiting Mercury: "We come in peace from the third planet," they say (Morgan *Poems* "The First Men on Mercury" 259 1). Apparently, the explorers are from Earth which is the third planet from the Sun. Morgan's poem presents a mock-meeting between aliens and humans for the first time, usurping the popular idiom of "we come in peace," followed by yet another unoriginal inquiry, "[w]ould you take us to your leader?," the poem suddenly takes an unusual turn upon the answer given by the man from Mercury: "– Bawr stretter! Bawr. Bawr. Stretterhawl?" (Morgan *Poems* "The First Men on Mercury" 259 2, 3). The question directed to the men from earth starts off a number of questions and explanations. While it is clear that the parties are having difficulty trying to communicate, something amazing happens:

> – Men come in peace from the third planet
> which we call 'earth'. We are earthmen.
> Take us earthmen to your leader.
> (Morgan *Poems* "The First Men on Mercury" 259 17-9)

– Thmen? Thmen? Bawr. Bawrhossop.
Yuleeda tan hanna. Harrabost yuleeda.

– I am the yuleeda. You see my hands,
we carry no benner, we come in peace.
The spaceways are all stretterhawn.
(Morgan *Poems* "The First Men on Mercury" 260 20-24)

The men from Mercury and the earthmen start to understand each other as can be seen from the inclusion of each other's words in their own languages. For Boddy, "Morgan (the translator)" is at work here, since he has always been "fascinated with the way that languages are acquired" (186), while according to Fox, "[t]his is more than just giving 'voice,' more even than Robert Crawford's description of Morgan as 'the translator, the decoder of alien messages'" (84). While the Mercurians question the men, "[t]hmen," and inquire after the earthmen's leader, "yoleeda," a process of familiarisation with the English language takes place. Gradually, however, peace talks come to an end, as the men from Mercury send the earthmen off showing at the same time an apparently complete acquisition of English. However, the acquisition of English does not strictly remain a one-way activity, but the earthmen themselves start to talk in the Mercurian language. By the end of the poem, the two groups have swapped languages and could easily understand each other:

– Banghapper now! Yes, third planet back.
Yuleeda will go back blue, white, brown
nowhanna! There is no more talk.

– Gawl han fasthapper?

– No. You must go back to your planet.
Go back in peace, take what you have gained
but quickly.

– Stretterworra gawl, gawl…

– Of course, but nothing is ever the same,
now is it? You'll remember Mercury.
(Morgan *Poems* "The First Men on Mercury" 260 32-41)

It is now the earthmen who are fluent in Mercurian which is what will make their expedition to Mercury memorable. For, during their conversation a familiarisation

process has taken place turning the aliens into mainstream figures, while this time the earthmen have come to be regarded as the "others." The othering process, which is overtly presented, combined with colonial implications, also bring to mind Scottish-British relations, while the marking of the Mercurian language as rude and barbaric, according to Herbert, signifies the British reception of particularly Glaswegian dialect (qtd. in Gardiner 144). Aside from that, Morgan's poem cleverly illustrates how everything is a matter of perspective. According to Watson, as a "chemical element Mercury is notably fluid, [. . .] and as Hermes, messenger to the gods, he is equally quick, playful, ingenious and even untrustworthy" ("Edwin" 179). Through the Mercurians' message, Morgan challenges the anthropocentric view of the humans as the most important species of the universe by introducing an alternative way to see things. That humanity in general is only a small part of a greater whole is emphasised once again as the "men who land on Mercury appear to believe that they are the supreme beings of the universe, only to be faced by equal or superior life forms. Their language faces similar opposition as they (and their observers, us readers) are forced to listen, learn and evolve their mother tongue to take messages away from their hosts" (Jones).

"Translunar Space March 1972" deals with NASA's Pioneer-10 which was the first spacecraft to pass through the asteroid belt, the first to fly by Jupiter and take its photos as well as the first to make it to the outer solar system in 1973. More importantly, however, Morgan is concerned with the gold plaque that the spacecraft was carrying rather than the expedition itself:

> No crew for the two-year trip to Jupiter,
> but in the middle of the picture
> a gold plaque, six inches by nine,
> remedies the omission. Against a diagram
> of the planets and pulsars of our solar system and galaxy,
> [. . .] two quaint nude figures
> face the camera. A deodorized American man
> with apologetic genitals and no pubic hair
> holds up a banana-like right hand
> in Indian greeting, at his side a woman,
> smaller, and also with no pubic hair
> is not allowed to hold up her hand,
> stands with one leg off centre, and

> is obviously an inferior sort
> of the same species.
> (Morgan *Poems* "Translunar Space March 1972" 211 5-9, 13-22)

The gold plaque picturing the diagram was designed by Dr. Carl Sagan and Dr. Frank Dale who had the man's hand raised as it was in a gesture of good will. Morgan considers the diagram offensive: "the male chauvinist pig / has a sullen expression, and the woman / is faintly smiling, so / interplanetary inteligences may still have homework" (Morgan *Poems* "Translunar Space March 1972" 211 23-6). For Morgan, then, the diagram becomes an embodiment of gender inequality between man and woman. Envisioning an alien's perception of the humans, the plaque, instead of setting an example of scientific and technological advancement, actually shows how backward mankind still is in some of the more important aspects.

The poem "Twilight of a Tyranny" presents a futuristic setting where prisoners from other worlds were left to die so that they become words floating in the air. Spoken by the two sides in turns, the poem foretells a future which has caused the fall of many who, nonetheless, continue to live through their speech: "Astronomers once said our sun was dying. / Where are they now? Our towers blaze and stare. / We made them words to wander with the wind. / *We warned you, in the rising of the wind*" (Morgan *Poems* "Twilight of a Tyranny" 344 20-23 italics original). The italicised words belong to the astronomers who have been subjected to tyranny and are now floating in the air, warning the tyrants that "[y]our thrones are death. Ours is the reign of speech" (Morgan *Poems* "Twilight of a Tyranny" 344 29). No matter how hard the tyrants try to drown the scientists' voices, the voices hold the secret to true wealth and riches; that is the sciences' "hope" to create a better future (Morgan *Poems* "Twilight of a Tyranny" 344 25-6).

Morgan's "The Ages," through an analogy of days, draws parallels between steps of the creation of the universe and the changes that came about during these periods: "There was this universe on Saturday – / it may have been here before, but we had never seen" (Morgan *Poems* 186 1-2). As with anything new, scientists arrange an expedition there in order "to peer forward, and report" not only for curiosity's sake but so as to avoid the

misconceptions of "Twilight of a Tyranny" (Morgan *Poems* "The Ages" 187 56). Opening with a complaint that "[a] silicon-based life replaced us –," "Era," too, introduces to the readers a post-apocalyptic world. Harbouring in a cave, the survivors wait for their end while at the same time desperately try to pass on their story to the future:

> We few soft things, of earth, in caves, live.
> We shall go blind soon. This is oral
> but someone is writing still. Carbon!
> You could write with diamonds and be silent.
> The air is like walking through barbed wire.
> (Morgan *Poems* "Era" 389 14-8)

Carbon is the source material for both pencils and diamonds. The reference to writing, then, indicates that written literature is contrasted with oral literature in the poem. "Era" is followed by "Foundation" which seems to take up where the previous poem left. Questioning "'What would you put in the foundation-stone / for future generations?'" the poem comes to the conclusion that it is not anything material, but something thought-provoking that provides the most satisfactory result:

> '– a black hole, a dream, a conceptual universe,
> no, make it a dozen conceptual universes
> laid tail to head like sardines in a tin
> and poured all over with lovely oil
> of poetry: seal it; solder the key.'
> (Morgan *Poems* "Foundation" 389 1-2, 14-8)

In "Foundation" written literature, particularly poetry, is identified as the only thing that should be preserved for future generations. As for "From the Domain of Arnheim," the poem derives its title from one of Edgar Allan Poe's short stories (Nicholson 223). In Morgan's poem "an advanced class of humans" living in the Domain of Arnheim visit a group of "primitive, earthly people" dancing naked in a state of delirium celebrating a birth (Walker "Voyage" 60). Although the primitive people cannot see their extraterrestrial visitors, they feel them because one of the trumpeters throws a firebrand in their direction (Walker 60). The chaotic harmony of the primitive people wins the admiration of the superior beings for they do not feel threatened at all when faced with a greater power:

> These primitive men and women are, after all, the superior beings because, as Morgan says, 'They are going to survive, not frightened by what to them appear to be alien spirits, gods. They have no gods: in a sense they are going to make or be themselves the gods' [. . .]. It is the memory of individual courage in the trumpeter and collective energy in the group that haunts the narrator when he has returned home. (Walker "Voyage" 60)

Feeling that they have intruded on the tribal community's joy and admiring their courage for feeling their presence and standing up against them, the visitors finally decide to take their leave from this place which is governed not by gods but by people: "We signaled to the ship; got back; / our lives and days returned to us, but / haunted by deeper souvenirs than any rocks or seeds. / From time the souvenirs are deeds" (Morgan *Poems* "From the Domain of Arnheim" 184 37-40). In the end, what the visitors experience on Earth is worth more than what they collect from there, for the earthmen's courage haunts them still.

Morgan has suggested that many of his science fiction poems are scenarios of future probabilities:

> Many of my science fiction poems are about things which haven't yet happened, but which could happen, I'm putting real people into extraordinary situations and seeing what happens, especially in a poem like 'In Sobieski's Shield' (a distant constellation), in which people are sent to a distant part of the Universe after a catastrophe on Earth just to survive. Again it's the idea of extreme, but maybe not impossible experience. If that sort of travel was ever made possible, I'm just trying to imagine what it would be like. (Cambridge 40-41)

Made up of one whole sentence, "In Sobieski's Shield," which is one of Morgan's longer science-fiction poems, starts *in medias res* describing a family's experiences "on a minor planet / of a sun in Sobieski's Shield" after they have dematerialised and rematerialised (Morgan *Poems* 181 8-9). The poem, "literally deconstructs the self – dismantling the body atom by atom, dispatching the atoms to a distant planet and reassembling them" (Gregson 150). The speaker, who is a survivor of "dematerialization and subsequent molecular reconstruction," reflects "anxiety at anatomical alteration in himself" and the rest of his family members (Nicholson 223).

Claiming that he would not have been surprised to see himself turn into a mouse or worse, the speaker states:

> I am
> very nearly who I was I see I have only
> four fingers on my left hand and there's a sharp
> twinge I never had in my knee and one most curious
> I almost said birthmark so it is in a sense
> light brown shape like a crazy heart spreading
> across my right forearm well let it be we are
> here my wife my son the rest of the laboratory
> my wife has those streaks of fiery red in her
> hair that is expected in women [. . .]
> [. . . . .]
> she is hardly altered apart from that extraordinarily
> strange and beautiful crown of bright red hair
> (Morgan *Poems* "In Sobieski's Shield" 181 20-9, 33-4)

The speaker's son is also more or less alright. He lost one of his nipples during re-materialization, according to his father, it is nevertheless not his worst loss: "[W]hen he speaks his boy's / treble has broken and at thirteen he is a man / what a limbo to lose childhood where has / it gone between the throwing of a switch" (Morgan *Poems* "In Sobieski's Shield" 182 49-52). For the speaker, losing one's childhood in a foreign land is a terrible thing. Despite everything, the speaker still feels blessed for having been given a "second life" (Morgan *Poems* "In Sobieski's Shield" 182 55). In time another problem surfaces. Apparently, rematerialization also comes with false memories in the form of fragments as the speaker finds himself struggling with memories of a war. Trying to pull himself together, the speaker realises that he has become "a "demonstrative man yet how to tell them / what and who I am that we are all bound to all that lived / though the barriers are unspeakable we know a little of that" (Morgan *Poems* "In Sobieski's Shield" 183 82-4). Although it will be difficult for him to leave everything behind, the speaker knows better than looking back and decides to grasp his second chance gratefully: "[L]et's take our second / like our first life out from the dome are the suits / ready the mineral storm is quieter it's hard / to go let's go" (Morgan *Poems* "In Sobieski's Shield" 183 95-8). The final remark, "let's go," neutralises the negativity of the former comment, consequently ending the poem in an optimistic note.

As is made clear by Morgan, the poem is heroic because it shows a group of people who, facing one of the most frightening changes in their lives, are "somehow determined to carry forward. 'Let's go' the poem says at the end" (Cambridge 40-41). Walker additionally identifies more in the poem to be admired:

> There is the tenderness of heart that marvels at his wife's new beauty as he draws her head into his arms [. . .]. There is the man's courage, his curiosity about the new environment of iron hills and lakes of mercury, and there is his deepened sense of the human bond prompted by the similarity of the new birthmark on his right forearm to the tattoo on the arm of a dead person in the First World War. Above all there is his resilence as he prepares to leave the protective 'dome' and fare forward into new life in the unknown world. ("Voyage" 59)

"Memories of Earth" reverses the journey from Earth to a distant planet that is encountered in "In Sobieski's Shield." The poem is Morgan's longest science-fiction poem which portrays a group of time-travellers whose duty is to observe and record what they witness during their travels, ultimately presenting these before a council. The poem begins with a dramatic note: "My fingers tremble when I touch the tapes. / Since we came back from earth, nothing's the same" (Morgan *Poems* "Memories of Earth" 327 1-2). The speaker of the poem is Erlkon who refrains from asking questions for fear of the council:

> I must avoid questions, exclamations.
> Keep your report formal, said the Council,
> your evidence is for the memory-banks,
> not for crude wonder or cruder appraisal.
> I only report that nature is not the same.
> And I report it within the spirit
> of our resolve, which is indeed our duty,
> to record whatever we've found to be
> (Morgan *Poems* "Memories of Earth" 327 9-16)

Then, with a final resolve, the speaker starts to play the tapes one by one. Tape 1, which is named "The Stone," relates the experiences of Erlkon's expedition group of six that was tasked with the exploration of distant lands (Morgan *Poems* "Tape 1: The Stone" 327 23; 328 48-9). The group was expected to enter a marked stone which required them to shrink several times before they could enter it. Throughout the report the

speaker has the dilemma of whether to speak his mind out loud or to exercise self-censorship for fear of the council:

> [. . .] Have we moved at all?
> I am not to speculate, only to explore
> as commanded.
> [. . . . .]
> A desert in the middle of a stone!
> – Erase the exclamation mark. Surprise
> comes from old microstructure of thinking.
> (Morgan *Poems* "Tape 1: The Stone" 328 47-9, 58-60)

The council, thus, represents goal-oriented scientists who are concerned with objective data rather than the recitation of subjective experience. On the other hand, since the recitation of personal experiences belongs to Erlkon, he is representative of a poet in the poem. While the council tries to keep the report strictly objective, Erlkon is determined to include subjective experience in addition to the data provided. He asks questions, although the council strictly forbids it. In this sense, the poem exemplifies how sciences and humanities merge.

The group's last journey takes the expedition group to a distant galaxy within which they find "a speck of blue swirling with white / [. . .] a globe where millions of [. . .] [them] could live" which is, undoubtedly, Earth (Morgan *Poems* "Tape 1: The Stone" 329 97-8). Hence, the next tape expresses a speaker who is

> . . . so confused
> Questions come thick and fast, we don't erase them.
> This is most dangerous. The Council warned
> any questioning was theirs alone.
> What makes us disobey them? There – again!
> A question and an exclamation, both.
> Are we disintegrating, are we growing?
> (Morgan *Poems* "Tape 2: The Earth" 330 141-47)

The group members' speculations grow with every other encounter leading to more questions. What they witness in the earth is a series of images from the past such as King Dozsa, who was the "leader of an unsuccessful Hungarian peasant revolt in 1514;" Wordsworth, "one gaunt man," separated from his companions; then American

teenagers at a drive-in movie and, finally, a Nazi extermination camp (Nicholson 225). Especially the latter affects and changes the explorers tremendously, as they keep watching painfully "an earth labouring in memories" (Morgan *Poems* "Tape 2: The Earth" 335 318). The "[m]emory of the exploitation and control they witness produces" in Erlkon's report "excluded feelings that evolve as an oppositional strategy," which explains Erlkon's inquisitive monologue at the beginning of Tape 2 (Nicholson 226). By the end of the tape, the voyagers re-magnify themselves to their original size, but their serenity is ruined for good.

Unable to meet the expectations of the Council, they get frozen and their "anti-brainwashing sessions" begin (Morgan *Poems* "Memories of Earth" 336 386). Nonetheless, they cannot refrain from thinking, as Erlkon finally comes to the conclusion that "it seems / the virtue's in the question, not the answers" and starts to wonder "What use is order / to a chained world under a painted sky?" (Morgan *Poems* "Memories of Earth" 337 400-1, 432-3). As a result, once they are released from anti-brainwashing sessions, they meet in secret to "study how to change this life" (Morgan *Poems* "Memories of Earth" 338 444). Having the best of technology within an arm's reach helps, as they start to create "a source of life" bred in "pain and joy" (Morgan *Poems* "Memories of Earth" 338 457-8). According to Nicholson, "Memories of Earth," hence, "sings of aliens' 'first disobedience, and the fruit / Of that forbidden tree, whose mortal taste / Brought pain into their world, and all their woe,' a transgression that expands the subject towards political freedoms" (227). Ever hopeful of the future, although the poem does not cast light onto the issue of a possible revolt, Morgan emphasises his faith in progress once again, for the explorers vow to hold on to their memories of Earth in spite of the council's brainwashing efforts.

1.8. MICROCOSM-MACROCOSM RELATIONSHIP

In his article, "Modelling the Universe: Poetry, Science, and the Art of Metaphor," Simon Armitage claimed that "one of contemporary poetry's greatest achievements is the ability to make points about the universal out of the particular, and in gazing back into deep space, who can help but be ordered back to the fine detail of their own life"

(118). Similar to Armitage's claim, Morgan's poetry recurrently employs the relationship between the microcosm and the macrocosm so as to better emphasise man's place within the universe. Reid summarises Morgan's ability to do this by describing him as "[a] poet of this parish who was universal in his outreach. Whose imagination knew no bounds. A whittrick of a writer who could start in a tenement close and then take this city and country off on intergalactic journeys." Rogers, in turn, defines the relativity of the concepts of microcosm and macrocosm, which depend on the position of the onlooker, in the following manner:

> And we see ourselves as very tiny beings relative to the size of Earth, our planet, third from the sun in a family of nine planets all circling the sun, the star closest to us. We understand our Earth is tiny compared to the size of our star. [. . .]
>
> The sun is tiny compared to the size of the solar system, the solar system to the size of the Milky Way galaxy, the Milky Way to the size of the Andromeda galaxy, which is twice as big, containing 40 billion stars. And yet the Andromeda galaxy is tiny compared to the universe, which contains billions of other galaxies.
>
> We see ourselves as very tiny beings made up physically of groupings of other even tinier entities, atoms, molecules, cells, and organs. We are made from the dust of old stars. (Rogers 3)

As Rogers explains, there is a natural order in the cosmos with all things connected to one another. Naturally, the poet living in Glasgow is also a part of the galaxy, although it is but a fleeting existence "compared to the age of the earth, the history of the sun, the solar system, the Milky Way" (Rogers 4). On a minor level, this also makes the national Scots Makar an international citizen of the world. As the poet gradually extends from the local to the global through "the balance between global coherences and local differences" "from 'outer space' Scotland's cultural and literary history will be seen as but one (infinitely small) tessera of a larger mosaic. Its specificity, however, is as essential to the whole as any other of its parts" (Sassi 15). Although Morgan adopts "the notion of thinking globally, and of considering Glasgow as a 'world-city,' he is seldom content to be limited, even by the world," and always strives to explore beyond, believing that too much locality also creates a danger of creating its own "provinciality of one kind or another" (Boddy 187, 187).

Morgan's "London" is not only international but also intergalactic in reach. Divided into three parts, the first part of the poem portrays London on a sunny summer's day. Gradually, however, the summer day turns into a nightmarish scene in which the speaker and her/his lover are caught in a sandstorm. Obviously, this is not the London of twenty-first century but the London of future which is desolate and ruined. As the speaker loses notions of time and place, asking "where is summer, winter? Where is the world? / When we've lost time we have lost everything," "winged" help is offered to him and the remaining survivors (Morgan *Poems* "London: i. St James's Park" 239 48-9; 240 52). The second part, which describes Soho, brings together several combinations ranging from books, trademarks, literary names and cinema to cultural icons in addition to many other subjects:

> who's afraid of virginia golfinger
> dr no guide to london heller orgies book of the f
> 20,000 leagues under angus wilson yoga fetishism agency
> traps omar khayyam a week's supply for pocket torture photogr
> chinese medical cooking in 80 days lo duca come in and browse
> trial of oscar mickey fleming birth-cont catch-22 hyde miller
> (Morgan *Poems* 240 "London: ii. Soho" 29-34)

The things that are rumbling through the speaker's mouth are possibly a list of the things that make "london," "London" for the poet. Unfortunately, the things that are worth remembering are facing the threat of getting erased:

> But to wash London
> would take a sea.
> To wash it
> history.
>
> Now bury this poem in one of the vaults
> of our civilization, and let the Venusian
> computers come down, and searching for life
> crack our ghastly code.
> Bury it, bury it! Who cares?
> We shall never know.
> (Morgan *Poems* 241 "London: ii. Soho" 42-51)

The poem, then, moves into the future anticipating the dreadful erasure of memory and history, yet it also has confidence that technology will help preserve memory in newer horizons.

A further aspect of Morgan's science poems is their objective tone which, in terms of microcosm-macrocosm relationship, is achieved through Morgan's "impartial and matter-of-fact, instamatically razor sharp and unobtrusively universal [situation] in the timelessness of his prospect as the prophet-historian" (Wacior 53). In accordance with consideration of the universe as a place of ceaseless change, Morgan shies away from making pessimistic remarks. Instead, he presents his readers with a snapshot, not making any additional comments. Besides his computer poems, his poem "Pictures Floating from the World" objectively reflects an outsider's view of things describing a post-apocalyptic world where images from the past and present are caught in a limbo-like state venturing back and forth in time and depicting events as if the poems were instamatic:

> A mugger is disgustedly
> knifing his victim
> who has nothing on him
> but a small Raphael
> nipped from the Louvre.
> Conceptualize.
> (Morgan *Poems* 340 1-6)

The final word, "conceptualize," giving a command, creates the effect of alienation. Whatever is transmitting the images, they are making sure not to reflect anything at all while reporting the images stolen from earth. The rest of the poems in this sequence preserve this effect, too. Hence, despite the horrific nature of most of the images, they are told in a mater-of-fact manner.

In conclusion, praised as "a Niagara of invention" Morgan is certainly a prolific and innovative poet (Pow). Demonstrating the co-existence of sciences and humanities in his poems, Morgan defends an integrated world outlook. His poetry stresses the importance of change in human life which necessitates that humanity keeps up with the times. Hence, Morgan is quite impartial in his representations of the digital age in his science poetry. Specifically in his computer poems which rely heavily on concrete poetry, he shows a posthumanist approach towards artificial intelligences. Regarding change as a natural phenomenon, he has no difficulty in adapting to urban landscapes or futuristic journeys that, he assumes, will be made possible due to the advancements in

science and technology. Marking a poetic and scientific dream as one in his poems, Morgan continuously experiments with form and style. Compared to Crawford and Morley, Morgan is the most experimental poet of the three. Interested more in technology than science, Morgan is also the only one of the three poets who produced science-fiction poems. Believing in the inescapability of change, Morgan regards change as a positive phenomenon, unlike his successors. Morgan's attempts show that "the division between science and art may be due not so much to the artists, since artists like Morgan are clearly trying to incorporate science into the humanism of their art, but to readers who are trying to convert this art to pure scientific method, forgetting that there still must be humanistic layers enfolded in the technology" (Fox 80). Contributing to the development of contemporary science poetry, Morgan's science poetry emphasises the positive effects of science and technology, and anticipates futuristic settings where change is a welcome phenomenon.

CHAPTER II
ROBERT CRAWFORD

The Scottish poet Robert Crawford shares Edwin Morgan's enthusiasm for incorporating elements from science and technology into his poems. However, his science poems are unique in their subjectification of the objective sciences, which are shown in a personal, sentimental and nationalistic light. Crawford's largely lyrical poetry borrows terms and elements from the sciences like Morgan. Crawford also employs a technoscientific language in order to give accounts of personal experiences in his poetry. In fact much of Crawford's scientific poetry aims to create a national awareness through his representations of a technoscientific panorama of Scotland. As a consequence, Scottish writers, Scottish literature and other types of Scottish artworks are brought together with Scottish scientists, and Scottish inventions and discoveries in his poetry. Crawford attempts to create a national portrait of Scotland as a small, yet technically and intellectually advanced country. Accordingly, the aim of this chapter is to identify Robert Crawford's contributions to contemporary science poetry, and argue that Crawford presents a relatively subjective handling of the objective sciences and uses sciences in his poetry to develop a technoscientific national identity for Scotland.

Born in 1959 (O'Brien 584) in "Bellshill, Lanarkshire, in Central Scotland," Crawford travelled extensively around Scotland before settling down in St Andrews, where he currently resides and works as an academic (Dósa 79). Taught by Edwin Morgan at the University of Glasgow, Crawford was influenced by the poetry of Hugh MacDiarmid (Dósa 79). Later, at Oxford University, Crawford "studied alongside his Scottish contemporaries, the poets David Kinloch and W.N. Herbert" (Dósa 79). Crawford graduated from Oxford University, where he earned a doctoral degree in English right after his undergraduate years at the University of Glasgow. Crawford's experiences at Oxford University provided him with an intellectual stimulus as well as earning him a fresh perspective on Scottish matters: "The danger of living out of a place for too long is that you can get dewy-eyed about it, so that was one reason why it was important for me to come back to Scotland" states Crawford (Dósa 109). In a way, his time away from Scotland supplied Crawford with better insight, and became one of the driving forces behind his poetic career. Crawford's poetry collections comprise his first book

with W.N. Herbert, *Sharawaggi* (1990), which is followed by *A Scottish Assembly* within the same year, *Talkies* (1992), *Masculinity* (1996), *Spirit Machines* (1999), *The Tip of My Tongue* (2003), *Selected Poems* (2005) and, his latest, *Full Volume* (2008). Besides these, he also co-edited several books and series in addition to writing various critical works and biographies.

Crawford's poetry displays a wide variety of interests and concerns, including science and technology, politics, history, language, personal memory, familial relations, spiritual deliberations and Scotland. Humour is an ever-present aspect of his poetry, too. His early works are especially dominated by "[b]oth verbal and conceptual types of humour" which feature "Scotland's past and present realities in an intelligent, sharp-witted, thoughtful and sometimes laugh-out-loud funny way" (Dósa 80, 79). Defamiliarisation is also central to Crawford's works. In addition to borrowing terms from science and technology, Crawford occasionally includes in his poems random words from Scottish dialects. Dósa, in this regard, considers Crawford's poetry as "eclectic: it is both "synthetic" (in the sense that it is harvested from dictionaries and other written sources of language) and is assembled, like the pieces of a puzzle game, from personal memories of childhood words and local dialect" (79). The reader is made alert to his usage of both familiar and unfamiliar words. Aiming to build a national tradition which has science and technology at its centre, Crawford borrows words from technoscientific terminology as well as vernacular Scots.

In a country where at least three different "languages," English, Scots and Scottish Gaelic, are used as daily language, Crawford's awareness of "Scottish doubleness" is best reflected in *Sharawaggi*, his collaborative work with W. N. Herbert (Stafford 234). *Sharawaggi* and *A Scottish Assembly* (1990) were both published within the same year. They make Crawford's dedication to Scotland and Scottish heritage clear. *A Scottish Assembly* "written mainly in the 1980s when pressures for a Scottish Parliament or 'Assembly' were growing" was, as its title indicates, a political book (Crawford "*Spirit*" 56) reflecting the nation's, as well as the poet's, "devolutionary enthusiasm" (Stafford 231). Like Morgan's *The New Divan*, the connotations of the title are several. Crawford suggests that the title denoted

> an eclectic gathering of Scottish materials (in the way that the General Assembly of the Church of Scotland gathers Kirk ministers), or an 'assembly' in the sense that machines may be assembled on assembly lines or one might speak of the assembly of an engine. A number of the poems concerned Scottish scientists and inventors—Clerk Maxwell and Logie Baird, for instance—and sometimes I was interested in the way these figures (like Scotland itself at the time) seemed perilously balanced between breakthrough and failure. ("*Spirit*" 56)

His next collection, *Talkies* (1992), is about "talking cinema" which, however, is also "meant to signal different kinds of voice" (Dósa 90). Opening with a Bakhtinian epigraph which reads "one's own language is never a single language," it is made obvious that these poems will problematise language, speech and translation (Crawford *Talkies* 9). According to Stafford, the "sense of Scottish plurality" is reflected aptly by Crawford's choice of title, since "Scotland's literature has never been monolingual – English, Gaelic, Scots and Latin have each furnished Scottish poets with creative resources, while their readers have often been accustomed to more than one mode of speech" (231). *Masculinity* (1996) is perhaps Crawford's most personal work, chiefly dealing with the poet's own experiences of fatherhood. As for *Spirit Machines* (1999), written towards the very end of the twentieth century, it introduces to the readers the idea of computers and people as spirit machines. Crawford states:

> Spirit machines are computers, but they're also people. People have bodies but they have souls as well, and these two are fused. While I was writing some of the poems in *Spirit Machines* I was thinking about blurrings of the human and the mechanical. I was also thinking more prosaically about telephones and word processors, these machines through which human voice or some other human impulse passes. (Dósa 94)

Written in the aftermath of his father's death, the book is mainly a response to the poet's attempts to deal with loss. Crawford claims that "the experience of bereavement is there in the book, along with the experience of trying to learn to use a computer. I found a kind of link between the two" (Dósa 95). As for *The Tip of My Tongue* (2003), according to Crawford, it "has a more immediately human, bodily ring to it, something picked up on in many of the poems" ("*Spirit*" 67). A number of the poems within *The Tip of My Tongue* are dedicated to Scottish cities and poets, and problematise issues related to the languages spoken in Scotland. Casting aside *Spirit Machines*'s concern with the human and the computational, Crawford regards *The Tip of My Tongue* as

"often celebratory," yet points out that it also displays an awareness of environmental problems (Crawford "*Spirit*" 67). His last book *Full Volume* (2008) begins with a quotation from the Scottish poet Robert Burns which reads: "I'm truly sorry Man's dominion / Has broken Nature's social union" Crawford *Full* n. p.). *Full Volume*, especially in the early pages of the book, repeatedly stresses the harmony of differences, and argues for an ideal union between binary oppositions, such as sciences and humanities, despite their differences.

In his collections, Crawford relies mostly on lyric poetry in order to express the personal through technoscientific terms. His science poems, hence, are highly personal, written largely in sentimental and nationalistic terms. Through his poems Crawford aims at identifying Scotland as a technoscientific centre despite its diminutive size.

2.1. TECHNOSCIENTIFIC LANGUAGE

Crawford's poetry often relies on the use of technoscientific language which he frequently combines with Scottish elements. Having no restrictions with regard to subject matter in his science poems, and contrary to Holub who claimed that "poetry should not use science for its own metaphorical, unscientific, imaginative purposes," Crawford thinks that the use of science for figurative purposes in poetry is "liberating" due to "the colossal possibilities of science [. . .] in its metaphorical potential" ("*Spirit*" 61). Crawford, therefore, likes to combine the possibilities of technoscientific language with Scottish elements in his poems, thus juxtaposing the virtual with the historical ("*Spirit*" 66). Crawford's "Scotland" is an example of his interest in technoscientific language and history. Having two poems of the same title within the same collection, this particular "Scotland" has more technoscientific allusions than the initial poem. Crawford recalls that he wrote the poem while he was dating "a semiconductor physicist" from whom he would occasionally borrow words (Dósa 86). Consequently, the poem opens with the following lines:

> Semiconductor country, land crammed with intimate
> expanses,
> Your cities are superlattices, heterojunctive
> Graphed from the air, your cropmarked farmlands

> Are epitaxies of tweed.
> (Crawford *Scottish* "Scotland" 42 1-5)

According to Crawford, "words like 'heterojunctive'" are pretty "'sexy' [. . .]. I like to see my own poem as a love poem in several senses, but as a love poem to Scotland not least. It was a way of bringing together a number of different concerns: writing a little poem about littleness, about being in love with it, and the way this littleness expands" (Dósa 86). The intricate details that make up the country are described as parts of a machine which form the country as a whole, thus signalling "in related microscopic details what they also communicate on a more macroscopic level" (Crawford "Human" 58).

Written at a time when Scotland's autonomy was in question, the recognition of the country as a "semiconductor country" is significant in terms of identifying Scotland as a country whose power is limited by the superconductor England. The combination of technoscientific discourse with locality is visible in the poem. Crawford borrows terminology from geology, physics, electronics, textile industry, computer technology and nano-technology, thus, painting a technoscientific map of Scotland. A love of place names and local colour, which extends beyond the borders of different geographies, also adds to the effect of blending in the local, national and international in a manner which Crawford explains as follows:

> In some ways the internationalism of its scientific terminology has made it easily translatable for non-Scottish and non-English-speaking audiences. Yet there is also a love of placenames and local cultural details; this habit is strong in Scottish poetry, especially perhaps in Gaelic. In drawing on it and redeploying it in a poem that sounds a clear note of late-twentieth-century 'post-modernity', I wanted the local, national, and international to be bonded in a way that exemplified what I came to call my poetic ideal of 'Cosmopolibackofbeyondism'. (Crawford "*Spirit*" 57-8)

Thus, in this poem Scotland is presented as a close-knit structure of miscellaneous systems. The reference to the Scottish farmlands whose patterns are resembled to that of "tweed" is a deliberate choice introducing tweed as one of the most important elements of Scottish identity. Tweed, at its most characteristic, is hand-woven, and it has been an important means of livelihood for the Scottish whose industry was "confined [strictly]

to cotton" at the beginning of the Industrial Revolution (Mitchison 277). The history of Scotland is described as many-layered, for its agricultural past has been taken over by technology. The rise of technology is certainly affected by the underlying events which made advancements in science and technology possible. Thus indicating how intricately the country's past and present are combined, in the second and third stanzas, references to physics, nanotechnology and electronics emerge:

> All night motorways carry your signals, swept
> To East Kilbride or Dunfermline. A brightness of low
> headlands
> Beams-in the dawn to Fife's interstices,
> Optoelectronics of hay.
> (Crawford "Scotland" *Scottish* 42 6-10)

Dawn does not rise but is "beamed-in" through Fife's interstices, as if it were a laser light that the speaker is talking about. Moreover, what is distributed by dawn's light is described not simply as sunrays but rather "optoelectronics of hay" by the speaker. Scotland, as the speaker suggests, is truly a "[m]icro-nation" geographically (Crawford "Scotland" *Scottish* 42 11). Yet this "chip of a nation" is key to high-technology according to Crawford ("Scotland" *Scottish* 42 18). Being small in terms of proportion is not that important, for being miniaturised "[a]mong circuitboard crowsteps" is not a sign of small-mindedness but rather demonstrates the key-role it plays in Britain's technoscientific advancement, for Scotland, as a chip, functions as the base for the integrated circuit, that is Britain (Crawford "Scotland" *Scottish* 42 14).

"Scotland" displays that "to work best in a poem, scientific knowledge should have its own lexical allure [. . .] [which] may contribute towards a sense of something both 'more distant than stars and nearer than the eye'" as Crawford states ("*Spirit*" 61). Taking into consideration the poems in *Sharawaggi*, Crawford adds:

> A lot of the poems in *Sharawaggi* involved dictionary trawling. I'd be excited by the sound of these words and the chunky peculiarity of the language. There was a charge about it, and putting these words together would be a way of making sparks. It was both familiar and unfamiliar – rhythmically, consonantally and in terms of the noises. I could hear the words off the page, if you like, even although they were arcane vocabulary. It was at once writing in another language and not in another language. That

> combination of the familiar and the alien is something that, for whatever reason, has always excited my imagination. (Dósa 84-5)

Crawford's aim to produce a poem "from the tension between its familiarity and its strangeness" ("*Spirit*" 54), thus aims to "posit new, surprising juxtapositions to heighten our sense of reality and possibility" (Keatinge 151). Similar to the idea behind a metaphysical conceit, Crawford's use of technoscientific language in poetry according to Bronowski results in the imaginative act of displaying "new connections" whereby "every act of imagination" involves

> "the discovery of likenesses between two things which were thought unlike" [. . .]. All acts of imagination are of that kind. They take the closed system, they inspect it, they manipulate it and then they find something which had not yet been put into the system so far. They open the system up, they introduce new likenesses [. . .] and enlarge the total connectivity of the universe by showing them to be connected. (qtd. in Rogers 11)

This particular tension of the familiar and the unknown dominates most of Crawford's poetry. "Coll" emphasises such likenesses between unlikely pairs. The poem in general depicts the imprisonment of the very much alive nature by the cold reality of technology via the technoscientific language it employs. The poem describes the process of taking a photo of the Isle of Coll by the speaker. Metaphors are introduced at once into the poem: "Imagine an asylum for anemometers, / A discotheque of water" (Crawford *Scottish* "Coll" 12 1-2). The place is presented as a refuge for devices to measure the speed of wind as well as the centre of rain, sleet and the sea. As the storm continues outside, "like shot of God's anger," the persona manages to take a photograph and contrasts the calm image with the chaos going on outside: "The lens is rainlogged. / [. . .] But this matters because it sets the limits / All understand. One small lit square, / Chaos made dumb by a window" (Crawford *Scottish* "Coll" 12 8, 10, 12-14). Presenting a subdued version of the commotion, technology, like art, tames nature by giving order to its chaos and freezing the image forever in time.

In "Photonics" Crawford talks about photons, which are elementary particles of light (Bynum 199). Inspired "by a photograph in a Sunday newspaper of a computer system that ran only on light" the poem also anticipates Crawford's marriage to his wife Alice

Wales, as well as demonstrating a symbolic marriage of sciences and humanities ("*Spirit*" 57). Thus, words like "weds" "rings" "marriage" and "bond" run parallel to technoscientific language in the poem:

> We're a new technology a system that weds
> Lasers; no electronics; no gob-drops
> Of glass fibre to be teased and spun; just conjugate-phasing
> Turning constant signals into rings of light,
> A burgh packed with brilliant marriages
>
> [. . . . .]
> We meet as clearly as two beams in a saltire
> Bonded at the centre, having each
> Come through all the R & D to run on light.
> (Crawford *Scottish* "Photonics" 17 1-5, 13-15)

Covering "cutting-edge uses of lasers, optics, fiber-optics, and electro-optical devices in numerous and diverse fields of technology," the science of photons is concerned with the generation, manipulation and usage of light (Bynum 199). Underlining the freshness of the new theories concerning the distribution of light, Crawford illustrates how photons form light. The idea of light as both a wave and a particle is stressed in the poem, while the photons' union is likened to a Scottish burgh populated with newly-weds. Crawford's reference to a saltire, on the other hand, makes his national concerns clear. Identified as the cross of the Patron Saint of Scotland, Saint Adrew, the saltire is represented by the two beams meeting at the centre. In this respect, the saltire connects the advancements enabled by the discovery of photons no matter how small-scale their use is, like an x-ray unravelling "two pearl buttons in your throat," which is an obvious reference to tonsils (Crawford *Scottish* "Photonics" 17 10). The saltire combines not only two beams and disciplines but also two nations, extending from Scotland to the Giant's Causeway in Northern Ireland in the poem (Crawford *Scottish* "Photonics" 17 11). Each beam or nation, having been subjected to its own respective Research and Development unit, joins with the other forces halfway, to produce light waves over the Irish Sea. The last stanza introduces the union of photons as light waves travelling from two distinctive lighthouses situated on opposite sides, whose lights meet halfway between the nations "[o]ver gaunt blue water" (Crawford *Scottish* "Photonics" 17 12). Hence, technoscientific language is adopted to represent the union of two islands through technological advancements, as well as the union of sciences and humanities.

Likewise, concerned at first with light waves, Crawford's "Columban" deals with "[d]awn's fractured bone" which "windchills your channels, / Small, remote radio stations / Broadcasting Christ to the waves" (*Spirit* 14 1, 2-4). In this poem, Crawford's interest in light waves gradually gives way to an interest in radio waves. Making St Columba its central subject matter, Crawford likens Columba's dissemination of Christianity through the Western Isles of Harris, North Uist and Benbecula to a radio station's broadcast. Due to his deep voice and domineering manners, Columba had been successful in spreading Christianity (Oliver 51). Crawford speaks of a historical account in a technoscientific language, drawing parallels between Columba's voice and a radio broadcast. On account of Columba's efforts, the Bible's "hearing-aid whine draws congregations" over the sea, polluting the oceans (Crawford *Spirit* "Columban" 14 6). The implied congregations are the Vikings whose attacks on the Western islands around the time caused many deaths. Hearing Columba's voice, according to Crawford, the Vikings rushed to Scotland.

In the second stanza, the speaker claims that "[i]f a nuclear sub's / Viking blush passes down the islands," she / he "will mount a search" putting to sea the "crook of psalms;" that "holy grit" of the community rounded with "an anchor transformed to pearl" (Crawford *Spirit* "Columban" 14 13-14, 17, 18, 19, 20). Often painted in red, the blush of the Viking ships alludes to the raids carried out by the Vikings on the Scottish coasts particularly in the ninth and tenth centuries (Somerset Fry 46). Burning the monastery in Iona in 795 (Mackie 45), as they raided the Isle of Iona thrice between 795 and 806, the Vikings sacked and destroyed Celtic monasteries and carried off the gold and silver (Somerset Fry 47). The last lines of the poem refer to this as the pearl-anchor that the speaker will create "[s]hines across so-called Dark Ages / Its sol-fa brecbennach of calm" (Crawford *Spirit* "Columban" 14 21-22). In the eight century "Blathmac, an Irish monk, knowing that the Vikings would come for it, divided St Columba's relics in different places" (Mackie 46-7) one of which included the Brecbennach of St Columba, a temple-like box, "known as the Monymusk Reliquary" that is believed to contain fragments of the bones of the saint" and was usually carried into battle with the Scottish army for luck (Ross 91). Similarly, the speaker will attempt to comfort "[d]ying patients, the newborn in incubators" with his own words which will be singing to them

across time, while Crawford recounts the historical anecdote in technoscientific terms in order to appeal to modern-day listeners and readers with brand-new images of a historical account (Crawford *Spirit* "Columban" 14 10).

"Pollenation" also relies on technoscientific language to create an imagery of the fertilisation of the land by the sea resulting in the creation of the "first cell of Columba" (Crawford *Spirit* 3 12). The unidentified land mass is the Isle of Jura, as is suggested by "one of the world's most terrifying whirlpools, the Corrievreckan" (Balfour 149). Although traditionally associated with the Isle of Canna, Crawford seems to side with the idea that the Celtic monastery that was speculated to have been built in honour of St Columba was most probably on Jura (Balfour 149). Called "the dove," Columba was generally identified as an "aggressive Irish ecclesiastic" whose violence resulted in his exile from Ireland "until the number of the souls he saved equalled the number of those that he had caused to perish in battle" (Mackie 34, 36). Landing on the Isle of Iona in 563, he built monasteries all over the western coast of Scotland and became quite influential due to his political and rhetorical skills in addition to the miracles he performed (Mackie 36, 38). The poem reflects the union of the land and the sea in "a salty chant / Antiphonal among peatsmoke" which takes turns in singing their songs (Crawford *Spirit* "Pollenation" 3 5-6). It is this "[h]allucinatory *hi ro*, *ho ro*" that eventually gives birth to the legend of St Columba who passed the Irish Sea to settle on the Isle of Jura to disseminate Christianity in Scotland (Crawford *Spirit* "Pollenation" 3 10). The use of biological and geological terms enables Crawford to depict the conversion of Scotland to Christianity in a technoscientific manner.

"Iteration" reflects the idea of repetition via biological and mathematical terms. The poem as a whole is presented as a mathematical equation based on the idea of recurrence. Equating singularity with plurality from the start, the poem denies singular answers to any given question:

> It just won't stop, the solution of a simple equation,
> Fed in again at the start.
>
> Forever and ever in fractal geometry,
> Producing a four dimensional model

> Of how [. . .]
> A fern's replicated
>
> Sameness of tracery, a fir tree's cone after cone
> (Crawford *Talkies* "Iteration" 60 1-5, 6-7)

Sameness and circularity are stressed in a one-for-all, all-for-one kind of relationship. Each answer gives birth to a new question, as a fern's consistent design and a fir tree's cone, both in a botanical and a mathematical sense, reveal a deep-rooted connection. In this regard, they represent "the singular"

> [t]hat is also a plural, the true thing that always changes,
> Greek Department and Microcomputer Suite
>
> Alike called The Swallowgate, our marriage that is
> Monday, Tuesday, Wednesday, Thursday,
>
> Friday, Saturday, Sunday,
> -day, -day, -day, -day, -day.
> (Crawford *Talkies* "Iteration" 60 14-19)

Problematising the notion of a single truth, the poem embraces plurality emphasising that there is no single way to see things but rather numerous ways. The reference to The Swallowgate alludes to the address of the Greek Department and Microcomputer Suite at the University of St Andrews where Crawford works, hence confirming the existence of sciences and humanities side by side in life as well as their claims to be representatives of different sorts of "truths." Ultimately, repetition of the final "-day"s strengthens the idea, pointing to similarities rather than the differences in life.

Aside from plant imagery, Crawford refers to technology in "Satnav," which is the acronym for satellite navigation that relies on GPS imagery, to indicate the union of two lovers:

> In this windy town of lamps and horizons,
> [. . . . .]
> Where broadband flits down slim, carved vennels,
> [. . . . .]
> At the end of a leyline that runs forever
> [. . . . .]
> At the very centre of this off-centre town
> We come together, lost and found.

(Crawford *Full* 5 1, 3, 6, 9-10)

Leylines are imaginary lines which are thought to mark borders (Balfour 34). By associating myth and technology in this manner, Crawford brings together Scotland's ancient history with the contemporary one suggesting that present-day satellite navigation works in a similarly supernatural manner which is not visible, yet keeps bringing loved ones closer through its imperceptible data transmission signals.

"Radio Scottish Democracy" presents several scenes from different households as people listen to the radio. Problematising time by emphasising the time lapse that occurs between broadcasting and its reception when one is listening to the radio, the past and the present are shown as merged into one blurry experience running parallel to each other in the poem:

> You tune into a woman in Lima, yawning.
> You listen to what hasn't happened yet [. . .]
>
> A new voice starts to come unjammed
>
> Against a rout of white-noise, Floddens,
> Cullodens, nostalgias that rhyme,
> When kilties went roaring over the grass,
>
> Fell on it, let it grow through them.
> (Crawford *Talkies* "Radio Scottish Democracy" 26 4-5, 8-12)

The references to two of the bloodiest battles in Scottish history add a poignant tone to the poem as the Highlanders who died during the battles are recalled in a sad metonomy. During the Battle of Flodden (1513) the Scottish army under the leadership of James IV met the English army on Flodden Hill which ended with James IV's death and a major Scottish defeat (Mitchison 85, 86). As for the Battle of Culloden (1746), it marks the final Jacobite rebellion of Charles Edward Stuart, that is Bonnie Prince Charlie, against the English forces, which ended in an even more brutal aftermath (Somerset Fry 194-5). Deserted by their Prince, the Scottish clans met a gruesome end at the hands of the English forces. The English victory gave rise to a series of governmental acts that were passed to suppress the clan system in Scotland, hence gradually giving way to the Highland Clearances to follow (Somerset Fry 197). As the

speaker's "imagination / Becomes a microphone for the future," the past overshadows the present, while s/he is unable to decide whether the words move "– towards or away" (Crawford *Talkies* "Radio Scottish Democracy" 26 6-7, 13). Thus marking two major defeats as pivotal on the way to Scottish democracy, the poem indicates that the advancement of science and technology in Scotland indicates a similar struggle, although this time Scotland is guaranteed to be the winner: "Not to dour centuries of trudging, / Marching, and taking orders; / Today I have heard the feet of my country / Breaking into a run" (Crawford *Talkies* "Radio Scottish Democracy" 26 15-18).

Clearly, technoscientific language is central to Crawford's poetry not only in terms of bringing sciences and humanities together but also in reaching out to the distant past and recovering elements from history to present them in contemporary contexts where science and technology are important elements in sealing Scotland's fate.

2.2. LYRICAL SCIENCE POEMS

Due to its largely personal content, Crawford's poetry is lyrical in general, and his science poems are no exception. Aiming to capture "a quality of performativity" in his poetry, Crawford relies on the dramatic aspect of the Scottish poetic tradition which, in his view, has been there ever since Dunbar, Burns, Morgan and others (Dósa 92). Regarding poetry as "an oral pleasure," Crawford naturally thinks of "poetry as performance" (Dósa 90). He does not believe that "we're [. . .] living in a rhyming age" any longer (Dósa 90). On the contrary, he asserts that

> poetry in our era should not sound neat, or too well-fashioned, which is not to say that it shouldn't *be* well-fashioned, but it just shouldn't wear that on its sleeve. It shouldn't sound antique. It must be true to the grain of the voice of the age in which we live, and we live in an age full of bytes and bits and broken off voices and telephone jabber as well as conversational voices. That slight jaggedness of the acoustic of our age is something that I like to sense in poetry. I'd like to be able to find and make a beauty of that. There needs to be a tension between the jaggedness and the lyrical flow. (Dósa 90-91)

Particularly in his science poems the "jaggedness of the acoustic of our age" is observable. He states: "I see and hear poems like 'Scotland' ('Semiconductor

country…') as lyrical maybe in a way that other readers don't" (Dósa 91). Although objective sciences may not have been considered as prominent features in expressing subjective experience, for Crawford the kind of defamiliarisation that sciences provide has its own charms. Crawford uses lyric poetry as an already existing form to express subjective experiences through objective terms, theories and concepts that sciences provide. Charging technoscientific subject matter with the personal, Crawford's lyric poetry in a way displays what may be considered the subjectification of objective sciences.

Accordingly, Crawford's poem "Opera" is about the way a physics marvel was perceived by the speaker when he was a child. Describing her/his mother as if she was conducting an opera with her "SINGER" sewing machine, the speaker invites everyone to celebrate this machine:

> And her beneath an eighty-watt bulb, pedalling
> Iambs on an antique metal footplate
> Powering the needle through its regular lines,
> Doing her work. To me as a young boy
> That was her typewriter. [. . .]
> [. . . . . .]
> [. . .] Mass-produced polished wood and metal,
> It was a powerful instrument. [. . .]
> [. . . . . .]
> I went to work at school, wearing her songs.
> (Crawford *Scottish* "Opera" 9 4-8, 11-12, 15)

The speaker holds no biases about mass-produced goods and is fascinated by the machinery which functions according to the laws of physics. The mother's pedalling, which requires kinetic energy to produce her work with the help of technology, is not necessarily supposed to arouse sentiments in the speaker. However, by ascribing the machinery with fond childhood memories, the sewing machine turns into an object of nostalgia. The poem also echoes the process of writing a poem, as the speaker imagines her/his mother creating iambs rhythmically on the machine. In addition, the speaker enjoys wearing the machine's products, that is clothes, to school, which s/he defines as the physical "songs" created by her/his mother. Crawford's treatment of the mechanical subject is highly personal, thus showing how it is possible to employ objective elements, while reflecting subjective experiences in contemporary science poetry.

Likewise, in his autobiographical "Home" in which he talks about both his home and his love for his wife, Crawford refers to a "hydroponicum" built from his wife's tears (*Scottish* "Home" 18 12-13). Here the romantic imagery is provided in technoscientific terminology, as "bitter-sweet nutrition / Becomes the address we ripen in like fruit / No one thought would grow here" (Crawford *Scottish* 18 13-15). A hydroponicum is a type of garden that enables soilless cultivation through the use of mineral nutrient solutions in water. Thus, pointing to the success of their marriage despite the difficulty of their circumstances, the couple enjoy the bitter-sweet fruits of their matrimonial union. In "Mons Meg," too, Crawford continues the topic of his familial relations as the speaker's daughter is seen dancing at Edinburgh Castle close to the legendary cannon, Mons Meg (Somerset Fry 104): "Headsetted tourists evolve into / Cyborgs on the Castle ramparts / But I have ears and eyes only for you, / Wee ballerina" (Crawford *Tip* 20 4-7). The speaker in this manner brings past and present together observing that it looks as though a historical mechanism, the cannon, is being guarded by technology-inflicted tourists who are adorned with robot-like devices. Describing the posthuman condition as such, Crawford illustrates how recorded information is transmitted nowadays.

Describing a town in Argyll and Bute the speaker of "Dunoon" observes mist which "becomes polythene we burst with our fingers" (Crawford *Scottish* 37 1). As the chief material used in the making of plastics like bubble-wrap, the imagery of burstable polythene suggests a dense fog which has to be dispersed by hand. Loved due to its pastoral nature, technology is required of the town to advance further: "Tomatoes, leeks. The country is on a level with these things. / [. . .] Petulantly pleading, love / Cannot replace shopping or the mending of telephones" (Crawford *Scottish* 37 3, 5-6). As a consequence, the chairman of Dunoon writes a letter demanding shopping malls and repair shops to keep up with the times and make the place more eligible to younger populations. After all, as is pointed out, love of a place does not necessarily mean keeping the place unaltered but rather requires that it suits the needs of its age.

As for "Bedroom," the poem presents a "mica evening" as the light of Greenock lighthouse hits a window "on the Hill House" (Crawford *Scottish* 48 3, 4). Chinoiserie, in the poem, denotes Chinese artistic influences that combine Eastern and Western

stylistic elements (“Chinoiserie”). The reference to chinoiserie confirms that the poem is about the famous Glaswegian architect Charles Rennie Mackintosh and his designer wife Margaret MacDonald’s home, Hill House in Helensburgh: “That room’s a museum now [. . .]. / Nobody dreams there. Everybody does” (Crawford *Scottish* “Bedroom” 48 7, 6, 8). Mackintosh was the architect of a number of notable buildings in Glasgow including “The Lighthouse” and “Willow’s Tea Room.” His architectural style was particularly influenced by Japanese minimalism combined with the local technique of “harling” (Crawford *Scottish* “Bedroom” 48 7), which is “the Scottish term for a render of lime and aggregate” (“Pan”). The poem stresses the couple’s creativity that changed the image of the city. The lighthouse, which is a product of Scottish technology, illuminates the couple’s avant garde house, shedding light on to the beauties of art and the importance of imagination in both humanities and sciences.

Crawford’s love for his wife is a recurrent theme in several of his poems. “Love Poem for Alice with Old Cars” is one of them. The poem opens with a dream in which the speaker gives Alice “a big-radiatored” “steamcar” manufactured in Ohio with which she passes by several Scottish landmarks and car manufacturers (Crawford *Talkies* “Love Poem for Alice with Old Cars” 58 2). The speaker observes Alice while she drives

> Through Alexandria to Loch Lomond past the indigenous
> Argyll Motors Factory with its built-to-last
> Stone car over the door. People call you odd,
> Determined, unchaperoned, ‘fast’. Your wheels cover
>
> Scotland, familiar and intimate, Tin-Lizzying
> Right up Ben Nevis, mass-produced,
> Laughing with the dash of the woman driver’s
> TS1, first car in Dundee.
> (Crawford *Talkies* “Love Poem for Alice with Old Cars” 58 5-12)

Founded by the resolute Alex Govan, Argyll Motor Works was active from 1900 to 1949 (“Argyll”). Doomed to fail despite its initial success, the company’s imagery runs parallel to Alice’s own as an independent and unusual figure. Alice’s car is manufactured by “the White Sewing Machine Co.,” which was originally an American sewing company (“A bit about White”). With her car Alice drives up to the highest mountain in Britain, that is Ben Nevis. Tin Lizzie and TS1 are Ford T model cars.

Particularly TS1 is identified as the first affordable mass-produced car in transportation history manufactured by Henry Ford ("Henry Ford"). Romantic imagery runs parallel to technical details and technological, geographical and historical information, while Alice's "fingers / Run through my [the speaker's] hair with the uniqueness / Of Tullock's 1910 St Magnus / Handmade on mainland Orkney" (Crawford *Talkies* "Love Poem for Alice with Old Cars" 58 12-15). William Reid Tullock, born and raised in Orkney, left Scotland and immigrated to the United States where he worked with Henry Ford ("About W R Tullock"). Upon his return to Orkney in 1901, he opened a branch of Ford cars as well as manufacturing his own, thus becoming one of the first Scottish innovators in motor cars ("About W R Tullock").

As onlookers remember the "[n]ames of shared loves: Arrol Johnston, / Delaunay-Belleville, Renault," the speaker observes a "twine of exhaust" and wonders if the greenhouse effect will take the joy out of driving for Alice (Crawford *Talkies* "Love Poem for Alice with Old Cars" 58 17-18). While Johnston is Scottish, the other two are both French car manufacturing companies. Romance runs parallel to mass-produced image of Scotland in the poem. However, romance and car manufacturers are not Crawford's sole interests as indicated by the final line which acts like a control mechanism over the couple by reminding them of the environmental effects of exhaust fumes. Although enjoying the ride, the couple are not oblivious to the devastating effects of car exhaust on nature. Crawford's reluctance to speak his mind indicates that Alice will agree with him the moment he brings environmental concerns into conversation. In this way, Crawford implies the negative effects of technology on the environment, while the poem charts a technological map of Scotland.

"The Approach," also, has romance at its centre. Describing his beloved in detail, Crawford integrates technoscientific terms into the poem: "You can absorb / Long novels of sleep and thermocouples / As the waves crash in" (*Scottish* "The Approach" 32 5-7). Crawford's choice of "thermocouple" is significant in its representation of the lovers' affiliation. Like the device itself which measures and controls temperature, the beloved certainly acts as an equaliser in the couple's relationship. Relying on both sea and technoscientific imagery, Crawford arouses a sense of anticipation constantly in the

poem by repeatedly stressing that "it is approaching," "it" being love (*Scottish* "The Approach" 32 14). Later on, while one image recalls yesterdays that are recounted "[o]ver the telephone," another concentrates on the "pollen-drift" on the beloved's knee, as the couple watch "the laser on the disc's rotation / Dispensing arias" (Crawford *Scottish* "The Approach" 32 8, 16, 18-19). Playing romantic arias for the couple, technology in the form of a gramophone is presented not as something cold and indifferent to humans but, to the contrary, as something which is capable of arousing sentimental feelings and enabling those feelings to be shared over distances by the telephone.

Written in memory of John Lorne Campbell and Margaret Fay Shaw, "Passage" on the other hand, introduces them as a couple whose common interests in Gaelic culture brought them together. Margaret Fay Shaw was an American author whose interest in Gaelic songs resulted in her *Folksongs and Folklore of South Uist* (1955) ("Margaret Fay Shaw"). Having met while doing research, the couple got married in 1935 and joined their efforts to record Gaelic culture and traditions together. Buying the island of Canna in 1938, the couple later on "extend[ed] their interest to the Gaelic culture of Nova Scotia" as is referred to in the poem ("Margaret Fay Shaw"). Similar to the central figure of the sewing machine in "Opera" this time the focus is on a video recorder, used by the couple, as they woo each other through the poem: "'Record me,' she laughs through her Gaelic dance steps / While the cylinder reeling round and round / Scratches itself with song" (Crawford *Spirit* "Passage" 15 1-3):

> Old women's brittle notes are held
> On nerve-thin, tautened Ediphone wire,
> A longitude of music
>
> Stretched in one unending passage
> [. . . . .]
> Where the gone-away, digitized pew by pew,
> Climb aboard long tunes outlasting lips
> Danced down into the machine.
> (Crawford *Spirit* "Passage" 15 4-7, 10-12)

Dancing to the song dispensing from the gramophone, the poem refers to the technological elements that set a romantic scene for the couple. However, their use of

technology is not solely for entertainment purposes. Apart from playing music and recording videos of the couple, technology is central to the poem because of the use of Edison's wire which is used to take notes. The couple's digitalisation of Scottish culture, including Gaelic songs and dances, little by little saved what might otherwise be left to oblivion.

Apart from love and romance, sickness is another issue that comes up in Crawford's "Director" and "Illness." "Director" is about the speaker's experiences in a radiography room at a hospital:

> This afternoon a radiographer
> Locates the X-rays of someone dear to you
> Taken twenty years ago, and matches them against
> Tuesday's.
> She is beginning to dial her call
> [. . . . . .]
> [. . .] before you hear
> About the dark patch pressing on a lung.
> (Crawford *Talkies* 62 9-13, 17-18)

The morbid realisation that someone close to the speaker has a tumor in her/his lungs is presented in the poem. The indifference with which the radiographer starts making arrangements for the patient is contrasted with the speaker's shocked state, which is reflected in a sentimental manner. Crawford's "Illness," too, relies on science and technology to refer to the issue, yet this time in terms of metaphors. In the poem, illness is described as "a new road" which "has its own quite spells, rush-hours, / Buzzing where there were fields. / Everyone in the cars looks fit and well / [. . .] But exhaust leaks from village-sized lorries, / Making you cough, shortening your sentences" (Crawford *Talkies* "Illness" 73 1, 3, 5, 7-8). The poem shows how sickness eats one from within despite her/his fit appearance. Destroying the naturally healthy condition of the body by building artificial "roads" in place of "fields," the roads poison the system through their toxic leakages into the body. Crawford relies on science and technology to represent all kinds of personal subject matters, such as love, sickness, religious and familial issues and Scottish nationalism as a result.

Personal history is another theme in Crawford's lyrical poetry. In his poem "Order," Crawford talks about the Blitz starting with the description of a German client who in 1914 turned down his order for a steam yacht to be built in Port Glasgow. Fearful of World War I, the speaker's mother's uncle moved from Greenock to the speaker's grandmother's house during the time. Noting that it was a lucky move because a bomb fell on the uncle's then abandoned house, the speaker continues with an account of her/his son who explains the speaker of the poem "the human genome, / Letting me see in unassembled brass / Screws, handrails, greased pistons of an engine / [. . .] the stranded DNA / Of boatbuilding, that unbuilt yacht, the order" (Crawford *Tip* "The Order" 40 20-22, 23-24). The title is a direct reference to "sequencing" employed in the Human Genome Project (Bynum 237). Meaning the positioning of "the three billion 'base pairs' of molecules that make up our genome," these chemical pairs of genetic codes of the DNA are described in terms of the orderly parts that make up a ship (Bynum 237). Putting specific emphasis on Port Glasgow, Crawford shows how, because of its Glaswegian origins, the ship reflects features of Glasgow, just as human chromosomes work for different human beings turning them into unique individuals due to differences of their chromosomes in their DNA patterns. Perhaps the most striking aspect of Crawford's poetry, however, is his ability to attach sentimental value to elements borrowed from the objective sciences. Depending on scientific concepts, ideas and terms, Crawford employs these mostly in the form of figures of speech as have been identified in the poems mentioned so far.

2.3. CO-EXISTENCE OF SCIENCES AND HUMANITIES

Starting with *A Scottish Assembly* (1990), the co-existence of sciences and humanities is a central concern in Crawford's poems. Crawford's "Fiesta" relies on the idea of co-existence to present different representations of Scotland. The speaker of the poem meditates upon several scenes that he witnesses in fragments taking place in different parts of Scotland. In order to do this, the speaker refers to several Scottish authors and describes the country in scientific terms so that the poem becomes a literary and scientific panorama of Scotland. The first author to be recalled is Robert Louis Stevenson (1850-1894) who was born in Edinburgh, yet, due to his poor health, had to

move elsewhere. Travelling widely, Stevenson finally settled down in Samoa; an island in the Pacific (Lindsay 336-37). “Maybe inevitable” but “not as expected” (Crawford *Scottish* “Fiesta” 26 1), his desertion of Scotland is likened to the impossibility of philharmonic orchestras’ attempts to capture and play the sound of the Water of Tig that flows from South Ayrshire where the poet Robert Burns used to live (“Rivers”): “philharmonias [. . .] stockpiled for Life’s Great / Occasions / Couldn’t cram up this B road beside the Water of Tig” (Crawford *Scottish* “Fiesta” 26 5-7). The poem, thus refers to Robert Burns’s own attempts to write a poem about the Water of Tig, for “despite being impressed by its beauty, [Burns] was unable to find words to rhyme with the name” (“Rivers”). The plea of the orchestra, as a consequence, is described as similar to Burns’s own.

The speaker continues his reminiscence as follows: “You remotor to places that happily bored you in childhood – / They’re the same, different” (Crawford *Scottish* “Fiesta” 26 8-9). The poem’s nostalgic tone emerges at this point as the speaker finds his childhood surroundings both easily recognisable and unfamiliar. This has to do with the passage of time and science and, ultimately, technology’s affects on the scenery: “Ayhshire’s a mud database / Updated hourly by jets into Prestwick” (Crawford *Scottish* “Fiesta” 26 11-12). Databases are keepers and organisers of information which make Ayrshire an organic one (Bynum 252). As jets regularly fly to the place, information and society itself keep getting updated. The speaker humorously recounts the effects of change, as it is unavoidably felt everywhere, in the following lines: “Pubs old as tea-dances key their accounts / Into microcomputers; Robert Burns’s House of Statues / opens / On to a Ladies and Gents” (Crawford *Scottish* “Fiesta” 26 21-24). Old pubs making use of electronic cashiers and historical artefacts opening up to lavatories make the practicalities, as well as the incongruities, resulting from the proximity of the past and the present, of modern-day technologies clear. In addition, Crawford shows how language is subjected to change alongside the changes in society. As the speaker notices the words “FUCKING LYRICAL” scribbled somewhere in an ironically lyrical poem, “the postmodern condition” results in observation of “these / Scotlands [. . .] running together” in a place where the co-existence of sciences and humanities is felt practically in every aspect of life (Crawford *Scottish* “Fiesta” 26 16, 20, 16-17).

"Impossibility" brings sciences and humanities together by way of its technoscientific language and the juxtapositioning of the nineteenth-century literary figures with the scientists of the same period. The poem begins with a narration of Scottish novelist Margaret Oliphant's life (1828-1897). She "married her cousin Francis Wilson Oliphant, a stained glass artist, but by 1859, found herself a widow with three young children to sustain by her pen, in addition to brothers and a nephew" (Lindsay 331). Thus experiencing loss on both familial and financial levels, her publications become her only driving force. The speaker of the poem is identified as the authoress herself, early on

> Still weary, awash with hackwork to support
> Dead Maggie, Marjorie, Tiddy, and Cecco,
> Her water babies, breathing ectoplasm,
> She watches aqualungs glow with shellac,
> Mindful how she loves light's aftermath,
> Protozoa's luminescent wash
>
> On the Firth of Forth; she drifts
> Eagerly shorewards, can almost touch
> Piers at St Andrews, cybery, Chopinesque fingers
> Of Tenstmuir Sands, Blackwood's Strathtyrum
> Pressure-resistant, bathyscaphic den
> Deeply upholstered with morocco books
> (Crawford *Spirit* "Impossibility" 43 7-18)

Two of her sons and a daughter, Marjorie, did not survive their infancy. The rest of the names mentioned in the poem refer to Oliphant's other children who died during her lifetime (Lindsay 331). The terms Crawford relies on are quite unusual, borrowed from biology, specifically botanics and zoology, in order to develop an understanding of death as a physical transformation. However, physical transformation is not the only change that the poem is concerned with. Oliphant watches her children transform into "water babies," which is obviously a reference to Charles Kingsley's 1862-63 serial work. The idea of transformation that is associated with death echoes the transformation of Kingsley's protagonist, Tom the chimney sweep, in *The Water-Babies*. While terms borrowed from biology emphasise the physical aspects of being and death, the reference to *The Water-Babies* represents their spiritual aspects. In addition, the description of the fingers of Tentsmuir Sands in Fife which are identified as "cybery" rather than

"imaginary" relies on defamiliarisation to renew conventional terms of imagery, while the virtual existence, as well as non-existence, of the fingers exemplifies the appeal of current techno-scentific discourse in Crawford's poetry.

Blackwood's Strathtyrum is a central figure in the poem. It was "a country residence in Fife" (*Blackwood's* 770) owned by the founder and owner of *Blackwood's Edinburgh Magazine*, John Blackwood (Duncan "Scotland" 253). *Blackwood's Edinburgh Magazine* was one of the most prominent literary magazines of the nineteenth century, and Oliphant contributed to it with her writings and her role as a keeper of records in her *Annals of a Publishing House* (1897) (Lindsay 334). Strathtyrum played a significant role in the development of a Scottish intellectual frame of mind as it frequently hosted the writers of the period. Located near St Andrews, "in addition to its academic and historic associations," the place was distinctive also because of its shelter-like "high plantation" which "commanded [. . .] a view over the sea" (*Blackwood's* 770, 771). As a result, Crawford describes the place as a unique heaven submerged, yet protected.

Similar to Blackwood's "[p]ressure-resistant, bathyscaphic den," which refers to a kind of sea submersible that is used for deep sea exploration (Lahanas), Oliphant has her own "[s]ubsea [. . .] Victorian / [. . .] sewing room" where she is "inky" threaded with "spectra, gynaecological / Eyeball thistle-tassels of the sea / Brown, blue-grey, single-cell-like / Pre-embryo materials in store / But never used" (Crawford *Spirit* "Impossibility" 44 39-40, 41, 41-45). This time, Scottish symbols like thistle and tassel are combined with terms of physics and biology, and later by references to chemistry. These spectral colours that are normally invisible to the eye are what inspire Oliphant to write. The imagery that is recalled is one of pregnancy as is confirmed by the speaker's perception of the thistle-tassels of the sea as "spermatozoic" (Crawford *Spirit* "Impossibility" 44 45). Following this, Oliphant brings to attention her Scottish identity claiming that she is "too antisyzygously Scottish" (Crawford *Spirit* "Impossibility" 44 49). "The Caledonian antisyzygy," as is coined by "G. Gregory Smith in his *Scottish Literature: Character and Influence*" (1919) (Gish 943), means "a peculiarly Scottish union of opposites, discrete psychologies suspended in equivalence, as a creative engine

for the emerging nation" (Kelly). Perhaps epitomised best by the conflicting moralities in Robert Louis Stevenson's *Strange Case of Dr Jekyll and Mr Hyde*, the term was later on adapted by Hugh MacDiarmid, who in his poetry brought several dichotomies such as sciences and humanities, and Scottish and British identities together (Braidwood 1).

In the following stanzas of the poem, Scottish scientists and inventors are brought up. The first reference is to the physicist Lord Kelvin whose original name was William Thomson (1824-1907) (Bynum 173). Exclusively interested in "how heat and other forms of energy work[ed] in nature," he invented the "temperature scale [. . .] known as the Kelvin or K" (Bynum 173). The next scientist mentioned is Alexander Graham Bell whose groundbreaking invention of the telephone established a network of telecommunications in the late twentieth century. However, Crawford's recollection of his name is far from explicit: "When Alexander Diving Bell invented xenophone / I heard his voice calling, 'The sea! The sea!' / Hollowly into a shell / As if he could contact Robert Louis Verne / Or all the [. . .] forlorn spirits / Edinburgh exiled, waving from twenty thousand leagues" (*Spirit* "Impossibility" 45 60-66).

The references are numerous. Yet, none is as playful as Bell's. In his name alone there are allusions to Macedonian King Alexander the Great, Greek historian and soldier Xenophon and the scientist himself along with his invention. There has been a tendency from Aristotle's *Problemata* onwards to Roger Bacon's *De Mirabili* (1250) to associate the first use of a bathysphere with Alexander the Great who, inspired by Xenophon's *Anabasis*, was supposedly lowered in a glass diving bell into the the Mediterranean Sea in order to explore it (Lahanas). In this sense, "xenophone," and "[t]he sea! The sea" uttered one after another allude to Xenophon's *Anabasis* in which he records his experiences as a general leading the Greek mercenaries known as the Ten Thousand back home after their battle against the Persians (Hammond). While the troops were making their way through "the mountains toward Trapezus (now Trabzon) on the Black Sea coast [. . .] they finally saw the sea," as a result of which Xenophon recounts, "a great cry went up, '*Thalassa! Thalassa*!'—'The sea! The sea!'" (Hammond). Historical exploration is made parallel to scientific discovery here. Crawford stresses the fact that despite their differences, it's the same sense of discovery that unites distinct disciplines.

Besides, the poem makes explicit the close relationship between sciences and humanities in that it continuously associates scientists with writers, as in the case of Alexander Bell, Robert Louis Stevenson and Jules Verne. Compared to the complexity of the allusions in the previous line, the following line is rather plain. Here, the Scottish author Robert Louis Stevenson is recalled, albeit without his own surname. The surname that is provided instead is a reference to the famous science fiction author Jules Verne who is a distant Scottish descendant himself. Both Alexander Graham Bell and Robert Louis Stevenson were born and raised in Edinburgh. Yet, they moved to the British colonies later on. Their self-inflicted exile is complemented with Jules Verne's book *Twenty Thousand Leagues Under the Sea* which reinforces the sea imagery in the poem in addition to strengthening the idea that it is also possible for humanities to inspire science as Verne's novel inspired American marine biologist William Beebe to undertake diving in a bathysphere to explore sea-life in the twentieth century (Lahanas).

The rest of the poem continues like an autobiographical account of Oliphant's life by way of which the speaker reveals her pain over the loss of her husband and her children. The poem implies how she dealt with pain by writing: "Dear Mr Blackwood, here is a short story / Dear Mr Blackwood, here is my *Kirsteen*" (Crawford *Spirit* "Impossibility" 49 187-188). History, economics, theology and the suffragist movement all take turns as themes in the poem. Furthermore, Oliphant's reproach to "Father Almighty" upon her children's death has a distant echo of the Pearl-poet's speaker in the *Pearl* who experiences a similar loss and questions his faith (Crawford *Spirit* "Impossibility" 53 397). At one point, the poem even becomes a parody of her biography as observed tactlessly by others. It also makes use of pastiche wherever epistolary stanzas and newspaper headlines are concerned. The sea imagery runs paralel to all kinds of personal experiences all along and references to oceanograpy abound because as is noted in the poem: "'Margaret' = 'pearl'" (Crawford *Spirit* "Impossibility" 51 397). Truly, the speaker has been identified as a pearl from the beginning as she keeps reminding herself: "I am a pearl and Scotland is a pearl," and the sea is what starts these "embryonic / [. . .] drifts" that shapes her as well as her country (Crawford *Spirit* "Impossibility" 48 163, 169-170):

> As the sea circles this planets'
> Pictish spirals, Celtic solar discs,
> World-snake popping its tail in its own mouth,
> So I perfect my impossible, nuanced grit,
> Nacring its pregnant shell, its given / giving
> 360˚
> (Crawford *Spirit* "Impossibility" 55 457-460)

In the closing lines of the poem, Scottish symbols are defined in scientific terms once again. As the ideal symbol of a union, the poem closes with the imagery of spirals of sea currents and solar discs. Furthermore, the imagery of Ouroboros, a mythological serpent which eats its own tail, strengthens the idea representing the harmonious union of differences that is signified by two halves, complemented with the image of a pearl. The transformation of a grain of sand into a pearl takes a long time. Yet, in the end, its transformation makes something possible, which is otherwise realised as "impossible." Ultimately, a full circle, as indicated by "360˚," emerges as a spherical emblem of purity and unity in the poem which represents the co-existence of sciences and humanities for the poet, as in "Fiesta." By matching literary figures and literature of every era with scientists and scientific findings of the same era, Crawford shows how both groups contributed to the progress of their time.

2.4. INTERDISCIPLINARY APPROACH

In line with his positive views concerning an all-embracing interdisciplinary approach, Crawford as a contemporary poet considers singular interest in either sciences or humanities as reductive. Accordingly, his poems emphasise an interdisciplinary approach. Crawford states that he has a "distrust of the dourly secular rationalism which sometimes but not always accompanies scientific mindsets" ("*Spirit*" 53). He rather likes "the science that fuels and is fuelled by the dream-mind. I love to think of poetry and science as kinds of discovery quickened by observation and imagination" (Crawford "*Spirit*" 53). Wittgenstein states that "[w]e feel that even if all possible scientific questions be answered, the problems of life have not been touched at all" (qtd. in Gander 42). Therefore, Crawford calls for "an inter-action with academia and knowledge, often scientific knowledge, [which] is almost inescapable now, and has been bound up with the cultural role of the poet (and with poetic practice) since at least

the mid-eighteenth century" ("*Spirit*" 60). Cherry further remarks that "[t]here is a world out there to be written about. [. . .] [A] world difficult to know. I believe we must bring every instrument at our disposal to bear on the knowing of it. And science is one of those instruments, but so is literature" (31). Moreover, scientists should not be alarmed in any way, for what the poet attempts to do is to produce "not more science but more poetry," hence the desire to be "truthful" rather than "factual" (Cherry 29).

Due to their quality of bringing sciences and literature together, Crawford's poems already signal an interdisciplinary approach. In this, he proves himself to be "[t]he creative person, whether scientist or artist, [. . .] who imagines new, different connections, broadening our conception of the universe and its interconnectedness as a whole" (Rogers 11-2). Without doubt, it is "our mutual ability to describe the universe that ultimately brings our endeavours together. It should not surprise us that many of the poets writing today find inspiration, not only in the stars, but in the fuzzy and beautiful slobs they make in the higher wavelengths that only the Hubble telescope can help us discern" (Williams 20). Through his poems, Crawford emphasises the necessity of sciences and humanities to communicate with each other in order not to fall into the trap of reductionism. Cherry points out: "*If we cannot even speak to one another, what good does it do us to have something to say? And if we speak only to ourselves, how long will we have anything new to say?*" (37 italics original). Several poems of Crawford strive to emphasise the benefits of interdisciplinarity among which "The Clerk Maxwell Country," "A Life-Exam," "Scotland in the 1890s," "Henry Bell Introduces Europe's First Commercial Steamship," "Man of Vision" and "Biology" can be mentioned.

Included in *A Scottish Assembly*, "The Clerk Maxwell Country" is about Scotland and one of Scotland's most renowned scientists, James Clerk Maxwell. The poem is dedicated to George A. Davie who was the author of *The Democratic Intellect* (1961). In his book, Davie observed that "in the eighteenth century and for most of the nineteenth, professional philosophers in Scotland numbered fewer than a dozen" (Graham "Nineteenth-Century" 339, 348). Lack of professionals in specific areas of research accordingly resulted in an interdisciplinary approach which reflects the

Scottish frame of mind that discerns no difference between sciences and humanities. The poem endorses the idea:

> Fog clears to his dry talk of electro-
>
> Magnetism. Cybernetics whistles 'Auld Lang Syne',
> Storming through thick-walled cottages where science
>
> Means an unusual marriage. Dafty's in his attic
> Shifting things round, chairs and classical physics [. . .]
> (Crawford *Scottish* "The Clerk Maxwell Country" 17 2-6)

The poem makes references to James Clerk Maxwell, Robert Burns and Albert Einstein under the over-bearing presence of Davie. Every word within the poem, therefore, strives to emphasise the idea of interdisciplinarity. The run-on-line with Crawford's separation of "electro / Magnetism" imitates how sound travels in space, thus wittily mirroring the wave-like qualities of electromagnetic fields discovered by Maxwell. Cybernetics, which is Greek for "steersman," was also a discovery of Maxwell, although the term itself was coined by twentieth-century scientists among whom American mathematician Norbert Wiener can be counted (Mayr 425). Wiener states that they

> decided to call the entire field of control and communication theory, whether in the machine or in the animal, by the name *Cybernetics* [. . .]. In choosing this term, we wish to recognize that the first significant paper on feed-back mechanisms is an article on governors, which was published by Clerk Maxwell in 1868. (qtd. in Mayr 425)

Bynum sums up how Maxwell in his article, "On Governors," "developed the basic concept of 'feedback mechanism': processes that go in loops, which he called 'governors.' These mechanisms are very important in technology, in twentieth-century developments in artifical intelligence, and in computers" (132). Cybernetics which whistles "Auld Lang Syne" in the poem, then, is no other device than the radio which relies both on electro-magnetic fields and cybernetics to transmit its broadcast to the audiences. The song that is being transmitted is also quite important not only in Scottish history and culture but also around the world because of its nostalgic tone and praise of friendship. Of all the songs written by Robert Burns, "Auld Lang Syne" still remains to

be a favourite among listeners because of its "valedictory" quality (Lindsay 224, 225). The way the song is transmitted through radio waves and enters into people's households, despite their skeptical view of a co-existence of sciences and humanities, stresses the fact that it has already been legitimised whether they believe in it or not.

In the poem, the "unusual marriage" is between two types of creators, Maxwell and Burns, and a single faculty shared by both of them; that is imagination, which results in their poems and theories respectively. As "[h]is desklight / Burns through storms," the reference to Burns is stressed playfully in the poem (Crawford *Scottish* "The Clerk Maxwell Country" 17 7-8). On the other hand, the use of "Dafty," which means "stupid" in Scots, is rather ironic. Given to Maxwell by his peers because of his "strange" accent, Maxwell proved to be quite the opposite (Farmelo 1). The only time he is reported in action in the poem is when he stirs up the rules of classical physics which is described as if he was re-arranging a room. Challenging conventional physics, his theories will prove so revolutionary that "Einstein will come trampling through that gap" (Crawford *Scottish* "The Clerk Maxwell Country" 17 10). In fact, one of Einstein's anectodes recalled in Ohanian's review of Basil Mahon's *The Man who Changed Everything: The Life of James Clerk Maxwell* confirms the idea. During one of his visits to Cambridge in the 1920s when he was accused of "stand[ing] on Newton's shoulders," Einstein replied: "'No, I stand on Maxwell's shoulders'" (24). So, the poem deals with imagination that leads to two types of creativity emphasising the fact that artists and scientists have more in common than initially suspected, and that each of their ideas are revolutionary, influential and complementary, despite the differences in their end products.

Crawford's "A Life-Exam" promotes an interdisciplinary world-view by way of an exam. The poem is written in test format which keeps asking questions regarding all aspects of life in an all-encompassing manner. The poem begins as follows:

> Answer truthfully from your own heart:
>
> 1. Rewrite *The Waste Land* using only
> English words of one syllable.

2. Rearrange the entire Bible
   into two coloumns, one headed
   KNOWLEDGE, the other WISDOM

3. How many women did Henry VIII
   fancy, apart from his wives?

4. Make one of the following dramatic entrances:
   Natural, Caesarean, Episiotomy.
[. . . . . .]

6. COMPLETE EITHER SENTENCE:
   Love comes before a fall in
   Love conquers all in
   Love-in . . .
   OR
   I love . . .

7. Knit together the plates of your skull correctly.

8. Succesfully avoid all of the following:
   cot-death, meningitis, heart-defects
   leukemia, projectile vomiting, polio
  (Crawford *Spirit* "A Life-Exam" 23 1-10, 13-22)

Made up of 71 questions, the poem is truly a "Life-Exam." As is seen, the questions relate to different stages and aspects of life. In this sense, the poem aims at emphasising the subjectivity of some of the answers as well as marking interdisciplinarity as unavoidable. Irony and humour dominate the poem as a natural birth or a Caesarean are regarded as types of "dramatic entrances" into life. Furthermore, the questions are asked in such a way that they appeal to the imagination as well as reason. The correct placement of skull plates, which requires reason, and imagining how many women Henry VIII might have fancied or completing entirely fictional sentences, which necessiate imagination, are all parts of "a" life exam. In fact, creative faculties are called into play according to whether the reply to a specific question requires an ontological or an epistemological response:

18. Without aid of a calculator, Napier's bones,
    parent, child, or prior instruction,
    emulate ancient arithmeticians'
    calculations of pi.

19. Grow a tree. Manufacture a light bulb.
    Weave a carpet. Make paper. Be humble.

20. Rewrite at least one of the following:
    Kipling's 'If', your National Health Number,
    the official birthdays of the Royal Family,
    your vaccination details, your chosen names.

22. Which of the following is incorrect?
    The New Testament; The Gitas; The Koran.
[. . . . .]

24. With a view to bioengineering
    suggest at least six names for new animals.

25. Imagine your reaction to the news
    that all the technologies of your childhood
    are utterly outmoded junk.

(Crawford *Spirit* "A Life-Exam" 24-25 45-56, 59-63)

The questions playfully invite the readers to take part in the creative process whether what is asked is an arithmetic calculation, a new name for a hybrid animal or a re-writing a well-known poem. Science and scientific truths are downplayed in the poem in an attempt to approximate science and poetry. Also the notion of a singular universal "truth" is problematised in the poem as the examiner wonders whether it is possible to have a correct or an incorrect holy book and, if holy books can be considered as facts, how to validate their authenticity. The "truth" behind such a query certainly differs from an answer to a mathematical problem, for, although such query may be true, it is not a fact. "A Life-Exam," then, is essentially about "the study of being" and "the study of knowing" and how they invade each other's territories inevitably (Spencer). Within the context of the poem, while religion asks ontological questions and sciences ask epistemological ones, there are also fields of interaction through the same creative energy whereby sciences do not have the final word but keep on challenging old facts and transforming societies in the process. Meanwhile, humanities can be reproduced in so many different ways, such as a poem asked to be re-written in one-syllable words. Likewise, the speaker encourages new methods of calculation to be invented relying on the imaginative faculties of the scientists. The utilitarian aspect of science leads to further advancement, since technology gets outdated fast, and science develops more practical methods all the time. As a result, the examiner asks imaginative questions to further enhance, for instance, the way a poem may be perceived following a different style or set of forms and rules.

Because of these fields of mutual contact, such as imagination and re-formulation, the poem becomes considerably ironic at times, as when the importance of accuracy is downplayed in "42. If you were given your chance again / which three questions might you answer differently?"; or when a question is asked and then another one is posited right after it so that it trivialises the previous question's importance in "43. Name several people who found the New World. / 44. Name several people who lost it" (Crawford *Spirit* "A Life-Exam" 27 94-95). Some other enquiries are direct commands: "Do not read *Finnegans Wake*" (Crawford *Spirit* "A Life-Exam" 26 88). Crawford's exam does not have an objective, "final," answer but rather aims to problematise the issue of truth by continuously challenging singular answers and multiplying them by situating them in subjective contexts. In this manner, Crawford teasingly explores whether factual truths may affect a personal answer, and if so whether that makes it a fact then, as is the case in question "61. Could you tell by the syllabic patterns / of names of people you met how much / they would come to mean in your life?" (*Spirit* "A Life-Exam" 26 125-127).

"A Life-Exam" ends with a final query which, again, by problematising the question, aims at an open-ended set of subjective answers: "71. From here on you may add optional questions, and need not / supply answers" (Crawford *Spirit* 29 146-147). The note of the examiner, given in parentheses, reads: "(Success and failure in the above paper will inevitably lead to riches or poverty; define these in your own terms.)" (Crawford *Spirit* "A Life-Exam" 29 148-149). This statement is an indicator of what this exam has been all about. This is a test to measure one's own self-knowledge. It is based on grading several faculties of a person ranging from artistic capability to scientific capability; directing questions that have the capacity to distinguish between wisdom and knowledge to questions that are related to character as well as mental power. At the end of the exam, what is gained is obviously a profound understanding of life that reflects the individuals as hosting a series of distinct interdisciplinary aspects in themselves as a whole.

As for "Scotland in the 1890s," the poem shows the scientist in her/his social context. First of all, "Scotland in the 1890s" presents the readers with a number of scientists who are mentioned in relation to their major achievements in the poem:

> 'I came across these facts which, mixed with others . . .'
> Thinking of Helensburgh, J. G. Frazer
> Revises flaying and human sacrifice;
> Abo of the Celtic Twilight; St Andrew Lang
> Posts him a ten-page note on totemism
> And a coloured fairy book [. . .]
> (Crawford *Scottish* 22 1-6)

The first scientist to be mentioned is the Scottish social anthropologist James George Frazer who is known chiefly for his seminal work, *The Golden Bough* (1890-1915) (Pittock 263). Studying religious customs of different societies, Frazer in his work outlined several archetypes, thus becoming one of the pioneers of archetypal criticism. Similarly, Scottish poet, critic, author and collector Andrew Lang (1844-1912), who is mainly known for his coloured *Fairy Books*, contributed to the field of anthropology due to his attempts to collect fairy tales far and wide (Lindsay 306, 371). The following figures, who are related by blood, represent different fields of knowledge:

> 'When you've lived here, even for a short time,
> Samoa's a bit like Scotland – there's the sea . . .
> Back in Auld Reekie with a pen that sputtered
> I wrote my ballad [. . .]
> You know my grandfather lit Lismore's south end?'
> (Crawford *Scottish* "Scotland in the 1890s" 22 8-11, 14)

Uttered in first-person, as was the case with Sir James Frazer, this time the poem is concerned with Scottish author Robert Louis Stevenson and his civil engineer grandfather Robert Stevenson who is known for his remarkable contributions to lighthouse-building (Lindsay 336). Although it would seem that the young Stevenson would follow his father's and grandfather's footsteps at first, a lung disease suffered at an early age "made a career so strenuous impossible" for him as a result of which he turned to writing (Lindsay 336). Due to his illness, Stevenson was forced to leave his beloved "Auld Reekie," that is Edinburgh, behind because of its troublesome weather, but would look forward to coming back every summer until he completely settled down

in Samoa four years prior to his death (Lindsay 337). Thinking to himself, younger Stevenson wonders whether his engineer grandfather is known to the audience.

The poem then moves onto three other figures, namely Andrew Carnegie, James Murray and James Matthew Barrie. To begin with, Andrew Carnegie was a Scottish-American industrialist and philanthropist who, having succeeded in the US, invested in Scotland most visibly through the Carnegie Libraries he opened as well as his purchase of Skibo Castle (Armitage "Scottish" 295, 302). Thus, he transformed the façade of his country placing special importance upon education and industrial advancement. As for James Murray (1837-1915), he was a Scottish lexicographer and philologist, who was the "first editor (from 1879) of *A New English Dictionary on Historical Principles*, now known as *The Oxford English Dictionary*" ("Sir"). Lastly, J. M. Barrie (1860-1937) was the well-known author of *Peter Pan* (1904) which was inspired by his close relations with a family in London (Lindsay 350, 372). In the light of all the names that are recalled in Crawford's poem, it can be said that Crawford presents the readers with an anthropological and literary overview of Scotland in the 1890s, as the title at once indicates. The poem shows how these different groups of scientists and literary figures reflect Scotland and their Scottish identity in their lives and works. The joint efforts of scientists and writers alike have made Scotland what it is today. By including scientists in a literary work, along with other writers, Crawford points to the importance of their collaborative efforts in shaping the success of present-day Scotland.

The collective efforts of the scientists and their literary peers in "Scotland in the 1890s" illustrate how progress is made possible in Scotland. Conversely, lack of communication between individual disciplines results in separate groups within the society who offer limited solutions to multifaceted problems of the world in terms of their own incomplete perception. Therefore, "scientists and nonscientists need to try to understand each other's language" (Cherry 37). It is the "moral responsibility" of both the poet and the scientist to do so (Grosholz 70). According to Grosholz, "poetry has to criticize science and reassert [. . .] the primacy of its own claim to certain domains along reality's great fault," while certainly not refusing "to criticize science for its inherent risks that threaten both nature and culture" (70, 71). The poet, then, as both the

spokesperson and the mediator of technoscientific advancements can question these developments by voicing the public's worries and can reassure the public against their possible "hostility and skepticism toward" new research such as "the Hubble space telescope, the genome mapping project, biogenetic engineering, or the extinction of species" (Hawthorne Deming 184). Crawford's "Henry Bell Introduces Europe's First Commercial Steamship" encourages communication instead of alienation and fear between different disciplines in this sense.

"Henry Bell Introduces Europe's First Commercial Steamship" opens with the Scottish engineer Henry Bell (1767-1830), who made the "first successful passenger steamboat service" in Europe possible ("Henry"). Speculating how Bell might have perceived his steamer, *PS Comet*, in his mind's eye, the speaker reflects upon how both poems and technoscientific innovations are equally results of imagination and invention. Despite their differences, inspiration triggers them both. Stressing the creative process of the scientist in this manner, the poem then reads as follows:

> [. . .] Your Cleopatran dream,
> Democratised by Watt's technology
> Of fire and air, burned on the water and
>
> Made your name History. Not caring about
> A Glasgow girl at the rail accompanied by
> Two sets of radial paddles whistled to her man
> Choruses from Allan Ramsay's *The Ever Green*.
> (Crawford *Scottish* "Henry Bell" 21 6-12)

Combining James Watt's technology with a scientific, or rather a poetic dream of connecting continents, Bell achieved a major success. However, while he became renowned for his achievements in science, he sent others to oblivion, such as "a Glasgow girl" and "her man." Singing a poem written by the Scottish poet Allan Ramsay (1686-1758) from his *The Ever Green* (1724), the girl represents the oblivious humanities who are yet unaware of the effects science and technology might have on them (Lindsay 172, 179). Not aware of the changes occurring around her, the girl needs to get familiar with Bell's invention. Crawford's point is that poets need to include science and technology in their poems, if only to act as a mediator for the people

warming them to the idea of their benefits, as well as warning them of their possible dangers.

In his poems "Man of Vision" and "Biology," too, Crawford's concern that singular interest either in sciences or humanities is equally reductive is visible. "Man of Vision," dedicated to the Scottish painter Stephen Conroy provides an insight into one of Conroy's paintings which has the same title (Chilvers and Glaves-Smith). Born in Helensburgh, like the inventor of the television, John Logie Baird himself, Conroy in his painting (1987) displays (Chilvers and Glaves-Smith):

> A bareskinned man, arm raised, adjusts a movie
> Projector's lens. It is pointed towards us, so we
> Are what is being shown. He is getting us into focus.
> Only a trick o perspective. It's just
> A game to think we are linked to him and he
> To the light of source [. . .].
> (Crawford *Scottish* "Man of Vision" 24 2-7)

The painting illustrates a half-naked man who is touching a source of light which Crawford identifies as a projector's lens. Behind this half-dressed man of vision stand a group of men in suits who are oblivious to the light that is coming from behind. The painting shows the man of vision in action, as if he was arranging the light to fall onto the group of men that are left in the dark behind him. Crawford through his poem praises Conroy's ability to capture the technoscientific enlightenment. Having another painting entitled "Wireless Vision Accomplished," Conroy is praised by Morgan as a man of vision himself who brings technoscientific developments into his art.

Acclaimed by Crawford as a meta-structure, the painting captures the new enlightenment as "a daring / Remake of [. . .] the Light of the World" (Crawford *Scottish* "Man of Vision" 24 19-20). Drawing parallels between the two paintings, Crawford regards Conroy's painting as a modern version of Hunt's idea, whereby the scientist has replaced the allegorical figure of Christ. William Holman Hunt's "The Light of the World" (1854), which represents Jesus knocking on a long-unopened door, "promise[s] [. . .] a new day, a new life once the soul awakens to Christ" (Landow).

Hunt himself associated the closed door in his painting with the "obstinately shut mind" which can only be opened from the inside (qtd. in Landow). Apart from its religious reading then, the enlightenment that follows can be also considered as a technoscientific one as Conroy via his painting and Crawford via his poem illustrate due to their use of technoscientific material in their artworks which underlines their celebration of interdisciplinarity.

In "Biology," the discipline is treated in terms of its literary and biological aspects: "Our days and ways, our chromosomes are numbered, / Lettered, making up a long, tagged story, / A still unfolding book of Genesis, / But one, like poetry, lost in translation" (Crawford *Full* 36 1-4). Thus, emphasising the uniqueness of each being as well as the continuity of the process of becoming, the poem demonstrates how it is impossible to describe and/or understand each being or experience in a fixed manner. Throughout the poem, scientific language runs parallel to literary aspects of life, such as "strange dialects" like "*zymogens*" and "*Avogadro's number*" that come to be loved, folktales spoken in "strands of narrative" rather than strands of DNA, "[e]nzyme legends," "mitochondric organelles" "label proteins," "recognition scenes" and "[a]tom-fine get-togethers, microbondings, / Pos and neg held in a cyclic shape" (Crawford *Full* "Biology" 36-7 8, 9, 10, 12, 13, 14, 15, 16-17).

Zymogens is a term in biochemistry which denotes a group of proteins ("Zymogen"), while Avagadro's number is a chemical term meaning "number of units in one mole of any substance" ("Avagadro's Number"). The "strange dialects" refers to the unusual presence of these scientific terms in a poem which sounds unfamiliar to the listeners. Despite their foreign presence, they are still loved by the listeners due to their strange allure and fresh glossing. While strands of narrative, rather than DNA strands, give birth to "enzyme legends," it is only natural that "recognition scenes" occur between "mitochondric organelles" and "label proteins." The poem itself is an example of the intermolecular embrace given in the last lines, as sciences and humanities get together to create this gripping genetic myth:

> And there, in trees, in cats' or human kidneys,

> Articulates a sort of Word made flesh,
> Goes unrecognised, unspoken, joins together
>
> Mice, people, choughs, so colourlessly proving
> Gut feelings true, that all are held in one
>
> Genetic myth, one Loch Ness-deep, compelling,
>
> Deft, intermolecular embrace.
> (Crawford *Full* "Biology" 36-7 18-24)

It is not only the microscopic or atomic elements that get together to form the cyclic shape mentioned before, but trees, cats and organs, too, whose names's statement alone evokes their presence, strive to create this Genetic myth of creation. The word making these elements flesh, thus reflects Crawford's views of an interdisciplinary approach where everything is connected and interdependent on one another.

2.5. INTEGRATED WORLD OUTLOOK

Life as a series of interdisciplinary experiences promotes the idea of an integrated world outlook in Crawford's poems. While Hawthorne Deming claims that scientists are generally regarded as "seekers of fact [. . .] [and] poets revelers in sensation" (183), it is possible to consider them as one because "[d]espite their inevitable conflict," they "have one important thing in common: they are both representations. The practitioners are extremely self-conscious of their role as representers, for the fact of representation is essential to their pursuit of truth" (Grosholz 71). In a world where there are so many different aspects to a single question, as is the case in "A Life-Exam," specialisation creates more problems than answering them.

Gander, as a result, observes that once "scientific method meant that we chopped something apart and put it back together; we made a machine. That still is one scientific model, and a very successful one, for it predicts that when we do something, we will obtain certain results. But such methodology is not a universal, embracing all human experience" (42). Similarly, Bush comments that "modern science, in moving beyond the tight dogmas of nineteenth-century science to recognition of the inexplicable, has come nearer to poetry, and that poetry and science are really sisters, or at least cousins,

under the skin, because both seek the universal through study of the particular" (165). Therefore, sciences and humanities should both bring their complimentary roles to work towards an all-encompassing universal goal. In this regard, their "intellectual functions [. . .] overlap to form a unity, with each conditioning and complementing the other" (Holub "Poetry" 53).

Moreover, as Williams asserts, because every scientific endeavour starts off "as a crazy dream," there is no reason to deny the "Romantic element" of science in its quest for truth (20). Despite differences in their methods, "[e]ach way of seeing contributes to the total human endeavour; each description of the universe adds to our ability to see further into the depths of universe" (Williams 20), as the scientist and the poet each experiments with their individual "conceptual methods" (Grosholz 71). Additionally, scientists continue to draw inspiration from humanities in naming new stars or species. A similar kind of familiarity will also be useful for the poets. So, poets, too, as attempted by Simon Armitage, should attend astronomy lectures, even if it reduces the poet's status to an amateur, as indicated by the title: "*Astronomy for Poets*," thus "associat[ing the poets] with all kinds of scientific incompetence" (Armitage "Modelling" 110, 111). Regardless of such prejudices, Williams proposes that poets should "interrogate the scientific worldview, study fractal geometry and chaos theory" not only to get a better understanding of the world but also to be inspired by it in return (18). Crawford's poetry abounds in examples which are inspired by sciences and encourage an integrated worldview, as in "The Saltcoat Structuralists," "Fiat Lux," "A Moment of Your Time," "Micro," "Dreamers" and especially his latest collection, *Full Volume*, with several short poems such as "Advice," "Yin and Yang," "Bronze Age," "Pretender," "Same, Difference," and "Rounding."

"The Saltcoat Structuralists" is about the birth of a new era marked by technology, post-structuralist theories and decline of imperialism in the British Empire. On the surface, the poem is about Scottish engineers and ex-patriots who "went on / to tame the dessert, importing locomotives / From a distant Firth" (Crawford *Scottish* "The Saltcoat Structuralists" 9 7-9). Structuralist and post-structuralist attitudes can be read both literally and metaphorically in the poem for they imply the rise of Scottish engineering,

hence structrual power, which ran "[s]traight out of Cairo," as well as recent theories of literature which are reminiscent of "the world's new structure" of "a binary / Gleaming opposition of two rails / That never crossed but ran on parallel," as in decostructive theories (Crawford *Scottish* "The Saltcoat Structuralists" 9 4, 1-3). Moreover, the opposition of these two rails can be taken as representative of humanities and sciences which likewise ran together without crossing each other at the beginning of the twentieth century.

The poem unites technoscientific language with post-colonial discourse as the ex-patriots, who were nicknamed "'The / Pharaohs'" due to their "RP," "embarrass their families," / [. . .] never underst[anding] the deconstruction / Visited on Empire when their reign in Egypt / Ran out of steam" (Crawford *Scottish* "The Saltcoat Structuralists" 10 16-17, 14, 18-20). As the ex-patriots make their way to Scotland "on slow commuter diesels" they observe "the proud slave faces / Of laid-off engineering workers, lost / In the electronics revolution" (Crawford *Scottish* "The Saltcoat Structuralists" 10 21, 23-25). Besides this, they also note the changes in their childhood homes due to the electronics revolution that transformed the society within which children nowadays "zapped the videogames in big arcades / [. . .]. Local people found / New energy resources, poems didn't rhyme" (Crawford *Scottish* "The Saltcoat Structuralists" 10 32-34). This is the post-structuralist condition of the age as traditional forms and styles are challenged and replaced by polyphony instead; a condition which came alongside the new technoscientific revolution.

"Fiat Lux" similarly brings together religious concerns with technoscientific endeavours. Meaning "let there be light" in Latin, the lines are borrowed from the Bible (Genesis 1:3). The fact that Fiat is also the name of a famous car brand, incidentally multiplies the poem's interpretations. The poem resonates with allusions as the repetitive "Let-there-be" pattern imitates the Bible and unites scriptural revelation with that of a technological one:

> Let there be braziers, holophotal lenses [. . .]
> Skyscrapers, glinting jumbos, Rannoch lochans
> Grand Canyons, fireflies, tapers, tapirs, matches
> [. . .] let there be all,

> End all, every generation, so the whole
> Unknown universe be recreated
> Through retinal cone and iris and religion.
> (Crawford *Tip* "Fiat Lux" 1 1, 7-8, 22-25)

The holophotal lenses, which are generally used in lighthouses because they channel light better in foggy and smoky weather revolutionised car technologies also (Otter 190). Light, which is associated with religious enlightenment at first, is later affiliated with technoscientific illumination in this manner. Technology which made perception easier for the retinal cone and iris, metaphorically opened the way to learn more about the world. Closing the poem with the English translation of the Latin title of the poem, the poem presents an integrated worldview, since the poem abounds in numerous references to objects, people, places and animals that are recounted next to technoscientific elements, thus reflecting the posthuman condition of the world.

"A Moment of Your Time" begins with Z-rods and ends with "an A," matching the line numbers of the poem with the number of letters in the English alphabet (Crawford *Tip* 9 1, 26). Dedicated to the Glaswegian painter-sculptor Kate Whiteford, the poem makes references to her unique style which is inspired "by the visual languages of ancient civilizations. In particular [. . .] the possibilities of universal significance in the symbols and markings of earlier cultures – fish, bird, circle, chevron, lines – especially those of Pictish origin" ("Kate Whiteford"). Whiteford's artworks are populated with spirals and geometric designs that can be often found in Pictish symbols. The "double-disk" Z-rods are among one of the most frequently used symbols on Pictish stones along with crescent-shaped V-rods (Bellchamber 1). The way Crawford presents the Pictish symbols mirrors Whiteford's perception of these signs: "Here's the whole shebang that is / Time, place and climate, ebbing, dancing, set / In stone and motion, calmly at the ready / Before and after, purled in helices / Every last atom pregnant with an A" (*Tip* "A Moment of Your Time" 9 22-26). The shape of helices symbolises a continuity which gives birth to new helices with every motion, just as each atom gives birth to a new creation. In terms of physics and literature both then, atoms and each alphabetical letter indicate a new beginning, which draws attention to the similarity between sciences and humanities. The Pictish symbols, as a result, are ceaselessly borne into the future, since

the signs reappear in her artworks and each of their atoms give rise to new meanings and readings as is the case with Crawford's poem.

Among the poems mentioned so far, Crawford's "Micro" is perhaps the most interesting one. Emphasising an integrated world outlook, the poem displays how science and art successfully meet by presenting English micro-sculptor Willard Wigan's works as examples. In the poem, the influence of sciences and technology, combined with the creative powers of the artist, results in quite an unusual experience:

> Angström by angström, working
> With resin, Willard Wigan
> Sculpts only at night – less traffic, less vibration.
> Inside a microscopic ring
> Muhammad Ali fights Sonny Liston.
> Wigan trains himself to slow down his heart
> So he can work between beats.
> (Crawford *Tip* "Micro" 35 1-7)

"Micro" describes a number of Wigan's artworks as well as the way he produces them in detail. Angström is a unit of measurement which is equal to 0.1 nanometre and is generally used in measuring the sizes of molecules, atoms and the electromagnetic wavelengths ("What"). Wigan works at night and slows down his heart in order to produce his sculptures which are invisible to the naked eye. Trying not to inhale his work, he works under a microscope working with materials such as a single grain of sand, nylon, dust fibres, spider's cobwebs and as such, shaping these with surgical blades or sharpened needles and painting them with a hair obtained from a fly ("About Willard"). Placed upon a variety of items such as pinheads or the eye of a needle, his micro-sculptures, as a consequence, are only visible through a microscope ("About Willard"). The rest of the poem makes references to Wigan's works which rely mostly on historical events and literary works: "Consider Wigan's finest work, / A tableau: Snow White and the Seven Dwarfs / Disneying in the eye of a needle" (Crawford *Tip* "Micro" 35 13-15).

His childhood experiences are the reason behind Wigan's inspiration for micro-sculptures. As a dyslexic child who had been regarded a failure by his teachers, he used to skip school and on one of these days, while he was watching a group of ants, he

decided to build houses for them ("About Willard"). His idea of micro-sculpture developed from that point onwards as he started to challenge himself more and began experimenting in order to see how far he could take it. The inclusion of Wigan's website in the following lines stresses the fact that virtual reality is also a part of his endeavours. As the speaker of the poem enters the website and witnesses Wigan's artwork, the equally artistic and technical sides of the artist who relies on science to create wonder is emphasised once again. In this respect the poem echoes Crawford's own efforts, as he presents an integrated worldview by using sciences and humanities in an innovative manner to show how science can be an integral part of poetic material.

Also in "Dreamers," Crawford introduces two different types of dreamers that make up an integrated whole despite their differences: "Some know they want specific things – / A bergamot, or a Granny Smith – / But others stare so hard at lochans, / They unlearn the usual focus" (*Tip* 46 1-4). The scientist and the mystic; the factual and the spiritualist thinker feature together in the poem. The latter, the kind of people who lose focus and, unable to give meaning to earthquakes, seek the answer in leaving aeons at St Fillan's feet:

> Earth-burps, geological yawns
> Lure them in to listen hard
>
> To the uvula of the globe,
> Where tired commuters to mammoth and elk
>
> Holed up, Delphic aeons before
> St Fillan – he of the luminous bones.
> (Crawford *Tip* "Dreamers" 46 5-10)

St Fillan, who allegedly wrote "with the aid of a luminuous glow from his left arm," lived in the seventh century in a cave at Pittenweem, in Fife, where he used to worship (Balfour 21, 20-21). The "Delphic aeons," in this regard, stand for both a long period of time and Gnosticism which considers spiritual truth as the key to salvation (Hoeller). Thus, making a differentiation between two types of dreamers; the mystical and the factual, Crawford places his favour on the mystical.

Of Crawford's collections, *Full Volume* specifically stands out due to its recurrent theme of an integrated world outlook which is a central element of contemporary science poetry. "Advice," "Yin and Yang," "Bronze Age," "Pretender," "Shetland Vows," "Same, Difference" and "Rounding" stress the idea of co-existence over and over again within the collection. Despite their lack of techno-scientific language these poems are still significant due to their defence of an integrated worldview which acknowledges the co-existence of sciences and humanities everywhere.

In this sense, "Advice" exhibits the inescapability of an integrated worldview by emphasising the connections between everything: "When you are faced with two alternatives / Choose both. And should they put you to the test, / Tick every box. Nothing is ever single. / A seed's a tree's a ship's a constellation" (Crawford *Full* 1 1-4). The poem is reminiscent of a Frostian dilemma, yet instead of choosing one of the two options, the speaker encourages readers to embrace them both. In this sense, the "two alternatives" can be read as sciences and humanities and how an understanding of both can lead to a satisfying totality to understand the universe. As complementary of each other, sciences and humanities are both required to understand the world better, while singular disciplines fall short of providing satisfying answers.

"Yin and Yang," likewise, stresses the inter-connectedness of everything such as hills, forests, boats, the sun and the night. Spoken in terms of two bodies, Crawford, in line with the Eastern philosophy, suggests how opposites are in fact complimentary to each other, each containing a piece of the other to some extent within itself: "In my body you scour the sgurr / For its sun buried deep in the forest. / In your body I search for the boat / Let sleep in the middle of the night" (*Full* "Yin and Yang" 2 1-4). Apart from being the name of a mountain in Scotland, sgùrr in Gaelic means "a high sharp-pointed hill" ("What's"). Indicating top and bottom divide in the poem, the poem, thus, rejects the Cartesian duality of body and mind. Signifying the interdependentness of everything, yin and yang is emblematic of a harmonious union of contrasts making it clear that no one can survive without the other.

The next poem, “Bronze Age” extends the idea that everything, including things that are considered as opposites, are interdependent to human relations: “Fights and kisses, touch and go, / Body-heat and cool, wedding-day downpour, / Tin yin fused to the yang of copper, / I want our Bronze Age to last forever” (Crawford *Full* 3 1-4). Binary oppositions are employed to describe the union of a married couple, such as proximity vs distance, body-heat vs cold weather. Tin yin fused with copper yang recalls the ages of man, while conflicting emotions show up in all sorts of unions. Instead of being regarded as oppositional, the things mentioned in the poem are presented as complementary to one another, hence displaying an ideal union.

“Pretender,” on the other hand, is basically on the art of deception or, to be more precise, on literature as representation: “The lie I live is different from yours. / I will be true to it until I die, / Faithful forever to the trompe l’oeil truth / Of the bee-orchid or the fishing fly” (Crawford *Full* 9 1-4). Differentiating between the scientist and the poet’s representations, Crawford’s speaker claims that the metaphoric “truth” behind representations rather than the literal is what concerns her/him the most. The optical illusion that is favoured by the poet, which resembles an orchid to a bee or a fishing tool to a fly, is based on reality, too, albeit a mimetic one which the speaker intends to be true to until the day s/he dies.

Likewise, “Same, Difference” highlights the idea of a union through introducing difference and sameness as complementary to each other:

> Since each is shaped
> by all its drift,
> [. . . . .]
> in all the history of the world
> a snowflake’s double
> can’t be found.
> (Crawford *Full* 11 1-2, 5-7)

Neither is “a high cloud’s double” easy to find (Crawford *Full* “Same, Difference” 11 13). Even though “[a] world of difference flecks each word. / Nature abhors a Henry Ford” (Crawford *Full* “Same, Difference” 11 15-16). American car manufacturer Henry Ford is recalled in the poem in order to underline sameness as the dream of societies. In

contrast, uniqueness is identified as the chief mark of nature. Although authenticity may seem to be divisive, in the case of nature, what makes it beautiful is the unique qualities of things we come across everyday knowing that they are exceptional in their own way. This kind of uniqueness does not aim at divisiveness but rather upon drawing attention to a rich variety which makes up a harmonious whole, thus underlining how the interconnectedness of everything leads to perfection.

Crawford's "Rounding" reinforces the idea of an integrated outlook via both form and content:

> Fast in the tides' flow
> Each day rough boulders, rounding,
> Wear away oceans.
>
> Oceans wear away
> Boulders each rough day, rounding,
> In the tides' fast flow.
> (Crawford *Full* 13 1-6)

The poem repeats the idea of circularity that has been present ever since "Advice." "Rounding" almost has a mirror-like appearance as the same words that are used in the first stanza are re-arranged in the second stanza to give the opposite meaning. As boulders wear away oceans every day, oceans wear away boulders every other day. While the two wear each other away, in this manner, "a rounding" truly occurs on the page as well, for the second stanza repeats the pattern of the first by employing the same words in a different arrangement.

2.6. MICROCOSM-MACROCOSM RELATIONSHIP

The relationship between the microcosm and macrocosm is revealed through Crawford's insistence on remaining "'local' and factual" in his poetry (Stafford 241). Believing that "[p]oems often signal in related microscopic details what they also communicate on a more macroscopic level," Crawford's poems exemplify a microcosm and macrocosm relationship in many instances ("*Spirit*" 58). Crawford reveals his particular fascination with the microcosm and macrocosm relationship as follows: "I'm

probably more interested in the idea of the whole world! [. . .] There are kinds of technology, not least information technology but also environmental issues, that are pressuring us more and more to think of the world and the people in it as bonded rather than thinking simply we're a European bloc" (Dósa 107). That's why describing Scotland as a "semi-conductor country" he admits on one level that it "*is* a small country, in global terms, and one should face up to that, but Scotland's is a kind of smallness that's very diverse and expands around you" (Dósa 86). With its science and technology, the country plays an important role in contemporary technoscientific progress, despite its size. Fearful of "being parochial," he therefore likes to stress its international connections and outreach in his poetry (Dósa 105).

In "Developing Worlds" Crawford draws parallels between developing photographs and the journey enabled through photographs to different parts of the world: "Jungles, lemurs / [. . .] John Thomson – so / Saturated with collodion, / Pictures could be developed from his flesh – / Snaps couched Victorian debs" (*Tip* 16 1, 3-6). Scottish photographer John Thomson (1837-1921), was a pioneer in "photojournalism, using his camera to record life on London's streets in the 1870s" as well as capturing images of the Far East and introducing distant lands, cultures, and people to the "'armchair travellers' of Victorian Britain" ("Photographs"). With the help of the chemical, "collodiom," which is used to develop photos, and the technology to capture moments, Thomson made memories flesh. Crawford connects distant lands via photographs taken elsewhere with Scotland and vice versa: "Forbidden cities held in his emulsions' / Delinquescent, slewed, chemical time, / So Scotland sees by oxyhydrogen light / Khmer jungles flare through Sauchiehall Street rooms" (*Tip* "Developing Worlds" 16 10-14). With their developed technology the Scottish perceive jungles under the limelight. Thus, Thomson's photographs which are developed by chemistry to create worlds on paper hold light to distant places around the world. Making shared experiences visible, the photographs circulate different cultures and customs, informing the rest of the world of their presence here and far: "Each snatched glance worlds apart, each glance our own" (Crawford *Tip* "Developing Worlds" 16 20). What is observed, then, is a testament of these faraway countries that are witnessed by local observers, despite their distances.

Conversely, “Planetist” is a poem about a well-informed speaker who despite his love of “all windy, grand designs,” loves Earth the most: “From the tip of my tongue to the pit of my stomach / [. . .] With my lanky body I thee worship, / Scotland, New Zealand, all national dots, / The salt of the earth” (Crawford *Tip* 18 5, 7-9). Associating nations with dots, the speaker then regards the Earth as a speck: “But I’m a planetist as well, / Singing your praises, honoured speck” (Crawford *Tip* “Planetist” 18 11-12). The speaker’s love for her/his country is not limited but extends to the world in this manner. Sharing the same exuberance, Crawford’s “Acceptance Speech” praises the earth for its many qualities, too: “I want to thank each bead of water [. . .] / And to stones – strong, geriatric gneiss / [. . .] As a Scot, I know I owe a debt / To rain. That supportive, laundering drench” (*Tip* 21 1, 5, 7-8). Keeping these bountiful elements aside, the speaker is also aware of the world’s problems: “I know things might have been better done / Had Thomas Midgeley never exhaled / Lungfuls of CFC; / But today belongs to the pink camellia” (Crawford *Tip* “Acceptance Speech” 21 17-20).

Thomas Midgley (1889-1944) is a chemist and inventor who is considered to be one of the unluckiest scientists in history as a result of his experiments with Freon, a type of “flammable and highly toxic” compound (Van Duisen). Unaware of the effects of the chemical compound at the time, he subjected himself to it so much that he developed polio and was later “strangled to death by a complicated system of pulleys he invented to help others lift him out of bed” (Van Duisen). Although the government did not make the after-effects of his experiments clear at the time, in the long run they wreaked havoc upon the environment (Van Duisen). Accordingly, the speaker feels regret towards Midgley’s finding, yet, s/he also states that today belongs to nature and beauty rather than this unintentional environmental disaster. Moreover, s/he extends her/his prayers to “that opal-blue inch [. . .] beneath invisible / Transhumant stars, each reminiscent / Of everywhere in particular” (Crawford *Tip* “Acceptance Speech” 21 24-28). Thus, the poem ends while the speaker extends her/his thanks to the sky and the atmosphere; the stars and space, for wherever one goes, a reflection of something familiar is found.

Crawford’s “Local,” on the other hand, brings together the local and the global by introducing personal associations: “The global village doesn’t mean the globe / But

somewhere like that warm pub in St Andrews / We kissed in before seeing on television / How all the chemicals that make our bodies / First emigrated here from far, raw stars" (*Full* 6 1-5). The pub in St Andrews is identified as a local pub which represents a miniature globe with its global community, and this reflects a common human experience, like love, as a miniature cosmos. Crawford reveals that there is "something that in my own consciousness connects with being in St Andrews now, for instance: the notion of St Andrews as a kind of 'bull's-eye centred at the outer reaches.' I suppose I see Scotland like that" (Dósa 86). In this manner, he confirms that he admires writing about littleness which expands. Plus, the associations drawn between bodily chemicals and raw stars, connect humans to something even bigger than the global; the celestial, which the speaker finds fascinating. In this respect, the microcosm and macrocosm relationship is stressed in terms of the local and the global.

"A Gean Tree" reproduces the idea of a part and whole relationship which regards each entity as a part of the whole. Like "Local," "Gean Tree" upholds the notion that "[w]e see ourselves as very tiny beings made up physically of groupings of other even tinier entities, atoms, molecules, cells, and organs. We are made from the dust of old stars. Most of us believe we have risen through natural selection and mutation of genes over many, many million of years, our bodies being related to all other living bodies on Earth" (Rogers 3). Walking in the botanical gardens late at night, the speaker experiences such a revelation by looking at a type of cherry tree:

> petal on petal
> not grown
> up root and branch, more
> levitated
> or flounced down
> from stars, a damp
> nebular dance, [. . .]
> [. . . . .]
> where each of us
> with thanks
> must take our time.
> (Crawford *Full* "A Gean Tree" 7 11-17, 21-23)

The microcosm and macrocosm relationship is emphasised in the speaker's observation of the cosmos in the petal. The viewing of the petals is regarded as something ethereal

through which the speaker experiences a kind of revelation whereupon s /he feels the need to extend her/his thanks to the nebular system for sustaining the cherry tree; and thereby for sustaining her/him.

2.7. BIOCENTRICISM

Several poems of Crawford incorporate elements from flora and fauna in order to emphasise the idea of biocentricism which considers different parts of the world as composing a unified whole. In this sense, "Bio," "Tweeds," "Tree Dance" and "The Also Ran" make Crawford's biocentric approach obvious as he relies on biological diversities, a type of cloth, nature and animals to reflect the universe as a whole inhabited by different organisms.

Of the poems which stress biocentricism, "Bio" stands out also as one of the few examples of concrete poetry in Crawford's poems. Emphasising the interconnectedness of humanities and sciences, the poem reflects an integrated world outlook and stresses interdisciplinarity via its shape which looks like the world due to its circular structure. Starting with the words "I, day," the poem ends with "I, night" stating various protozoa, elements, animals, plants, objects and subjects in-between (Crawford *Full* "Bio" 59 1, 27). The poem, rejecting anthropocentricism, emphasises biocentricism instead by foregrounding a number of fundamental elements that make up the ecology, such as "moss," "water," "fire," "tyrannosaurus rex. [. . .] human[,] [. . .] insect," "microbe" and "oxygen" (Crawford *Full* "Bio" 59 3, 4, 7, 14, 17, 23). The poem is posthuman in approach representing via its shape a world in harmony with all its present and bygone elements as well as its macro and microorganisms placed in a random order. Moreover, placing "I" before each of the elements that are mentioned ("I, moss," "I, water" e.g.), Crawford shows how the elements that are mentioned share an equal value in the biocentric world order.

"Tweeds" refers specifically to Harris Tweed from the Outer Hebrides, Scotland. The poem describes tweed, which is a product of textile industry, in terms of nature: "Ready-to-wear moors, their darker straths / Playgrounds for erotic picnics / Evenings

scented with sphagnum moss, / Secret, pollen-speckled grass" (Crawford *Scottish* "Tweeds" 59 1-4). As a hand-woven fabric which can be regarded as endemic to Scotland, elements of Scottish nature, such as moors and straths, can also be identified with it. Crawford pays attention to scientific detail as well as is indicated by the presence of pollens. Botanics is an important part of the poem as well as zoology. The pattern of nature is reflected via the cloth itself as it not only provides people with clothing but also with a picnic blanket. Even when manufactured, the cloth is still in touch with nature as is also confirmed in the final line of the poem where the speaker suggests that "[b]irdsong rise[s] from" it (Crawford *Scottish* "Tweeds" 59 6).

"Tree Dance" also reassures the readers that there is a universal connection between humans and nonhumans. While s/he is wandering around the woods of a Scottish Glen, the speaker observes nature and a frog which goes into hiding. When s/he realises that s/he is lost, the speaker notices a pine tree, which is described as an "arterial road" that reaches up "to the clouds," and leans against it: "My ear an inch from rings and resin, hiding / Frog-quite, out of the wind. [. . .] / The tree sways, dandering in high blashes, rooted. / I sway with it, cheek to living cheek. / Each of us will last a lifetime" (Crawford *Tip* "Tree Dance" 39 6, 8-9, 10-12). In a way, the moment that s/he thinks that s/he is lost, the speaker is found. Parallels including the arteries of the tree and the speaker, as well as their "dandering," which is Scots for wandering, and their vitality makes the speaker realise their connection. The frog is not excluded from this scene either, for, despite its silent presence, it, too, will "last a lifetime."

Contrary to "Tweeds" and "Tree Dance," the first-person narrator of "The Also Ran" is quite a familiar one. The poem is a parody of Aesop's fable, "The Tortoise and the Hare," which is likened to a Formula-1 race. The "unsponsored" tortoise seems to have no chance against the "sponsored" hare:

> The hare was nowhere
> To be seen [. . .]
> Every hair of the flank of the hare so sleek, so chic,
> It was sponsored, it caressed his physique.
> Out of sight, out of mind, the unsponsored tortoise fell
> Into a vertical sleep that sank him deep
> Down in his shell. He dreamed. He smelled the smell

Of formula one.

(Crawford *Full* 31 1-2, 4-9)

However, in Crawford's poem the dynamics of the fable is very much altered. In contrast to the sleeping hare of Aesop's fable, here it is the tortoise that does the sleeping. As soon as the race starts, the tortoise hibernates and starts dreaming at once. He dreams of himself travelling speedily onwards, like a train, as he begins to think the earth may "[o]ut-accelerate light, the planet's race, pace, place / In the universe chang[es]. Then, ranging / Further than any dream has ever gone, / The tortoise sh[ines]. A comet. A meteor" (Crawford *Full* "The Also Ran" 31 27-30). The tortoise's shell, then, transforms into a capsule which falls steadily down from outer space.

Reflecting the progress of science and technology in this primordial tale of triumph and loss, Crawford deliberately uses the word "peace" instead of "space" to emphasise the tortoise's experience as he travels "like a stone / From outer peace" (*Full* "The Also Ran" 31 31-32). Although he is sure that he has lost the race, the tortoise is not sorry because he wins wisdom and becomes "wiser" during the process in contrast to the hare who is "only the winner" (Crawford *Full* "The Also Ran" 32 47, 51). As he tells his visionary journey to his listeners, they are impressed by how "cool" the tortoise is: "They loved / How he hadn't moved but the earth had sped beneath him" (Crawford *Full* "The Also Ran" 32 43-44). Therefore, the morality of Crawford's poem is rather different from Aesop's. Describing in detail how the listeners are amazed by the tortoise's experience, Crawford indicates that it is important for societies to be informed about the current technoscientific advancements so that they know the extent to which science and technology will take them to. Crawford makes clear that presently intelligence and information are what truly matters: "They knew, like you / And I, it was true" (*Full* "The Also Ran" 32 37-38). In a world dominated by facts, the hare is only a "survivor" with knowledge but no wisdom; a quality which is not sufficient to be considered an impressive one by the poet (Crawford *Full* "The Also Ran" 32 48). After all, the hare only succeeds in winning a race rather than "the" race in scientific advancements.

2.8. CONSTRUCTION OF A TECHNOSCIENTIFIC NATIONAL IDENTITY

Crawford's poetry displays a particular interest in Scottish authors and scientists which reveals his attempts to construct a Scottish identity that foregrounds scientific and technological advancements and acknowledges the scientific leadership of Scotland. Scottish history has certainly been a problematic one. Scotland has been subjected to constant attacks of the Vikings, Romans and, lastly, the English which led to the country's eventual conflict with the "Auld Enemy." Although Scotland has been forced into union with England at several points in history, such as Edward I's invasions of Scotland, none had been as pervasive as the Union of Crowns (1603) that occurred upon the death of Queen Elizabeth I of England with the ascension of King James VI of Scotland as James I to the throne of England (Mitchison 161). Later on, despite the end of the Stuart dynasty, the Union was secured this time by the Union of Parliaments which occurred with negotiations started off by Queen Mary II's husband William of Orange under Jacobite threats that came to fruition during the reign of their daughter Queen Anne; ultimately uniting the two countries under one name, Great Britain, in 1707 (Ross 220).

In the case of commonwealth countries, such as Scotland, looking back and delving into the past are requirements in securing a future to exist in their own right. In order to survive, a nation has to have a tradition. The most common method to do so has been to create the future by depending on the past, as the "sense of 'whence we came' is central to the definition of 'who we are'" (McCrone 265, 259). In order to exist as an independent country, it is necessary for Scotland to construct an image of itself by its own means. Accordingly, Crawford's poetry tries to create a sense of what it means to be Scottish through science poems (Davidson 134). Stating that "history is not a product of the past, but a response to the requirements of the present" McCrone believes that "all traditions are 'invented' in so far as they are constructed and mobilised for current political ends in some way or another" (261). This kind of invention requires the subversion of old centres in order to "make 'new centres out of old peripheries'" (Fazzini xv), because the construction of a new tradition often involves a charge against new or oppositional nationalisms (McCrone 261).

Skoblow argues that "dominations and submissions, dichotomized social orders, anxieties of powerlessness, assertions of abiding strength, and questions of silence pervade issues long familiar through [. . .] nationalist [. . .] terms of oppression and liberation" (327). In the Scottish case, the terms of oppression include "the loss of national identity, the schizophrenic contradictions linked to its multi-linguistic reality, the psychic and cultural anxiety determined by its 'marginalization', the tragedies of the Scottish Clearances and Diaspora, the contaminations and the divergences between the English and the Scottish canons, the role played, through various centuries, by translation" (Fazzini xiv). Specifically issues related to literature confirm McIlvanney's fear that "'when a country loses the dynamic of its own history, the ability to develop on its own terms, its sense of its past can fragment and freeze into caricature. For a long time this was Scotland's fate'" (qtd. in McCrone 256).

Observing that "Scottish literature, like Welsh, Irish, and any other non-canonical literary productions outside England, has been neglected because of its supposed provincial or barbarous condition" (Fazzini xiii), Crawford asserts that despite their common plea, the "visibility of Scottish literature has been nothing compared with the visibility of Irish literature. Why? It's partly that Ireland has had such a stellar clutch of writers in the twentieth century, and partly because of Ireland's political clout as an independent nation in terms of embassies and cultural outreach, but also because of the Troubles that have made Ireland a politically interesting case" (Dósa 105). To reverse the situation, Scottish writers initiated "a resistance literature" in order to "discover its [Scotland's] role as a '*minor* nation'" (McCracken-Flesher 2). As a result, "the oppositional acts made against the Canon supported by the Centre, have tended towards the destruction of a 'major' literature, and a 'major' language from within," while Scottish poets challenged mainstream English poetry by incorporating distinctly Scottish elements and Scottish words in their poems written in English (Fazzini xiii).

Crawford's deliberate inclusion of Scottish words, alongside technoscientific terms, is an example in case. Contrary to the popular inclination to delve into the past in order to recover poetic material, as has been exemplified in the works of Sir Walter Scott, for instance, in whose works "actual history is often forgotten in favour of a foundational

legend," Robert Crawford turns his back to myth and folklore in order to build a new tradition that involves the present age and he looks to the future in as much as the past for poetic creativity. Hence, contrary to conventional practices, Crawford combines the "emotional" with the "rational" in his engagement with national identity (McCrone 265, 255). As an important part of Crawford's science poetry, thus, history provides a link between the past and the present while looking forward to the future. His interest in history as such is predominantly a nation-specific matter for Crawford, since he considers science as a Scottish invention which constitutes not only a major part of contemporary Scottish experience but also of Scotland's character. Therefore, a number of his poems make use of technoscientific features in order to claim science and technology as a particularly Scottish feature and to establish a national identity based on that assumption.

Accordingly, his poem "A Scottish Assembly" forges "a link between devolution and the 'revival' of contemporary Scottish literature" (Thomson 3). As the title-poem of the collection, the poem obviously has political overtones:

> Circuitry's electric tartan, the sea,
> Libraries, fields – I want the lot
>
> To fly off and scatter, but most of all
> Always to come home to roost
>
> In this unkempt country where a handicapped printer,
> Engraver of dog collars, began with his friends
>
> The ultimate encyclopedia.
> (Crawford *Scottish* "A Scottish Assembly"43 1-7)

Published at a time when tension was building up in the "run-up to Scotland's 'Independence Referendum'" (Galbraith 561), Crawford's poem epitomises the "1979 devolution debacle" that led to the "establishment of the [Scottish] Parliament in 1999" (Crawford *Books* 662). A sense of longing presides over the poem in which the poet yearns to become one with everything that makes up "circuitry's electric tartan," that is, Scotland. Likening Scotland to an electric circuit board whose pattern resembles that of a tartan, the speaker associates each part of the circuit board with a different part of the country. As was the case in "Scotland," a pattern of criss-crossed horizontal and vertical

lines sectionalise the country with the lines continuously intersecting one another. Although tattered and beaten, this worn away country is still miraculous in terms of its contribution to the international developments in science and technology and to the world of knowledge and information in general. The reference to the "ultimate encyclopedia" confirms the notion that Scotland acts as a source of information. The allusion is to the Scottish engraver printer Andrew Bell who was one of the two co-founders of *Encyclopedia Britannica* which started its publication in 1768 (Ross 240).

Although not only Scotland, but also England "ceased to be a nation state" with the Union of 1707 (Dósa 107), many still upheld the belief that "Scottish history seemed to have 'died' at the point at which British history took over" as a result of which the "'narrative' of the nation is told and retold through national histories, literatures, the media and popular culture" to secure the nation's persistence (McCrone 259, 264-5). Attempts to construct a national identity most commonly "took [their] obvious expression in the founding of national museums in which the nation's 'heritage' could be shown to best advantage" whereby "national galleries, museums and academies to capture and celebrate the nation. 'National' art was cultivated in the form of painting, sculpture, architecture, music and so on. If national art did not exist, then it was the role of artists to invent it, or at least discover or recover it from the fragments of the people's culture (hence, the interest in folk song and folk art)" (McCrone 266, 267).

More serious in tone than "A Scottish Assembly," "Technology Transfer" deals with the Highland Clearances and the forced emigration that took place following it. The Clearances which started out initially as a result of the Disarming Act following the Battle of Culloden in 1746 aimed at eradicating the close-knit structure of the clans by banning the Scottish tartan and the Gaelic language to prevent further Jacobite threats (Oliver 320). As parallels are drawn between forced emigration and technology transfer, the speaker suggests: "Now to set out means being left behind" (Crawford *Talkies* "Technology Transfer" 50 11). Opening with a young girl's dramatic account of what she remembers of Scotland when she left the country as a child, the poem reads:

> *I know little about Scotland only Millport*
> *I left when I was fourteen in the rain*

To go to Queensland when I saw your photos
Of the house on Great Cumbrae I cried

Her voice
Gets ahead of itself, aware of small lace-up shoes

Left behind on the side of the world
Without aeroplanes or tv"
(Crawford *Talkies* "Technology Transfer" 50 1-8 italics original)

Emigrating to Australia from Scotland's Millport, what the speaker goes through is a kind of loss of innocence which is strengthened by the image of children's shoes left behind. Her birth, predating "that of the plastic," she is unable to transfer them back or fulfill her longing to her homeland via TV (Crawford *Talkies* "Technology Transfer" 50 9). Because she has been forced to emigrate, the sentiments that accompany such a journey are not the same as a willing one. Rather than opening new vistas for the speaker, her emigration imprisons her in a debris of nostalgia. Contrarily, nowadays the individual always comes second when racing against "more stylish technologies: ships called Personal / Computer, / Cardphone, Creditcard. We travel by manmade fibres / Towards a New World that is already / Dated or being updated, / Singing of the Old Country / [. . .] Where our great inventors wore shorts or pinnies / In the places from which we were cleared" (Crawford *Talkies* "Technology Transfer" 50 12-17, 20-21). In the poem, Scotland is again hailed as the centre of technology where metaphorical ships of cyber technology get people to their destinations easily. Compared with Scotland, Australia is like "a never-changing holiday continent" functioning with more primitive technologies such as grubbers and 78s gramophones (Crawford *Talkies* "Technology Transfer" 50 18, 19). The stylish technologies of computers, microfibers, phones and credit cards that are widespread in Scotland are compared to the dated technologies of Australia where, bereft of their inventors, Scottish emigrants cannot expect to show the same kind of progress. What Crawford proposes in his science poems then, is to mark Scotland as a technology capital, whose impact can be felt world-wide.

"Uist," on the other hand, opens with pastoral imagery. The speaker is lying down on the island of Uist where the south is still the north compared to the lowlands of the country, and the sun is caught in the rain. While "levitational birdsong" fills the fields,

"e-mails graze sand-covered villages / And shaped bone combs comb force-fives in the dunes" (Crawford *Tip* "Uist" 48 2, 3-4). "Force-fives" is a reference to wind's speed which forms dunes on the sand. The speaker then lies down, like a compass, parallel to the surrounding islands and starts "[w]atching the sly clouds' micromanagement / Of thirthy shades of cerulean blue" (Crawford *Tip* "Uist" 48 7-8). The micromanagement of the clouds has to do with the micro-climate of the island which is often hidden beneath a curtain of rain. Observing yellow irises singed by June gales, the speaker notices native sheep scratching themselves on a satellite dish which adds a humorous practicality to the dish. Oblivious to e-mails running back and forth through the atmosphere, and to the main function of the dish, the sheep's acts show how the technological features of the poem easily harmonise with the rest of the pastoral image.

The peaceful atmosphere is soon threatened by the approach of rain as a result of which the speaker starts striding across the plain. On his way back, he begins to ponder about "Taigh Chearsabhagh, a museum in Northern Uist, where "New Age lettering / Englishes a maybe age-old Gaelic gnomon: / There is no stone but the stream will change its shape" (Crawford *Tip* "Uist" 48 16-18). The idea that an old Scottish artefact may be Anglicised is unbearable for the poet, although the gnomon is an imaginary sundial. His final remark, which suggests that times are changing and shaping history in such a way that perhaps there will not be a stone in the end, ultimately removes the object of conflict out of the argument. This indicates that Crawford is hopeful towards the future, when there probably will not be any need to Anglicise any Gaelic words since Scotland will be a free country.

"Accidents," likewise, makes use of scientific, literary and national history. The poem opens as follows: "After centuries of feuding, the names of Scotland and / England / Have settled down, so this side of the quicksands Carlyle / Means *Sartor Resartus*; on the other side, Carlisle" (Crawford *Talkies* "Accidents" 16 2-5). The juxtapositioning of English town Carlisle in Cumbria with the nineteenth-century Scottish philosopher Thomas Carlyle, according to the speaker, marks the border-line between the two nations as "[p]atriots get huffy, seeing the hills over there / Look just like our own and shrug off what we call them" (Crawford *Talkies* "Accidents" 16 6-7). Nonetheless, it is

rather the two subsequent names that the poem is centred upon: Sellafield and Windscale, the two names of the same place. Originally called Windscale, Sellafield is a nuclear reactor site located in Cumbria ("Nuclear"). Hoping to erase the negative media image affiliated with the original place where a number of accidents took place, the worst of which occured in 1957 when a fire started and resulted in radioactivity release into the area, the original name of the place changed ("Nuclear"). This change of name indicates starting anew which will probably be possible for Scotland as well according to Crawford, once the Scottish people gain their independence.

Then, abruptly moving on with Henry Duncan who "[l]inks the savings bank movement to the first scientific / treatise / On fossilised footprints," the speaker makes it clear that accidents in spelling, accidents in hi-tech nuclear plants, and accidents in scientific discoveries are what this poem is concerned with (Crawford *Talkies* "Accidents" 16 10-12). Specifically Henry Duncan's case shows how science inspires other aspects of life, thus, emphasising the interdepence of sciences. Duncan, who was a Scottish geologist and Reverend, founded the "[w]orld's first savings bank" in 1810 (Ross 328), and upon examining the fossil footmarks found on the red sandstones of the Corncockle Muir, he published the first paper on palaeontology in 1831 (Pemberton and Gingras 69). The accident concerning Duncan's scientific findings, thus, shows how in science there is never really an accident but each finding leads to a different answer of sorts by leading to the constructions of a brand new hypothesis from scratch. In contrast to the negative nuances of the accidents listed above, then, the accident is more likely a coincidence which ended up in a twofold revelation regarding both science and finance. On the whole, nothing is an accident in the poem. Every name/place/person is deliberately chosen to serve the purpose of stressing national identity and displaying different aspects of life as fitting in together as a single piece.

Inspired by writers such as Robert Burns, James Macpherson, Sir Walter Scott, Hugh MacDiarmid and Edwin Morgan on the Scottish line, Crawford also makes references to Scottish poets and writers all the time in his science poetry to establish a strong national identity. "Transformer" is set against a historical background in order to emphasise the antiquity of Scottish history: "Lenghts of model trailway track [jut] from the Pictish

stones" and "scale-model engines [hurtle]" towards the speaker to the present (Crawford *Scottish* "Transformer" 40). Named by the Romans as such because of their "painted" features, the Picts were one of the earliest natives of Scotland whose symbol stones are scattered all over Scotland (Balfour 27). The Pictish Stones, which are apparently erected for commemorative purposes, are in fact the only enduring artefact of the Picts apart from a few place-names (Balfour 28). Crawford's combination of technology with history and culture, then, extends to literature as the speaker, bent down to further examine the stones, tries to catch "*Ivanhoe*, *The Lady of the Lake*, *The Fair Maid of Perth* with gleaming pistons" before "they'd shoot off the ends of their tracks," and goes on to collect them "lurching from stone to stone" (*Scottish* "Transformer" 40).

Written by Sir Salter Scott, *Ivanho*e and *The Fair Maid of Perth* are historical romance novels, while *The Lady of the Lake* is a long narrative poem which, despite its Arthurian title, is again a historical romance about the Highland clans (Ross 269). Considered as the originator of the historical novel (Somerset Fry 206), Scott aimed to preserve Scottish history, ironically at a time when the Highland Clearances had already been going on for some time (Oliver 384). The speaker of the poem observing several layers of Scottish history on the stones grabs them, as if grabbing model trains to play with, and erects them in her/his loft: "I wrapped the locomotives in plastic bags to carry them away; their metal bodies grew heavy and cold as I walked. Home, I laid them in my loft, [. . .] wondering if they'd work on my layout. That night I saw them carved new, crewed by warriors, steaming their way into battle. [. . .] *Royal Scots* poured from the stones" (Crawford *Scottish* "Transformer" 40).

The whole experience, uncanny as it sounds, brings together past, present and future mingled with history, culture and technology. Presenting a humorous image of ancient carved stones carried off in a plastic bag, the speaker notes how during "the night they [slacken] off," which denotes their elemental transformation from stone to metal (Crawford *Scottish* "Transformer" 40). Hence, associating the stones with locomotives into the past, the speaker's wish for a supernatural occurrence is fulfilled, when the stones, carved anew, go to battle as metal trains carrying the regiment of *Royal Scots* on them (Ross 315). Crawford, in this manner unites past, present and future demonstrating

how science and technology open new vistas. The speaker's close examination of the stones, as a result, frees the ancient artefacts from being stuck in time, for upon them s/he observes archetypal symbols which are shared by Scott's novels in the nineteenth century and which later on reach out to the present century with the help of technology that uses these symbols in model-scale toys commemorating ancient Scottish history.

"The Railway Library" exemplifies Crawford's interest in constructing a national identity by way of the parallels drawn between Scottish literature and technology. As the title at once indicates, revolutionising transportation, railways, hence technology, enables both a figurative and literal journey for the passenger/readers as well as acting out as a popular character in several novels of the period:

> Grass is growing through the disused lines
> Of *Marmion* and *Martin Rattler*. You could pick up a book
> At any station, racing through its chapters
> In a slipcase of steam until your destination
> Broke off the story. Rochester met Jane Eyre
> At Falkirk High; Bram Stoker's action plunged
> Through mile-long tunnels; *The Moonstone* gleamed in
> Paisley.
> (Crawford *Scottish* "The Railway Library" 20 1-8)

Parallels such as these drawn between narrative lines and railway lines; readers racing through the pages of a novel, while the train itself races through stations to its destination; steam rising from a book due to its exciting content and steam that drives trains; and finally both trains and books looking forward to reach their destinations, dominate the poem. Railway libraries bring together rails and books in a renewed manner as the places where the characters meet change from their originals so that Jane Eyre and Mr Rochester meet at a train station in Lowland Scotland rather than Thornfield Hall for the first time, which adds new excitement to the classics. They also draw attention to historical romances of Sir Walter Scott and his nephew Robert Michael Ballantine's juvenile fiction (Ross 333). Parallels continue while passengers buy tickets "for good books" and trains "spe[e]d home, thundering across the points / Where readers [clutch] their seats" (Crawford *Scottish* "The Railway Library" 20 9, 10-11). Although Holmes has his charms hailing "a hansom cab" on his way to solve

another mysetery, none can compete with Stevenson's passengers: "Impatient Crewe passengers / For Stevenson are out of luck – his adventures / All borrowed by shy children travelling north / Kidnapped by *Treasure Island*" (Crawford *Scottish* "The Railway Library" 20 21-24). Ending the poem with the question "Quo Vadis?," that is "Where are you going?," Crawford again relies on parallels to question where technology and literature can take the reader-passengers next (*Scottish* "The Railway Library" 20 32). By re-locating the characters in Scottish settings, Crawford introduces a fresh perspective on the classics.

Besides his particular interest in native Scottish scientists and inventors, in "Alba Einstein" Crawford claims a non-Scottish scientist, Albert Einstein, for Scotland as a symbol of Scotland's technoscientific leadership. In the poem "proof of Einstein's Glaswegian birth," he creates an excitement all over the country where the previous idols were overthrown for the sake of this new national hero:

> When proof of Einstein's Glaswegian birth
> First hit the media everything else was dropped:
> Logie Baird, Dundee painters, David Hume – [. . .]
> [……..]
> [. . .] Scots publishers hurled awa[y]
> MacDiarmid like an overbaked potato, and swooped
> On memorabilia: [. . .]
> [……..]
> He'd loved fiddlers' rallies. His favourite sport was curling.
> Thanks to this, Scottish business expanded
> Endlessly. His head grew toby-jug-shaped,
> Ideal for keyrings. He'd always worn brogues.
> Ate bannocks in exile. As a wee boy he'd read *The Beano*.
> His name brought new energy: our culture was solidly based
> On pride in our hero, The Universal Scot.
> (Crawford *Scottish* "Alba Einstein" 53 1-3, 5-7, 17-23)

The poem's sarcastic tone is critical of the lengths that people can go to over media sensations. While claiming Einstein for Scotland, the Scotsmen associate him with distinctly Scottish interests like his admiration for fiddlers and curling. His iconic messy hair has ideal proportions for a keyring ready to be consumed for capitalist ends. As a child, he is described as wearing brogue shoes and eating bannocks as well as being fond of *The Beano*, which was a popular children's comic developed in 1938 by the Dundee-based company D. C. Thompson & Co. ("Beano"). The references to his

alleged childhood, once again combines personal history with the national. In his humourous style then, Crawford relates how the tide of popularity nowadays affects scientists and literary figures alike. This, too, has to do with the process of his attempts to formulate a techno-scientific national identity, since every nation needs heroic figures to build a tradition upon as symbolic figures to turn to in times of trouble, when, for instance, a country is invaded. Accordingly, science is no more something confined to a group of elite intellectuals but ever since the appearance of Einstein's theories on quantum physics, it is treated as an essential part of everyday reality giving shape to history. Hence, Crawford uses the sensationalism that is caused by Einstein's popularity to promote Scotland and its iconic elements.

Crawford's "John Logie Baird" continues his exclusive interest in Scottish scientists and inventors to establish a national identity. Skipping Classics at school in favour of motorbike rides, and chided by one of his schoolmasters for his pronunciation of his hometown, Helensburgh, as "'Eelensburgh,'" the speaker wonders: "Who, if they could see your biker's career from today's / Long distance, would snigger" (Crawford *Scottish* "John Logie Baird" 23 6, 8-9). An engineering drop-out, he is hidden from polite society due to his delinquent ways. Baird, nevertheless, goes on to become one of the most influential inventors of history, when he invents the world's first television, yet he ironically pays for it:

> At the trials a boy called Reith
>
> Risen from your old class shook hands, then wrote you off.
> You worked. When World War II ended
>
> Baird equipment broadcast victory in the Savoy
> But no one diner said cheerio when you faded,
> An obsolete wallah, edited out, still beaming [. . .].
> (Crawford *Scottish* "John Logie Baird" 23 13-18)

The obstacle truly found Baird in the figure of a fellow Scotsman, John Reith, who was a broadcasting executive at BBC around the time and denied Baird his chance to broadcast in 1936 (Ross 27). Although no one thanked him, Baird continued to work till the end of his life. While the speaker praises him for his resolute efforts to enlighten the

world, the references to the technical terms of a fading image, editing out and beaming illustrate how Crawford unites the personal and the technological.

As for "Napier's Bones," the poem is about the Scottish inventor and scientist John Napier. Born in Edinburgh, Napier (1550-1617) introduced "[l]ogarithms and the decimals' modern notations" into mathematics as well as inventing the first abacus for calculation called "Napier's bones" ("John"). Like Thompson, he was a polymath qualified in mathematics, physics and astronomy ("John"). The poem makes several references to his versatility:

> Incessant abacus of water plunged
> Through a lint-mill opposite. Its *clack clack clack*
> forced you to yell to the miller on the other bank
> To stop his wheel and let your thoughts flow free
> Towards logarithms
> (Crawford *Talkies* "Napier's Bones" 66 4-8 italics original)

Employing words associated with Napier to form metaphors, like the abacus of water, Crawford gives clues to the readers about Napier's final invention. Studying logarithms at the time, after his wife's death he turned his interest to the study of "[r]efinement of manures and common salt" in order to improve agriculture (Crawford *Talkies* "Napier's Bones" 66 11). Moreover, obsessed with "[h]ydraulic force and constantly revolving Axles" (Crawford *Talkies* "Napier's Bones" 66 12-13), he took part in the struggle against Calvinists who aimed to eradicate Catholicism in Scotland by building new weapons ("John"). Personally suffering from gout, he later wrote *Rabdologiae* (1617) ("John"). However, it is with his final invention that he is most notably remembered today:

> [Y]our ivory
> Computer uttering through speaking rods
> 23025850, the world's
>
> First calculator. Your eleven children
> Would have to see this other, stranger child
> Outlive them, accurate as today's pale sun
> [. . . . .]
> Napier's bones.
> (Crawford *Talkies* "Napier's Bones" 66 16-21, 24)

With its logarithms and decimals, it is true that more than a calculator, Napier's bones served more like the world's first computer, however primitive. Yet, the most striking feature of the abacus is that it will outlive all his children just like a text outlives its writer. The poem, thus, draws parallels between sciences and humanities as well by emphasising the point that the outputs of both scientists and poets are equally immortal.

Crawford's "Sir David Brewster Invents the Kaleidoscope" brings another Scottish inventor to attention in order to emphasise a strong scientific vein in Scottish history. As the title indicates, it is about the physicist, mathematician and astronomer David Brewster's (1781-1868) invention of the first kaleidoscope in 1816 (Ross 328), when Brewster "clear[ed] the atmosphere of cool St Andrews – / Into dense constellations that revolve[d] / At a hand's turn" (Crawford *Scottish* "Sir David Brewster Invents the Kaleidoscope" 46 1-3). Although his invention caused much sensation in Europe and among poets, like Lord Byron who himself is half-Scottish, Brewster did not earn much from it himself because at the time there were not any patent laws. Therefore, it is considered as "[j]ust a universal sold" all around the world with no credits to its inventor (Crawford *Scottish* "Sir David Brewster Invents the Kaleidoscope" 46 12). Crawford's description of the device emphasises his outlook of the association of sciences and humanities:

> Baudelaire will say modern art's like this
> Brilliant and shifty, a fantastic model
> Of how the real will open up, the micro-
> Particular, the split, then the expanding
> Universe that spills out silent stars
> Light years from Scotland. [. . .]
> (*Scottish* "Sir David Brewster Invents the Kaleidoscope" 46 5-10)

Likened to modern art, the kaleidoscope multiplies the core; "the micro-particular" expanding it to the universal. In this manner, it also emphasises the relationship between the microcosm and macrocosm through which Scotland expands to the Universe; in the same way the kaleidoscopes spread out to the world, and the power of both scientific and literary ideas manifold.

2.9. URBAN LIFE

Owing to the fact that they are dealing with science and technology in the contemporary world, Crawford's science poems are concerned with urban experience as well. To begin with, "Inner Glasgow" describes the industrial city with its pits, docks and smoke where "everybody looks the same and sings / Of oppression" (Crawford *Scottish* 27 7-8). Although the city is "pseudo-Griersonned," it refuses these false images and chooses to remain authentically industrial. John Grierson (1898-1972) was a Scottish documentary film-maker whose documentaries on Scotland were decisively nostalgic; a condition which the speaker whole-heartedly rejects (Enticknap). What the speaker intends to do instead is to present a realist picture of the city with its "tubular steel frontage" (Crawford *Scottish* "Inner Glasgow" 27 14). This is the image that the speaker cherishes and wants to preserve. Yet, even s/he is not exempt from making sentimental remarks: "My inner Glasgow, you don't leave me, I / Do not leave you" (Crawford *Scottish* "Inner Glasgow" 27 13-14). Contrary to Grierson, then, s/he rejoices at the prospect of new technologies which have altered Glasgow for the better.

In "Graid," the definition of the word, which means to make ready and made ready in Scottish, opens the poem. The poem presents a versatile picture of the contemporary city as young women walk around selling telephones, a statistics shows that Scottish stonechat population is still the same, "[a]n accountant moves on with [. . .] her software," a big plane balances over Glasgow, clock radios wake people with a different song every morning, and cars are observed either while they are revving or for their manuals that include quotes from Confucius (Crawford *Talkies* "Graid" 30-31 17, 7, 11-12, 14, 15-16). The versatility of these lifestyles represents the contemporary situation, since presently life is highly dependent on technological tools that are designed for transportation, telecommunication and information. Lack of difference between the tenses implies that temporal time is abandoned in the urban life due to its hectic structure.

In contrast to the dizzying images of "Graid," "Aberdeenshire" presents an idyllic atmosphere which is, yet, described in terms of metaphors of technology:

> Oilrig excaliburs of burning gas
> [. . . . . .]
> [. . .] the reeling of dancers
> Spattering an on-off wind's signal
> [. . . . . .]
>
> The King's College corona satellite-tracks
> Star dialects. [. . .]
> [. . .] Computer screens dazzle the
> night,
> Their flickering eyes added to the land's.
> (Crawford *Talkies* 49 1, 3, 4, 7-8, 9-11)

While oilrig machines function as mythical swords of urban life nowadays, and when the wind gives signals, acting like a machine that can be turned on and off, it is not surprising to observe the stars forming dialects in the sky. Inspecting them in order to decode their dialects, the stars are presented as if they were speaking a secret language of their own. From star gazing, the gaze is next directed towards computer screens' lights which flicker like stars and illuminate the night. Joining their efforts with nature, with their bright screens the computers also reflect an essential element of urban experience in the poem.

The poem "Glasgow Herald" is about the industrial city and the change that transformed its façade over the years. The industrial image of the city is combined with powerful feeling: "On industrial evenings serenaded by welding / [. . .] one white-hot pouring arc / Glimpsed from a diesel, I carried my paintings in a plastic / sack / Through Central Station" (Crawford *Talkies* 54 1, 2-5). Listening to the woman announcer on the train, the speaker is reminded of the announcer's "messages in the middle Sixties / Still held a departing tremor of steam, the Greenock Blitz, torpedoes on wagons, my parents' threatened / Destinations" (Crawford *Talkies* "The Glasgow Herald" 54 9-12). Recalling memories of World War II, when the speaker and his family made journeys with war machinery under the threat of the Blitz, the speaker then observes power stations and towerblocks in the post-war destinations. The ending of the poem recreates the initial melody, as he hears "[b]rushed by work hooters, the lyric blasts of a train" (Crawford *Talkies* "The Glasgow Herald" 54 15). The speaker's initial resemblance of the sound of welding to a serenade and the melody of the hooters and lyric blasts of the train recall Crawford's "Opera" which similarly stressed the ability of technology to inspire and

produce art. Besides, with its allusion to the national newspaper "Glasgow Herald," the poem gives news about the surrounding area as well as the industrial growth of Glasgow over the years following World War II, thus presenting an urban picture of Glasgow.

Yet another poem on Glasgow, "Glasgow 1989," captures the essence of the city as quite technological and marks change as its dominant element. Returning to Glasgow after ten years, a young Sikh visits Kelvinbridge remembering how the tenements in which he grew up have been turned into a park. In another demolished warehouse, a woman named Janice is sighted "xeroxing copyright music," while the "ex- / Railway bridge is just sky" and a "sculpted paper boat, berg-sized, / Floats off berths zoned for redevelopment" (Crawford *Talkies* "Glasgow 1989" 56 7, 8-9, 10-11). Redevelopment obviously transforms the city and for the better. Where tenements for underpaid workers used to be, now parks open up, and where ex-railway bridges used to stand is nothing but the sky now. The ending of the poem is optimistic as well, demonstrating that change is not necessarily for the worse but can be for the better as the word "redevelopment" indicates.

When so much of Scottish economy is dependent upon Highland attractions for tourists, Crawford unsurprisingly writes a poem on the urban condition of the Highlands, too. "Amazing Grace" mocks the traditional prayer, which gives thanks, by appropriating it to contemporary Highland life-style, which is a mixture of the urban and the traditional:

> For replacement neck skin after application
> Of locally-bottled midge repellents
> Sold at your netted Reception;
> [. . . . . .]
> For endless conversations about septic tanks
> [. . .] then that notice by the juice-tray:
> OUR SEPTIC TANK IS NORMAL AGAIN;
>
> [. . . . . .]
> [. . .] plus not pointing out
> Yon electric trouser-press was live;
>
> For disturbance caused by [. . .]
> [. . .] The Pibroch VIP
> Helipad immediately above;

> For these and other Highland hospitalities
> We of the Lowland Ascetic Church
> Are truly thankful.
> (Crawford *Spirit* 35 7-9, 13-15, 17-19, 20-24)

Midge repellents sold at the reception, electric trouser-press and VIP helipads illustrate how the traditional virtues of Highland life are abandoned for capitalist ends. Written from the viewpoint of Lowlander cleric-tourists, the poem illustrates the changes in Highland life-style with their chemical compounds, hi-tech devices and helipads. Feeling thankful for all of these Highland hospitalities, the poem ends with the final assertion that for these utilities the Highlanders will be in the clerics' prayers. Combining religion and science and technology with the traditional life-style that is associated with the Highlands, the speakers show how authenticity is a dream of the past in this age of technoscientific progress.

2.10. VIRTUAL REALITIES

Arguing that one needs to include virtual reality in poetry to make it more Wordsworthian because it was Wordsworth who was "the first to realize, twenty-first-century poetry in English must sound unWordsworthian if it is to follow Wordsworth's precept," an interest in computer technologies is often visible in Crawford's poetry (Crawford "*Spirit*" 59). Following the Wordsworthian guideline, then, Crawford eagerly includes within his poetry "a note of scientifically inflected modernity, as well as being attuned to [. . .] the 'divine' and 'the heart of man'" ("*Spirit*" 60). Specifically, *Spirit Machines* is remarkable in its attunement. The collection "examines fax machines, tape recordings, parallel universes and chaos theory but is always most concerned with the human dimensions of reality" (Stafford 241). Revealing his fascination with technology and science, Crawford says, they

> excite me most as metaphors. To restate, re-express spiritual and religious values in an age dominated, or at least processed by machine intelligences, is surely an exciting task. There is no reason why the visionary imagination (which, after all, produced these machines) should not be expressed through them; why the computer should not act as a way of figuring bereavement, the human and the computational reconnected; or why the multiplicity of the

> Web should not be a metaphor for or articulation of the many mansions of the Kingdom of Heaven. ("*Spirit*" 65)

In this light, Crawford frequently turns to computers for resource and employs programming language in his poems. "Time and Motion" encapsulates the importance of virtual realities in contemporary life in detail. The speaker is Crawford himself who observes his father who was a bank-teller. The poem opens with his father going through a check-up, all the while writing cheques and ordering banknotes, thus, identifying time and motion as the central elements of urban life early on. While paper-work downsized "tedious conversation" and forms everywhere ask "*Please insert your personal number*," communication is almost lost, except for a few random words ordering the speaker to remind her/his employees that "'time is money'" (Crawford *Spirit* "Time and Motion" 60 4, 6, 8 italics original). Money circulates "[f]rom hand to purse, from wallet to Geneva, / Auldhouse to Stirling, sterling-dollars, stocks, / Traded for credit" (Crawford *Spirit* "Time and Motion" 60 9-11). So, even in the transference of money which extends from the local to global, it gradually loses human contact and starts its existence in the virtual realm. As time goes by, the banking system, too, goes through a change like "an old spinning florin / Suddenly worthless, its long service / Abolished by the need to power ahead" (Crawford *Spirit* "Time and Motion" 60 15-17). Progress requires that old-fashioned customs are left aside in

> a fibre-optic age
> When money zoomed at light speed, or might
> At phone-call rate, then launch an e-mail panic.
> Liquidity called up an oceanic
> Tsunami of investment [. . .]
> [. . . . .]
> Through modems moving with no moving parts
>
> 24-hours
> (Crawford *Spirit* "Time and Motion" 60 22-26; 61 28-29)

Due to cyber technologies and the virtual existence of money on computer screens, material substance of money is not an issue any more. Gradually the old systems lose their significance due to the speed of high technology. While bank-tellers are replaced by "autotellers" which would dial people "by mobile phone" and the human agent is replaced by the computational, the speaker himself makes an appearance:

> I glared impatiently, zapped in from a future
>
> Run by lean boys with VDUs, while Dad
> Traitorously introduced me to his cronies
> Whom my cool generation would replace
> With cash machines. They vanished without trace
> (Crawford *Spirit* "Time and Motion" 61 33, 35, 42-46)

Looking like an alien from a futuristic novel, the speaker's consideration of his father's introduction stresses the alienation process which is the result of heavy reliance on technology. Having no patience to deal with his father's "cronies," the speaker's "cool" generation does in fact do away with the bank-tellers of old by their extreme reliance on technology, which is further emphasised by the vanishing act of the elderly group in the poem. Pointing out that the elderly are "[a]bducted by aliens who all looked like me, / And mumbled electronic dialect / Gawping at prehistoric, stacked punched-cards," the speaker continues that they will meet the elderly "only to smirk like misers, / Sussing their personal pension plans, suggesting / *Please insert your personal number*, / And [move] on fast because we [haven't] time" (Crawford *Spirit* "Time and Motion" 61 49-54 italics original). The elderly, who cannot keep up with the technological advancements, are erased from the poem. The poem also has a futuristic tone because of its description of a world where human interaction is reduced to minimum due to computer technologies. The mechanical repetition of "*Please insert your personal number*," which itself evolves from small-scale technology to hi-tech and is at first asked by a form, steadily appears on calculators, computer screens and cash machines, finally ending up on the lips of the speaker whose mechanisation process is, thus, completed. Stressed by the final lines, when they no more have time for their parents and the elderly, the mechanised youth are ciriticised for turning into unfeeling machines themselves, who have no difference from non-human agencies.

As for "Alford," the poem is named after the village where Crawford's father used to live during his adolescence ("*Spirit*" 66). Claiming that the poem is "about a kind of translation from and of this world into another;" that is from the material world of the Internet to the aerial world of virtual reality, Crawford employs them both as "suitable metaphors" to this end ("*Spirit*" 66). The poem opens with a description of the speaker surfing the internet, when he comes across "a site designed as an old harled manse, /

Sash windows opening on many Scotlands. / Through one surf broke on the West Sands, St Andrews, / And through another Glasgow mobbed George Square" (Crawford *Spirit* "Alford" 66 3-6). As these virtual windows expose vistas of many Scotlands, the speaker makes associations between personal history and Scottish history going through each window one by one and talking about the house in Alford, with its "hallstand's canny, digitized gamp / Pointed to fading pixels," his Aunt Jean, his grandfather Robert and, most importantly, his father whom Crawford had lost right before he started working on *Spirit Machines*:

> My father
>
> Walked me through presses with a map of Paris,
> Though all the names he used were Cattens, Leochil,
> Tibberchindy, Alford, Don Midmill.
>
> I understood. 'Virtual reality?'
> I asked him. In reply he looked so blank
> His loved face was a fresh roll of papyrus
>
> Waiting to be made a sacred text,
> Hands empty as the screen where he projected
> Slides of our holidays at Arisaig [. . .].
> (*Spirit* "Alford" 66 10-11, 24; 67 25-33)

The speaker sympathises with his father who despite his limited knowledge pushes the speaker forward. Associating the presses with virtual reality, the speaker surprises his father when he utters the words outloud. His father's surprised face, which is likened to a *tabula rasa*, is expectant both because it is about to process new information and because his son is going to honour him by writing a poem about him, thus immortalising him. Despite this, however, his father is evidently not illiterate in virtual reality as the next lines, where he arranges a number of slides, demonstrate. Ending the poem with a quotation in Greek taken from the Bible (John 14:2) and providing the readers with a translation of it in the very next line, "In my Father's house are many mansions;" Crawford celebrates both his father and the upcoming Internet age (*Spirit* "Alford" 67 44). In this sense, "Alford" uses the "Internet as a framing device, one that liberates the imagination. As the Internet telescopes geographies, times, recorded incidents, so does the mind in acts of remembrance, and does the dream-mind that produces poems" (Crawford "*Spirit*" 66). Furthermore, like the "fading pixels" of the

earlier lines, the poem emphasises a kind of bereavement that has to do with memory and the "simultaneous absence and presence [of the computers]; there's a sense of the dead person as intimately with us, ghosting our thoughts and actions, yet that very sense of haunting is also an indicator of absence: the person is intangible, gone, flickering" (Crawford "*Spirit*" 62).

Similarly, Crawford's "Deincarnation" makes much use of terms borrowed from the digital age, yet with one major difference; it also makes allusions to several Scottish scientists that made it possible:

> Each daybreak laptops siphon off the glens,
> Ada, Countess of Lovelace, Vannevar Bush,
>
> Alan Turing spectral in Scourie,
> Babbage downloading half of Sutherland
>
> With factors and reels, inescapable
> Whirring of different engines.
> Inverailort and Morar host
> Shrewd pioneers of computing.
>
> (*Spirit* 65 1-8)

Crawford speaks of daybreaks that clear the glens of rain in computational terms. According to Crawford "Deincarnation" "offers cyber-Highlands, Never-Neverlands, images of an uncertain otherworld. The computational and the spiritual/religious both feed off and clash with each other" ("*Spirit*" 63). Considered to be "the first programmer," mathematician Ada Lovelace was the "only legitimate child" of Lord Byron ("Ada"). Meeting Charles Babbage (1792-1871) in 1833 who shared with her his ideas of an analytical engine, the pair colloborated their efforts to develop the machine ("Ada"). Babbage later finalised the engine by building the first programmable machine (Bynum 251). Although he died before the foundation of the World Wide Web, Vannevar Bush is often regarded as the father of the internet ("Internet"). As an electrical engineer, he worked on analog computers and with his article "As We May Think," in which he argued "for the application of science in a field which is largely neglected by science" that is the "automation or augmentation of human thought," he created sensation ("Internet"). Last but not least, Alan Turing (1912-1954) was also a mathematician who, like Ada, was of Scottish descent and published extensively on

computer mathematics and artificial intelligence (Bynum 253). He also built "an early electronic computer called ACE" in London based upon his studies on factors (Bynum 253). In the poem, Turing's spectral existence refers to his virtual existence in the cyber realm.

Lovelace, Bush, Turing and Babbage are the pioneers of computer technologies whose inventions lead to computer technologies of today. With their distinct contributions, which drove their inspiration from the Highlands, they made the dream of a digital age come true. In the second half of the poem, nature continues to be affected by them. "Digitized" by losing its substance, nature is described as "[d]eincarnated and weightless. / [. . .] the tangible spirited away / Cybered in a world of light" (Crawford *Spirit* "Deincarnation" 65 9, 11, 19-20). This is where the core idea of the poem lies. Taking into consideration that reincarnation is the concept that the spirit begins a new life all over again after the body's death, what is meant by the title is a slow process of erasure during when the tangible slowly disappears as it starts a new life-form in the virtual world making what was once physical, ethereal. Crawford sums it up as follows: "'Deincarnation' [. . .] talk[s] about that sense of ghostliness, of clearance, of lost solidity that accompanies bereavement [. . .] of a computational, virtual reality world. So it talks about [. . .] becoming weightless, losing substance" (Crawford "*Spirit*" 63). In this respect, considering the virtual as "dematerialization of reality," he talks about the poem "not in terms of a new presence but an absence, a loss" because what is presented by the computer is not real but only virtual (Crawford "*Spirit*" 63).

His poem "CD ROM" is about a different type of technology which is still closely associated with computers: "Play me a CD of roofless cols, [. . .] / That gives up cuddies' stereophonic chewing [. . .] / Compact Disc (Read-Only Memory) / Means I can never rearrange a sound" (Crawford *Spirit* 59 1, 3, 7-8). In the poem CDs are treated as keepers of memory. Collecting different types of melodic sounds, their only disadvantage seems to be that they are "Read-Only." So, it is not possible to turn back and make changes with the sound once it is recorded. Same is valid for the speaker's wedding day. Drawing parallels between a CD and the past both of which the speaker cannot undo, the poem moves away from the "faltering" voice of the marriage day to the "[n]ewborn, max-vol, needy yells" (Crawford *Spirit* "CD ROM" 59 11, 12). Thus,

keeping a memory of the couple's newborn's cries, CD's inability to be overwritten is identified as what makes it safe as well: "Still sound exactly as recorded / Throwaway, absolute, unremixable / Teasing the rapt ear forever" (Crawford *Spirit* "CD ROM" 59 13-15). Crawford considers this as the hallmark of the "spirit machines" since they work both ways: "Memories feed the machine, the machine holds memory. The machine too dies, is replaced—not a soul, but a body through which the spirit can be known" ("*Spirit*" 52). Therefore, like "Deincarnation," the recorded sounds continue to exist in a different life-form in the virtual realm.

For "The Digital Library, St Andrews," keeping a record of things is a major issue. Yet, this time rather than memory it is cultural artefacts that are facing the threat of oblivion:

> Here in Scotland's oldest bookhoard
> Used since the Middle Ages,
>
> From secret seams of inked enlightenment –
> [. . . . .]
>
> How many hops, skips, and jumps
> To the right conclusions it took to slip
>
> Into this tip-tap Aladdin's–Cave–
> [. . . . .]
>
> Where laptops open like thick-leaved books
> The flatpack wealth of nations
> (Crawford *Full* 43 1-3, 7-9, 11-12)

Dedicated to his wife who works as a librarian, the poem opens with a kenning resembling a library to a bookhoard. Then, the poem moves on to the Enlightenment, which was made possible due to the huge number of books published at the time. Making references to several other Scottish libraries, like Wanlockhead Miners' Library and Perthshire, the speaker steadily reveals the process from printed books to electronic books. Finally, in this magical realm of "free-for-all," the books are transferred into the virtual realm whereby laptops, which themselves are likened to books, disseminate the wealth of nations to the generations; the wealth of nations being a reference to Adam Smith's seminal work (Crawford *Full* "The Digital Library, St Andrews" 43 10).

Crawford views the digitisation process as a must in order to preserve what may otherwise be lost forever:

> Acts of recording, from names and dates on gravestones, to talking about or writing about the dead are natural, but the very word 'recording' carries with it for us now connotations of science and technology. Often 'recording' happens today through photography, or through digitization. If one thinks of the great digital collections and encyclopaedias being assembled by various computer companies, these are like sacred archives, designed to ensure the imperial 'capture' of all that is deemed valuable in the world; [. . .] digitally frozen through a kind of cryogenic impulse to preserve what is fading away. ("*Spirit*" 65)

Also concerned with the virtual realm, "Broadband" uses allusions to wireless technology and borrows heavily from its terminology. Technically denoting miscellaneous types of data transmission in wireless technology, broadband is one of the most crucial elements in telecommunications:

> Search engines crawl
> The cloned net, combing
> Each pixeled word
> [. . . . . .]
> That web of heaven
> [. . . . . .]
> Where the lost
> Are found
> Spellbound
> At their screens
> [. . . . . .]
> And our rushed lives
> Dwindle into mobile phones
> (Crawford *Full* "Broadband" 38 1-3, 6, 9-12, 23-24)

Internet is identified as cloned, for it is based on an imitation of "[t]hat web of heaven" where every answer is originally stored. Described as if it were a religious mania where "the lost / [a]re found," from search engines to the internet, each digital word to the World Wide Web, virtual reality has progressively invaded everyone's lives mesmerising people with its findings, while simultaneously reducing lives to smart phones. In the poem Crawford relies upon his own experiences when he used a computer for the first time:

> I still remember the very naive sensations I had as someone who had had this machine [. . .]. I had the experience of great plenitude and that all sort of things could be conjured up in an almost magical fashion there on to the screen, and yet if there was something wrong, you couldn't just reach inside and sort it. You couldn't really touch the stuff, because it wasn't there, it was only virtual. It was both present and absent. That seemed to me, metaphorically, to give me a language for talking about kinds of love and bereavement and kinds of religious belief which are often very much about presence and absence, and about one turning into the other or being difficult to disentangle from the other. (Dósa 95)

As people continue to look at their computers; spellbound, their hectic lives are reduced to numbers in an image which very much recalls the ideas that are raised in "Time and Motion." In the face of these developments, the speaker is dumb-founded. Not knowing what to do, he starts to pray that "[n]o human ear / Will ever have to bear / The world's full volume" (Crawford *Full* "Broadband" 39 35-37). Religious resonations of the poem become clearer in these final lines, as the wish of people to become all-knowing is problematised in an echo of Strickland's observation: "We are overwhelmed, not only by proliferation of paths that hypertext provides, but by an explosion of data. Data has gotten beyond human ability to process it unaided" (107). Questioning whether humanity is ready for such a boom; the speaker ends his words on not a happy note. Rather; in an image which reminds one of Moses's wish to see God in His full glory, the speaker warns people of the possible dangers of their wish to become all-knowing with their limited capacity.

Similar to "Time and Motion," "Killer" and "Exchange," too, employ financial discourse, in order to stress the lack of material substance of money which has been replaced with the virtual in contemporary world. Likened to computers of which "rather bodiless tone made me think of the dematerialization of money involved in such processes as electronic cash transfer and the late-capitalist rush towards 'branding' and image, away from chunky manufacturing substance," electronic money transfer interests Crawford much due to his father's profession largely ("*Spirit*" 64). Familiar with the terminology because of his childhood experiences, in "Killer" Crawford describes a stockbroker who works onscreen chasing figures all night long, since "all the time / A new market [opens] up" (*Talkies* 74 5-6). As the speaker, who is identified as the killer, continues his thrilling hunt through screens, his experiences are told as if he was

gambling: “When I logged on I felt lucky. Sammy / Knew all my signals [. . .] / We made a killing” (Crawford *Talkies* “Killer” 74 23-24, 26). However, his luck seems to desert him soon as new figures show onscreen and he despairs: “Christ. We lost millions” (Crawford *Talkies* “Killer” 75 36). Online interaction with money is highlighted in the poem, when, in about seconds, the speaker goes from one extreme to another. Even though everything happens in the realm of the virtual, its effects are real.

“Exchange” problematises the existence of money in the virtual realm resembling its presence to a limbo-like existence. Written in prose, the poem opens with the viewpoint of the speaker on the appeal of money: “Promising always to pay the bearer, money aspires to the condition of purest spirit. Divesting itself of carnal assets, it sheds its own metal and metal-stripped-paper body” (Crawford *Spirit* “Exchange” 62). Money transfer not only ends up in its circulation from one person / place to another, but also necessitates the transformation of its primary element. Hence, the elements which may be either in the form of metal or paper, changes from atoms to pixels on the screen. The exchange, then, also occurs on a molecular level: “Now shapeless itself, its body deferred forever, money promises all cybery shapes: an immortal form of starry-eyed silence, a harsh white heron of exchange” (Crawford *Spirit* “Exchange” 62). Despite its intangible form, money is still influential emphasising once again the absence and presence that Crawford observes in anything virtual.

Crawford’s “Really” presents a different kind of romance from Crawford’s previous love poems. The poem touches upon the issue of love in the contemporary age. In the age of virtual reality, Crawford naturally turns his attention to online dating and how a probable chat would go as the speaker repeatedly tries to make herself believable in this simultaneously real and unreal virtual universe: “Hi I’m Lois I’m lonely [. . .] / Want to chat with me? I love chatrooms / [. . .] I’m really feral I’m twenty-one / I love chatrooms Want to chat with me?” (Crawford *Full* “Really” 41 1, 2, 3-4). The poem, thus provides a pastiche of chatroom discourse where, despite the title, the speaker is disseminating lies rather than truths. The fact that she cannot be trusted is stressed especially in the final line where she reveals that she will be “sixteen” next year

contrary to her initial claims that she is twenty-one (Crawford *Full* "Really" 41 28). As the adressees change, her interests too change accordingly:

> I temp as an archaeologist but mostly do modelling
> I love ballooning and bathyscaphing
> I've lots of piercings I love liquefied oxygen
> [. . . . .]
> Don't you think logarithms are really depraved?
> [. . . . .]
> I live in a cage of iron and glass Want to chat with me?
> (Crawford *Full* "Really" 41 8-10, 13, 18)

The "cage of iron and glass" mentioned in the poem is a reference to computers which are made out of glass and iron ores, in addition to several other elements. Besides the false information she spreads, the speaker claims that she makes "lots of aluminium" and also gets "really excited about geodetic surveys" (Crawford *Full* "Really" 41 21, 24). As is implied by her ever-changing attributes, the speaker is trying to appeal to those who are interested in science as well as those that are interested in good looks and outdoor activities. Her lies undermine the truth concerning the title of the poem and make reality an ironic one in the virtual realm.

As for "Haiku," it emphasises the role of cyberspace in relationships in the contemporary age:

> From that first email
> We were living together
>
> [. . . . .]
> Messaging, apart,
>
> In that otherworld
> Where we met when we emailed
> [. . . . .]
>
> In that fingertip waiting
> You are my reply
> (Crawford *Full* 42 1-2, 6-8, 11-12)

Although the theme of the poem is a conventional one, the traditional haiku form is renovated. While communication takes place over computer network, the lovers are

united in that "otherworld" of virtual space; both together and apart. Cyberspace, thus, allows the lovers a third space where, waiting for an answer to her/his messages, the speaker knows that her/his lover/beloved is the real answer.

2.11. CONCERN WITH NEGATIVE ASPECTS OF SCIENCE AND TECHNOLOGY

Apart from its benefits, the developments in science and technology introduced a new set of problems. Crawford voices the negative effects of science and technology just as surely as voicing their advantages. He says, an "awareness of science and technology, in their lighter and darker manifestations, continues to be important to me as a poet" (Crawford "*Spirit*" 67). According to Walker, the tendency is only natural due to the "inescapable duality of science – benefactor and malefactor of mankind [which] has caused poets both to praise and condemn science. They have lavished science with almost god-like qualities – this noblest of man's endeavours – while simultaneously [. . .] criticizing its degradation of man and nature, and decrying its relevance to man's true concerns" (*Twain* 245). Ranging from experiments-gone-bad to environmental problems, Crawford's poetry presents a wide variety of these crises.

To begin with, "Lord Peter Splits a Gut" deals with environmental problems and the controversial issue of nuclear power plants in a sarcastic manner. Presented as a live reportage, the police's attempts to condemn Lord Peter, because he has been drinking, proves futile as he indicates that he has been "dining with [his] old friend, the Chief Constable" (Crawford *Talkies*, "Lord Peter Splits a Gut" 69 4). Not interested in that piece of news, the reporter from "the *Daily Yell*," inquires after his views upon "mutant prawns" which are "creeping again" instead (Crawford *Talkies*, "Lord Peter Splits a Gut" 69 6, 7). Yet, Lord Peter apparently could not care less. He finds the situation funny, thinking to himself that "[t]here's a Labour Government" to deal with the problems in addition to put the blame on, if something goes wrong (Crawford *Talkies*, "Lord Peter Splits a Gut" 69 13). He, on the other hand, has to think about nothing and instead wonders whether Lady Boak is wearing "the diamonds," and what to "wear to a Nirex plant in Dundee" himself (Crawford *Talkies*, "Lord Peter Splits a Gut" 69 11, 14). The poem, thus, ironically reveals what happens, when science and technology remain

the monopoly of the wealthy aristocracy who could not care less about the rest of society. Crawford, hence, warns the readers to be environmentally, as well as technoscientifically conscious in order to criticise the policies of both the government and wealthy industrialists.

Similar to the "mutant prawns" in "Lord Peter Splits a Gut," "Experiments" presents a series of experiments that have gone bad: "Engineers are munching toadfruit / With Ovid Surprize. A duck barks. [. . .] / Peaceful. Only the mewing of cattle / [. . .] But the horse weeps [. . .] / 'They hate me because I am human'" (Crawford *Scottish* 60 1-2, 5, 7, 8). A barking duck, mewing cattle and a weeping horse, who believes it is hated because s/he is "human," presents a chaotic picture of a laboratory experiment that went bad. Apparently, the last experiment has gone wrong in this mad scientist's dream which has led to the identity crisis experienced by everyone in the lab including both the animals and humans. The after-effects are not limited to this, however. Aside from the anthropomorphised animals, it is "Ovid Surprize" that catches the attention. Re-naming the popular children's snack "Kinder Surprise" as Ovid Surprize, the poem enriches the literary allusions of the poem. The reference is clearly to Ovid's *Metamorphoses*, which deals with similar transformations. Although presented humorously, the poem functions as a warning to scientists who work on genetic modification.

Even though no one is openly held responsible for the accidents in "Experiments," the culprit of "The Bad Shepherd" is very much in the foreground: "I am the bad shepherd, torching my flocks in the fields, / Feeding them accelerant, hecatombs of wedders and tups. / In pits or pyres all are sheared and shamed by the flames. / Every sheep is a black sheep in that fire" (Crawford *Tip* 15 2-4). This is the mad scientist who went unidentified in the previous poem. Feeding chemicals to the sheep in order to accelerate their growth, he works on their genes, too: "Cloned palls cover Cumbria" (Crawford *Tip* "The Bad Shepherd" 15 10). Calling everyone to follow his example in his final cry, the bad shepherd represents the scientists affiliated with the human genome project who extended their research to cloning later on and succeeded in this with the cloning of the sheep, Dolly, in Scotland in 1996 (Bynum 238-9). Crawford consequently advises

scientists to re-consider their Promethean journey which might prove to be hazardous in the long run.

From these amusing but equally disturbing images, Crawford turns to criticism of the atomic bomb in his "Laughing Giftball." Stating that ever since "Fermi split the atom [. . .] [s]cience and poetry are drawn together," Armstrong regards them both "as fields of imaginative activity" with "the Fall [. . .] retold as nuclear physics" (85-6). Crawford's poem confirms this approach. Introduced by a call to a sales clerk over the phone, the poem trivialises the menacing quality of the object in a humorous style: "Yule-wrapped in its resilient mucusine box, / Laughing Giftball puts the bounce into Christmas. / [. . .] For safety, keep Giftball away / From liquid helium, elderly persons, or water" (Crawford *Spirit* "Laughing Giftball" 33 1-2, 7-8). On the surface, described as an alluring object which sounds as innocent as a children's toy, the hazardous qualities of it become even clearer when its side-effects continue as follows: "Giftball can emit a tone / Occasioning nausea and infrequent anal bleeding; / However, when propelled at the correct velocity, / Giftball will not shatter into shrapnel-like, lancing shards" (Crawford *Spirit* "Laughing Giftball" 33 11-14). Even when not activated, the Giftball causes mayhem. The ironic statement, "[l]aughing," indicates how the ball will be the winner in the end laughing at humanity's gullibility, once it is activated. In this light, the Giftball can be considered as a modern-day Trojan horse whose misleading appearance will unleash chaos once it is activated, despite its innocent look.

Crawford's "Zero" also deals with the issue of nuclear arms in a parodic manner. Mimicking a call-centre's information about its sales catalogue, the poem reads:

> If your main lust is for weapons of mass destruction
> Please try our other number in Inverbervie.
>
> On your touchtone phone jab one for details
> Of bombs that kill crofters but leave brochs and megaliths standing;
> Two for snug dumpsites; three for pre-owned
>
> Atomic oddments with warranties for several years
> (Crawford *Spirit* 34 2-7)

Like “Laughing Giftball,” “Zero” makes light of the issue in a playful manner. Counting up to nine, with the depiction of all sorts of nuclear toys, the poem ends with a warning ordering “Do not press zero” (Crawford *Spirit* “Zero” 34 21). Questioning the availability of nuclear arms, Crawford in the poem emphasises the destructive effects of science and technology in the light of what science has caused specifically after World War II when the horrors of nuclear physics were revealed through Nagasaki and Hiroshima which “offer[ed] little that seemed attractive, beyond an engagement with the death drive” (Armstrong 84-5). In addition, Crawford criticises lack of supervision of these devices.

Contrary to the weapons of massive destruction implied above, “Remote” deals with a small-scale scientific destruction which depicts a group of people who “[i]gnorant of the gas, [. . .] locked themselves / Indoors and suffocated. Cows dropped in the fields. / ‘We thought that factory made medicine.’ / Girls rub eyes sore with videotape” (Crawford *Scottish* 38 1-4). It seems that the factory produced something else than medicine. Besides making the dubious aspect of science clear, the poem also criticises the media’s treatment of the topic: “Use the remote to fast-rewind rough hands / Reaching through leaves, then replace the cassette. / What has that stuff to do with being nice / To Ken and Eileen’s kid who’s not quite there?” (Crawford *Scottish* “Remote” 38 7-10). Criticised for not covering the news before it was too late, the speaker considers media equally guilty, while Crawford reminds media of their primary responsibility towards the society. Underlining the necessity of control mechanisms in scientific establishments, Crawford, yet, does not condemn the sciences, but the human agencies responsible for the exploitation of the sciences.

In conclusion, it can be said that Robert Crawford’s science poems, unlike Morgan, rely heavily on technoscientific language for figurative purposes. Compared to Morgan, Crawford’s poetry is mostly lyrical, which reinforces a subjective tone that reflects subjective experiences via technoscientific figures of speech. Defending co-existence of sciences and humanities, Crawford argues that an interdisciplinary approach and an integrated worldview are the requirements of the present age. Relying upon science and technology for metaphors to defamiliarise conventional perceptions, Crawford attempts

to construct a Scottish national identity through terms and elements borrowed from the sciences, as well as rewriting Scottish history through its science and scientists. By juxtaposing Scottish scientists and discoveries with Scottish authors and literary works in his poetry, Crawford attempts to paint a technoscientific panorama of Scotland. In addition, his poetry foregrounds a microcosm-macrocosm relationship which sees each in all, thus emphasising a biocentric worldview. Very interested in the development of virtual realities which, according to him, represent an "absent presence," Crawford sets his poems against an urban setting which comfortably welcome the changes that come along with the sciences. However, unlike Morgan, Crawford emphasises the negative aspects of urban life just as surely as its positive aspects. Taking recent scientific experiments into consideration, Crawford voices his concerns regarding some of the possible results of experiments that may prove hazardous or fatal to mankind.

CHAPTER III

DAVID MORLEY

> If then we consider, on the one hand, the essential similarity of man's chief wants everywhere and at all times, and on the other hand, the wide difference between the means he has adopted to satisfy them in different ages, we shall perhaps be disposed to conclude that the movement of the higher thought, so far as we can trace it, has on the whole been from magic through religion to science. (Frazer 1658-9)

Studying the progress of belief systems in different cultures in his seminal work *The Golden Bough* (1890), the Scottish anthropologist James Frazer observes that the whole process can be divided into three stages. The first one, an Age of Magic, is replaced by an Age of Religion which subsequently is replaced by an Age of Science. Observing similar archetypal patterns in different parts of the world, Frazer claims that as far as "theories of thought [are concerned] [. . .] science has supplanted its predecessors, so it may hereafter be itself superseded by some more perfect hypothesis, perhaps by some totally different way of looking at the phenomena [. . .]. The advance of knowledge is an infinite progression towards a goal that for ever recedes" (1662). Although scientific research has proven the contrary by raising more questions with each passing day, in spite of the tremendous amount of answers it has provided; the rest of Frazer's observations stand valid enough. Faith in magic has truly been replaced by faith in religion and, at present, with belief in science.

David Morley's poetry is exemplary of the shift of interest from magic to science in society, for a firm belief in science lies at the foundations of his poetry. Relying particularly on life sciences, Morley's poems reflect how contemporary science poetry makes use of factual data, scientific reports, field-trips and laboratory observations just as easily as any other given subject. In his collections, Morley employs these elements and methods in addition to graphics, statistics and mathematical formula. The aim of this chapter is to analyse David Morley's contributions to contemporary British science poetry in showing the sciences as the hallmark of the contemporary age. Stressing science's inseparability from contemporary experience, Morley's poems can be read as scientific experiments which give information to the readers about the materials and

methods employed and the analogies that are created. Particularly the life sciences like zoology and botany remain among Morley's main interests alongside a keen awareness of current ecological problems. In this sense, his poems may be read as attempts to renew the impaired human-nature-animal bond, and Morley's ideas in his poems appear to be very much in line with the posthumanist theories of today.

Born in 1964 in Blackpool, Lancashire, David Morley studied zoology at the University of Bristol (Kuhfield). Upon graduation, he received a scholarship from the Freshwater Biological Association for research on acid rain ("David: Biography"). Morley worked there until the "closure of his ecology laboratory by Margaret Thatcher in 1988" ("Environmental"). Since 1996, he has been working at Warwick University. Defining himself as "an ecologist and a naturalist" by background (Kuhfield), in a way, the closing of Morley's lab proved to be "a catalyst for him to re-focus his work on his other passion – poetry" ("Environmental"). He turned out to be "a poet for whom science, language, and the natural world all meet at a point we might call 'meaning'" (Kuhfield). As a prolific author, he has published extensively. Morley's publications comprise twenty-six books, fourteen of which are poetry collections, and several edited critical works. He also gained fourteen literary awards and won "two awards for his teaching" ("*Night*"). In his work, "he makes extensive use [. . .] of his double heritage of Romani and English – two conduits of the secret knowledge, or lore, that makes a culture. His poetry collections and digital projects include translations of [Osip] Mandelstam, explorations of scientific method on language, projects based on natural history and the environment, and poems written half in Romani" (Kuhfield).

Arguing that "poetry could be misunderstood as inaccessible or irrelevant in today's fast paced society," Morley relies on science and technology to make it more accessible to audiences ("Environmental"). Thus, aiming to emphasise "the role of this important art in everyday life" ("Environmental"), Morley is "known for his pioneering ecological poetry installations within natural landscapes and the creation of 'slow poetry' sculptures and I-Cast poetry films. [His] creative writing podcasts are among the most popular literature downloads on iTunes worldwide" ("David"). His "slow poetry" project is particularly significant in that his slow poems consist of "ankle-high haikus,

and longer poems on fabric and wooden easels [. . .] which creates public art aimed at expressing and reinforcing local identities and sense of place. The poems are in place along a nature trail, intended to be taken in slowly, in context, and to remain there until they fade naturally" (Kuhfield). This is just one of the ways in which Morley brings two of his passions together in his poems. He not only includes elements of science and technology but also relies on nature, as much as on several technological devices, to make his poems more available.

Morley's poetry collections consist of *Releasing Stone* (1989), *A Belfast Kiss* (1991), *Mandelstam Variation*s (1993), *A Static Ballroom* (1994), *Clearing a Name* (1998), *Scientific Papers* (2002), *Of Science* which is a collaborative work with Andy Brown (2002), *Ludus Coventriae* (2003), *Invisible Kings* (2007), *The Night of the Day* (2009), *The Rose of the Moon* (2009), *Enchantment* (2010), *The Gypsy and the Poet* (2013) and lastly, a selection of his poems *The Invisible Gift: Selected Poems* (2015). Of his collections *A Belfast Kiss*, *Clearing a Name*, *Ludus Coventriae*, *The Night of the Day*, *The Rose of the Moon*, *The Gypsy and the Poet* deal specifically with his Romani heritage. His *Mandelstam Variations* (1993) is dedicated to the Russian poet Osip Mandelstam whose poetry inspired Morley to write about Mandelstam's exile years and experiences under Stalin's government. Most importantly, however, what is plainly discernible in his poetry is his interest in science and technology which he frequently makes use of in his works.

Of these collections, *Scientific Papers*, *Invisible Kings* and *Enchantment* function as a trilogy in which Morley's poetic ideals are observed. His *Scientific Papers* (2002) opens with a quotation from Osip Mandelstam whose deliberations on Darwin lead to Morley's ideas of poetry which Morley expresses as follows: "*I have in mind the law of heterogeneity which encourages the artist to seek to unite in one from the greatest number of sounds, concepts of various origins, and even antithetical images*" (*Scientific* 9 italics original). Morley asserts that the sciences and humanities are antithetical images, which, however, can be brought together: "*The concept of this text is that each piece of writing is a scientific paper in itself, a series of findings. The practice of writing science and poetry are, for me, carried out with the same eye and ear, and in the same laboratory of language*" (Morley *Scientific* 85 italics original). Recalling his fellow

poet-scientist Miroslav Holub's ideas that the sciences and humanities share the same medium of language, Morley expresses the central metaphor and the principles that his collection rests on in the following fashion:

> *An acceptable scientific paper must be the first disclosure containing sufficient information to enable other people to do three things: assess your observations, repeat your experiments, and evaluate your intellectual processes. Your position has everything to do with a system of reporting that is concise and readily understandable. Each paper must be susceptible to sensory perception and essentially permanent. Without publication science is dead.* (Morley *Scientific* 11 italics original)

Likewise, Holub defines the singular purpose of a scientific paper as "to make statements that are not an end in themselves, but the matter of verification for future experimentation or for a present or presented theory" ("Poetry" 56-7). *Scientific Papers*, hence, provides an insight into Morley's own ideas concerning the union of sciences and humanities in contemporary poetry. Correspondingly, the "'truth" of poetic statements is acceptable or verifiable by some attitude, within the framework of mood, style, and reference of the poem'" (Holub "Poetry" 58). Scientific and poetic statements demonstrate parallel goals despite their differences. The approach of sciences is to transmit "unequivocal information about one facet of a particular aspect of reality to the reader, and to the collective, anonymous thesaurus of scientific data. The aim of poetic communication [,on the other hand,] is to introduce a related feeling or grasp of the one aspect of the human condition to the reader, or to the collective mind of cultural consciousness" (Holub "Poetry" 58). As a result, both scientific and poetic communications "involve intellectual-emotional presence. In addition, both are concerned with the establishment of a lasting memory, of intellectual or intellectual-emotional debris in the individual mind and in the collective mind of culture" (Holub "Poetry" 58).

Morley's *Scientific Papers* in its present form reflects Holub's ideas about scientific papers which, according to Holub, should be "based on a proven narrative structure of introduction, technical elaboration, and almost instantaneous presentation of the findings where the graphic, numeral, or condensed textual statements sometimes attain the value of a revealing metaphor" ("Poetry" 58). In his collections, Morley employs all

these qualities relying upon graphics, statistics and mathematical formula to make his viewpoint evident, thus giving clues to his readers about the materials and methods employed in sciences through the analogies he creates.

3.1. TECHNOSCIENTIFIC LANGUAGE

According to Middleton, contemporaneity requires that the poets depend on technoscientific discourse: "Just as poets once drew on neo-Platonism, or classical mythology, or Christian eschatology, they now surprisingly draw on the imagery employed by our new cultural masters, the scientists" (197). As confirmed by Frazer earlier, the Age of Science necessitates this. While for a group of Victorians science was frightening, and for the modernists it was regarded as "the enemy of imagination, [. . .] another prominent strand of modernism, influenced by Italian futurism, celebrated the machine age" and encouraged that "'a negative attitude towards modern life' and particularly 'Machinery' should be replaced by a more 'positive equilibrium'" so that "scientific development and technological change have been central to notions of modernity" (Armstrong 78, 76). Fearful that

> poetry has become an increasingly marginal and arcane activity, no longer granted the cultural centrality it had in the nineteenth century, it has [. . .] sought cultural authority and justification for its experimental stance through recourse to scientific metaphor. Poetry has incorporated science, then; but it has also continued to make Arnoldian claims that it offers a way of seeing the world with more fidelity to human experience than science, and the ability to bind knowledge into the human subject where science disperses and objectifies. (Armstrong 76)

By way of incorporating technoscientific discourse and offering a critique of it at the same time, Modernist poetry presented "a partial contradiction, representing an ambivalence which is itself one of the keynotes of [M]odernity" (Armstrong 76). Recuperation occurred a century later with the introduction of Einsteinian theories of physics. With him, the world regulated by rules of science became "so abstract and hypothetical that it came to seem like a kind of poetry" itself, thus healing "the gap between the subjective and objective worlds" in the process (Armstrong 78).

One other thing to consider is that despite the fact that science and technology is very much central to contemporary life styles nowadays, they are still confined to the laboratories of a small select minority whose definitions of scientific phenomena differ from the public's understanding of science and technology widely. So, scientists, too, need someone to transmit their ideas to the public primarily because "[s]cientific papers have relatively short citation lifetimes compared to the span of significant literary works" (Middleton 198), and secondly because "publicity for scientific paradigms often conceals the actual character of science as it is practised in laboratories or the field, which remains poorly represented by popular accounts" (Middleton 197). The need for transmission for scientific ideas lead to widespread publication of popular science books in recent years, and poets also aid scientists in their mission to make science and technology more accessible.

"On Fire," which was first published in Morley's *Releasing Stone* but later on renamed as "Rodin's Physics" and republished in *Scientific Papers* with slight differences, demonstrates such an attempt to make science available in poetry. The poem introduces fire, earth and air as the dominating elements of the poem: "Smoke withers into life. It flows to an opacity / and its deft stone is cut from the sharpest energies / in fire: a compliance, a pliant slate of smoke, / a broken form turned blunt-end to the ground" (Morley *Scientific* 71 1-4). Whereas the original title of the poem puts the emphasis on fire, in the latter instance it is on the elements that give shape to the French sculptor Auguste Rodin's sculptures. The elements' transformation at the hands of the artist also reveal a scientific progress as fire reduces the original form of the stone and the oak to air: "The flame-points swell with wings and cobbled smoke. / Masking a fist, you weave in half-burnt oak / and stand away, watching how the falling-up of heat / quarries the air of flakes and its finity" (Morley *Scientific* "Rodin's Physics" 71 6-9). The states of the matter as solid, gas and plasma are visible in the poem. The heat that reduces the solid form of the wood to "a pliant slate of smoke," likewise, gives shape to Morley's poem.

Resemblances between the artist and a scientist are also emphasised in the poem. While Rodin gives shape to his creation, physics is what is actually at work during the process.

Once the chemical process starts, fire consumes matter in order to release energies of heat and light allowing the sculptor to work on his art. Similarly, the speaker, who is inspired by the scene, puts her/his creative faculties into the poem as follows:

> A Sculptor works less openly,
> releasing stone in secret,
>
> scraping out caves to find their captive,
> hands like drills. The binds of stone
>
> shrivel to his touch: a plying flame
> as if fumbled out of smoke.
> (Morley *Scientific* "Rodin's Physics" 71 10-15)

Like Rodin, who relies on science to produce art, the imagery that is employed by the speaker inspires her/him to give shape to the poem. As the sculptor shapes the stone to reveal the secrets it holds, the speaker overlooking the scene regards Rodin more like a scientist with his drill-like hands than an artist and relies on science to explain the transformation of the raw material. The observation of the scene in scientific terms as a transformation of elements, then, acts as the catalyst behind the formation of Morley's poem.

Included initially in *Mandelstam Variations*, "'I Grow a Wasp's Eyesight Behind My Eyes'" is another example of Morley's use of technoscientific discourse in his poetry. The poem is a variation of one of Osip Mandelstam's poems which also gave its name to one of his post-mortem poetry collections, *The Eyesight of Wasps: Poems* (1989) translated by James Greene ("Osip"). *Mandelstam Variations* has its inspiration from Mandelstam's exile years under the socialist rule of Joseph Stalin (Barker 75). Having escaped a severe punishment during his first exile, on account of his "'counter-revolutionary activities'" (Morley *Mandelstam*), Mandelstam was sentenced to exile a second time in Siberia where he died in 1938 before even making it to his designated place ("Osip"). In this sense, the wasp, serves as a symbol of creative energies in Morley's poem as his interrogators torture Mandelstam to reach the source of his creative powers:

> I grow a wasp's eyesight behind my eyes.

> It storms my head with needles
> [. . . . .]
>
> My head's on fire. [. . .] There's a flicker
> of yellow on my retina the shape of Georgia.
> Inside that, a man with mask, gloves, flail,
> swipes at a nest the size of the earth.
> (Morley *Mandelstam* "'I Grow a Wasp's Eyesight Behind My Eyes'" 26 1-2 6-10)

Considering that Mandelstam was sentenced to exile the first time because of his essays and poems, the poem touches upon the experience by marking the space behind his eyes as the source of his poetic inspiration. As words strive to get out, they cause pain to the poet and, apparently, once they are outside, the torture continues due to widespread persecution of writers expressing dissent that was carried out in Soviet Russia. Drawing parallels between the medical procedure of removing a tumor, the interrogation and a creative practice, Morley employs scientific discourse to shed light on a political and a historical situation.

Morley's "The River" is also concerned with Osip Mandelstam. The poem gives an account of Mandelstam's attempted suicide during his first exile ("Osip"). Describing Mandelstam while he admires the flow of an unidentified river, the poem opens as follows: "Low pressure over Voronezh. / The barometer held its breath. / I'm foot-slogging snow drifts / at the edge of the world. / It's a virtual white-out" (Morley *Mandelstam* "The River" 58 1-5). The snow that settles on Voronezh gives the place a kind of unreal appearance, as well as filling the speaker with a sense of serenity. Thinking about it for a short while, he suggests "[a] river might be pleasant / free-flowing, heading somewhere. / I'd follow it, try my hand with flotsam, / go all the way…" (Morley *Mandelstam* "The River" 58 8-11). Looking for a way out of the limitations that are put on him by the Soviet Union, Mandelstam decides that the river might be a good option because it eventually leads somewhere, unlike his catatonic state which will not allow him to express himself or travel freely. In this way, nature offers him a way out, although a risky one; since the river could either float or drown him.

"Two Temperatures for Snow" uses scientific discourse to discuss state violence through the imagery of two different states of snow. At first the allusions of the poem are ambiguous. Separated into two parts the initial part presents an ice land:

> Nothing will grow
> under her rule, as Signs will tell you at every corner.
>
> But when she invites you to her Ice Festival
> you will learn to love Slowfreeze and Nightflake,
> her daughters by sunless adoption. [. . .]
>
> [. . . . . .]
> You are falling out of life.
> (Morley *Scientific* "Two Temperatures for Snow" 46 5-9, 12)

The poem treats the threatening side of snow in a trivial manner by almost romanticising it. However, as lovely as they sound, the threatening presence of slowfreeze and nightflake which lead to frozen tissues and cells carries a distant echo of Morley's *Mandelstam Variations*, where people in exile died in huge numbers. The latter part of the poem, contrasting with the form of snow as ice, presents an image of melting snow. The significance of this part lies in the fact that the thaw makers make the looming danger a reality.

When the speaker is about to lose her/himself in serenity in the first part of the poem, an abrupt transition to the second part occurs. While the speaker is about to deliver an emotional image of snow-as-ice, stating "touch / where the words enter the water" the second part hastily cuts her/him off in the middle of her/his words and begins:

> and do none of these things. Call at the office.
> When someone says yes the answer is no.
> File your dockets in bin bags for burning
>
> the moment when a stranger rides up in the elevator.
> [. . . . . .]
> Avoid words like informer, auditor, police.
>
> There are things in the wall very like ears.
> (Morley *Scientific* "Two Temperatures for Snow" 46 20-21, 22-25, 27; 47 28)

The association with *Mandelstam Variations* becomes visible here as the speaker desperately tries to avoid her/his tormentors, but, unable to do so, ends up repeating "yes" after them (Morley *Scientific* "Two Temperatures for Snow" 47 34). Peace is allowed to the speaker only through the image of snow:

> Then, peace,
> a dream of snow, cold hands holding you,
>
> which you love; that lift you to where water
> rushes over your face. Will you dance, dance?
> Only so slowly. Melting, melting.
> (Morley *Scientific* "Two Temperatures for Snow" 47 35, 36-39)

Thus, the previously comforting image of snow which then melts at the hands of her/his interrogators signifies that the speaker's dreams are also crushed. The solid and liquid states of snow are employed metaphorically to represent the dissolution of the speaker's own self, as her/his form also changes due to outside factors. As her/his form changes from rock solid to pliant, s/he subsequently accepts whatever her/his tormentors accuse her/him of willingly.

In "The Ideal," Morley leaves politics aside and concentrates simply on the physics of light. The speaker of the poem describes a sunset as follows:

> [T]his physics of light-
> scattering; how wavelengths are also fronts, war,
> skied defeats, as though high kingdoms
> made out of sheer light went down clashing for
> an ideal of night.
> (Morley *Invisible* "The Ideal" 56 5-10)

Identifying the wavelengths as warring soldiers in the night sky who fight against the stars, Morley shows how technology has invaded nature. As night drives on, the speaker imagines a kingdom where the wavelengths of light fight for the ideal night. "The Waves," similarly introduce the physics related to sea-waves to discuss an entirely different matter. Observing her/his child at first, while he uses wet sand to make castles on the beach, the speaker draws parallels between language and the sea:

> The castles dry in no time;
> he unaware [. . .]
>
> As water strikes his world's edges
> it overwhelms small villages.
>
> As language is tsunami.
> It carves half-worlds we
>
> live and die in. There this
> comparison dries.
> (Morley *Invisible* "The Waves" 65 5-6, 7-12)

Making a connection between waves and tsunami, the speaker then argues that language acts very much like a tsunami leaving a destroyed world behind to be "made and unmade of our children" (Morley *Invisible* "The Waves" 65 16). Morley envisions the technoscientific discourse to be a necessity of the contemporary age, as is exemplified through his reliance on scientific terms and diction in the poem.

In his poetry, Morley occasionally relies on numerals as well, for the "language of science is mathematics, and mathematics is an instrument of ontological neutralization: it treats different kinds of things as if they were just the same, in virtue of shared mathematical structure" (Grosholz 71). Although both poetry and science share the same medium, that of language, to explore the unknown, their treatment of it strictly differs. Science "uses language for verification and counts on words to have a meaning so specific that they will not be colored by feelings and biases [. . .] as if it were another form of measurement –exact, definitive, and logical. The unknown, for science, is in nature" (Hawthorne Deming 188).

Morley's "The First Circle," in this sense, focuses on a "green woodpecker" which becomes the symbol of a couple's marital problem. Visiting the speaker's garden, the bird is described in mathematical terms: "It hacks a slight, millimetering circle / in the lawn, then revolves as though squaring up / to a mathematical problem" (Morley *Scientific* "The First Circle" 78 2-4). As parallels are drawn between the speaker's marital problems and the bird's flight pattern, the speaker factually observes: "From the wear of the crimson secondary feathers on its head / the woodpecker is likely to be three years old." This biological information contrasts with the speaker's marital timespan: "I

worked up to leaving you over five years" (Morley *Scientific* "The First Circle" 78 17-18, 19). Unlike the hesitations of the speaker who does not bring her/himself to act upon her/his suspicions that s/he is being cheated, the woodpecker seems to be "all head / and strategy," which shows how emotions tamper with human behavioural patterns (Morley *Scientific* "The First Circle" 79 25-26).

As for "**Σ**" (Sigma), standing for the "s" sound in the Greek alphabet and the number 200 in Greek numerals, the symbol indicates that a sequence of numbers should be summed up. The poem opens with a post-funeral gathering of relatives at the deceased's house. The deceased is soon identified as the speaker's grandmother: "The internal pressure burst the capillaries beneath my gran's eye / diagonially, like a whip might, opening her hale cheekbone up. / *Sigma* is the shape carved on that seventy-year-old face / where the care-worker screwed his fist around her nose to smash it" (Morley *Scientific* "**Σ**" 30 8-11 italics original). Through the grandmother, the poem presents a criticism of the National Health System which is responsible for her death. Sigma, in this sense, represents the chain of events that eventually lead to the death of the grandmother through a cause-and-effect relationship.

At other times, Morley's poetry presents direct formulas. Instead of hiding them within a poem, he transforms the mathematical signs directly into poetry. "Two Haiku Pennants" and "Translucent Jiyushi Banners" are exemplary of this. Inspired by Einstein and Minkovski, "Two Haiku Pennants" discloses the two physicists' individual approaches towards space-time in formulas. As Morley reveals in his notes to the poem in "Materials and Methods," the two poems, separate though they are on the page, are in fact parts of a complete equation by which Einstein, whose formula was represented by the left pennant, reformed Hermann Minkowski's model of space and space-time. Arguing that space "is a three-dimensional continuum," Morley adds that, "the world of physical phenomena which was briefly called 'world' by Minkovski is naturally four-dimensional in the space-time sense. For it is composed of individual events, each of which is described by four numbers, namely, three space co-ordinates x, y, z, and a time co-ordinate, the time vale t" (*Scientific* 85). Thus, updating the theories of Minkowski, Einstein revolutionised experimental physics. Correspondingly, "Translucent Jiyushi

Banners," too, relies on three banners (Morley *Invisible* "Translucent Jiyushi Banners" 60) to reveal both "Compton's equation for the physics for light scattering" and when read down for "scattered light" (Morley *Invisible* 79). Through these formulas, Morley defamiliarises perceptions of scientific statements to turn them into poetic statements.

3.2. CONCRETE POETRY

As is visible through his formula-like poems and his employment of numerals and mathematical symbols for poetry, Morley likes experimenting with form and style. His poems "include blacked-out sections and mathematical symbols, two devices by which – along with more complex concrete poems – Morley interrogates the poetic line and the limits of language" (Kuhfield). In this manner, he experiments with form very much like a laboratory experiment, mirroring the scientific progress in order to better poetic techniques by enabling organic unity. Therefore, it is not surprising that he frequently makes use of concrete poetry. Specifically *The Invisible Kings* is rich in concrete poetry including some of the most striking examples of his concrete poetry like "Patrin," "Dotterel," "Siskin," "Goldfinches," "European Larch," "Sycamore" and "Texts to the Inventor of Italics." To begin with, "Patrin" is designed as follows:

or *pateran*,
pyaytrin, or *sikaimasko*.
The marker used by Roma
that tells others of their direction,
often grids of branches or leaf-twists or
bark-binds. Used for passing on news
using prearranged forms, patterns
or permutations of these. Yet
it also means a leaf or,
simply a page.
(Morley *Invisible* 8 1-10 italics original)

Patrin, meaning pattern, according to the definitions given in the poem, was a method used by the Romans to secretly communicate with their comrades by marking branches, leaves or barks in certain shapes. In this regard, the poem, too, communicates a certain message. Giving information as to the materials used by the Romans, the speaker identifies them as organic materials, like leaves. Next, noting that *patrin* also means a

leaf, the poem is, then, easily perceived as one on the page. Furthermore, placed upon a page, it also meets its alternative meaning. The second part of the poem repeats the same words, yet by starting from the opposite end this time, which illuminates some of the remarks that were unnoticed the first time they were mentioned: "Bark-binds used for passing on news, / often grids of branches or leaf-twists / that tell to others of their direction" (Morley *Invisible* "Patrin" 8 15-17). Through the leaf pattern, Morley reflects the definitions of the word which also adds to the organic unity of the poem, as well as illustrating how flora can give messages.

Morley's keen interest in concrete poetry which makes use of elements of flora and fauna is stressed in "Dotterel," too. The poem reflects the movements of the bird as it flies horizontally in the following manner:

Through the mists
above the marsh
the linked, frantic gestures –

Flight-horizons
of dotterel –
shiver into one harmonic bridge.
(Morley *Invisible* "Dotterel" 40 1-6)

Each downward movement of the bird is reflected through the descending arrangement of words which create the effect that the bird is flying horizontally over every obstacle in the sky. Traveling as a group, the observation that the birds act as one is also reflected via form in the poem.

Similarly, "Siskin" displays the bird's movements as its sound rises from a whisper to a crescendo:

on birch and alder
cast between catskins
Kin to whisper
(Morley *Invisible* 44 1-3)

As the siskin's voice rises from a base sound to a crescendo, so does its movement. While its in-between movement is represented on the page by placing the word-group regarding the catskins in between the two lines, the first line is placed above because it mirrors the bird's position perching on a branch. Organic unity is once again preserved, as the upward movement of the siskin's voice demonstrates.

On the opposite page are placed, a group of goldfinches imitating the look of the solar system. "Goldfinches," like the previous poems, has organic unity because it establishes an association between the goldfinches and the solar system by stating that the "sun / smelted in space / Goldfinches burst [. . .] / from that molten gold" (Morley *Invisible* 45 1-4). Associated with something aerial as such, the goldfinches are related to the Sun because of their "gold" which is treated as a metal by the Sun in the poem. The sun, which provides supreme energy, is also held responsible for the creation of goldfinches. Naming the mandala-looking poem-diagram "A charm," the right hand-side of the poem is important in confirming the microcosm-macrocosm relationship, since the act of creating goldfinches "[spark] / Sunspots" and "[flash] Suns" during the process (Morley *Invisible* "Goldfinches" 45 3-4). Thus, the poem stresses the idea of each in all since, created by sun, the goldfinches carry a reflection of the sun with them.

"European Larch," borrowing its definition from "*Collins* Field Guide to British and European Trees" introduces scientific facts in a memorable manner on page (Morley *Invisible* 57). Divided into four stanzas, each stanza mimics the look of the European larch. As an endemic species, information concerning their origins, location, fiber and shape are provided. Furthermore, when the poem passes onto presenting information on the saplings of the tree, the last stanza about this new generation is given on the next page mirroring the small-scale size of the young tree:

Saplings,
grow wildly twisting trunks.
They *un*bend with maturity.
Leaves: vivid
green, two pale bands beneath. Cones:
soon brown: egg-shaped when ripe, their
scales *not or scarcely not curving*.
Female flowers: bright as rubies in

mid-spring
among new green needles. They are easily overlooked.
(Morley *Invisible* "European Larch" 58 31-40 italics original)

Playfully representing the image of the sapling on the page, the poem also relies on different fonts to add to the effect. Hence, while mentioning the barely curving scales of the sapling, Morley employs italics to capture the image of curvy scales, thus adding to the organic unity. Like "European Larch," "Sycamore" is also concerned with the representation of the tree besides giving information about the species. Starting from the top leaves which give information about their Alpine origins, the poem depicts each part of the tree of which the speaker is talking about one by one, as it makes its way from top to bottom in an orderly fashion:

Upturned to a false
horizon, she can
pause, gaze
on the falling
distance, find
rooting, rigging.
The rigging of
a sycamore
is capsized
into winter.
Her limbs
stiffen, then
her used
dressings
fall where
they will[.]
(Morley *Invisible* "Sycamore" 59 13-28)

As the upturned heights of the tree give way to its trunk and lower parts, summer, stated in the upper parts of the tree, too, gradually gives way to winter and the tone of the poem transforms from cheerful to nostalgic as "her used / dressings," that is her leaves, start to fall. In order to reflect the "skeletal" imagery of the tree, the poem reduces its parts to a singular trunk which contrasts with the earlier look of multiple branches given above, and the tree gradually starts shedding its leaves (Morley *Invisible* "Sycamore" 59 31). Providing the readers with the appearance of fallen leaves randomly scattered on the ground, the poem ends with the image of the tree "standing clear" of its "scarlet

leaves" in the end, while Morley imitates the effects of colder seasons on the tree with the arrangement of scarcer words (Morley *Invisible* "Sycamore" 59 35, 33). In this sense, the poet documents the seasonal changes by representing them both visually and linguistically.

Lastly, written completely in italics, with the mark of an anchor and a dolphin placed right at the heart of the poem, "Texts to the Inventor of Italics" is dedicated to the Italian publisher Aldus Manutius who "adopted the anchor and dolphin as the printer's mark (or rose) for the Aldine Press, in Venice, in the sixteenth century" (Morley *Invisible* 79). Also inventing the italics, Manutius called this "'a new typeface that mimicked the cursive handwriting of humanist writers'" (Morley *Invisible* 79). Mimicking Manutius, Morley organises a "*type of cursive humanism*" on page via Manutius's own invention (Morley *Invisible* "Texts to the Inventor of Italics" 61 9 italics original). Since the poem identifies cursives as the typo of the humanist age, parallels can be drawn between the emergence of cursives during the rise of humanism and the inclusion of technoscientific language in contemporary poetry in the present age as means to suit the requirements of their respective ages.

3.3. INTERDISCIPLINARY APPROACH

N. Walker and M. Fulton Walker observe that the interests of sciences and humanities "in the universe are widely different, yet in no true sense are they hostile or mutually destructive" (275). If anything, together they add to the collective voice of the universe regardless of any divisions. Echoing Hawthorne Deming's viewpoint that "[p]oems and songs were manifestations of a collective voice, of spells and visions, of spirits returning from the dead" which "transcended individualism rather than celebrating it," Morley's poetry embraces interdisciplinarity in a similar attempt to transcend academic specialisations (193). In some disciplines, the union of sciences and humanities is inevitable. As in Morley's "Archaeologies" which depicts "a clutch of old keys, each in a cocoon / of verdigris," recovered from an excavation site (Morley *Releasing* "Archaeologies" 30 2-3). The speaker speculates about their recovery process wondering what the archaeologist might be thinking when "your spade made contact /

like a magnet drawn to those hints / of metal" (Morley *Releasing* "Archaeologies" 30 3-5). What happens next imitates the speculations that are raised where archaeological findings are concerned. The speaker puts forward several hypotheses regarding the keys suggesting perhaps they were thrown by a vengeful gardener or slipped from a lover's pocket on his way to meet his beloved. The closing lines of the poem read as follows: "Dig then, with these, archaeologies / down a century's slammed silence; / a door here or there, and keys to none" (Morley *Releasing* "Archaeologies" 30 12-14). What is implied here is that, as a science, archaeology depends on hypotheses which themselves rely on creative faculties and fictional connections. What appeals to the seer is the personal history, or rather story, behind the keys rather than the history of the keys.

Personal history is also what makes "The Lucy Poem" special. Lucy of the title refers to "the famous *Australopithecus afarensis* of Ethiopia dating to 3.2 million years BC, the heart of the Pleiocene era" (Morley *Enchantment* 82 italics original), although parallels can be drawn between William Wordsworth's "Lucy Poems," too, such as a dead persona who leads a slumber-like existence in between "various realms of existence" (Hartman 158). Uncovered in 1978, Lucy is one of the oldest skeletons of human ancestry (Bynum 222). In his notes to the poem Morley makes his intentions clear:

> Most environmental research depends on the establishment of a timeline: how far back in the history of the planet can we go find information that we can analyse in order to make reasonable predictions? And taking these historical timelines together, how do they interact and inter-twine? I first found myself writing about the future until I realised that such images neither consoled nor could describe accurately the climactic possibilities opening before us. The science of global warming alerts us to the realisation that such catastrophes lie behind us in history as well as before us; that everything affects another thing; and that, however much we have transformed them, climate conditions are beyond good and evil – our weather is not a moral climate. (*Enchantment* 81-2)

Morley regards nature as an amoral element which acts out of its own accord rather than as a force which, influenced by people's malignant behaviours, takes vengeance in return. The way Morley perceives it, catastrophes that happened at certain points in history will continue to do so. Consequently, Morley attempts to capture the environmental changes that occur around the era through the eyes of Lucy. The poem depicts Lucy during her quest to find water:

She can sense as much water
  in her breasts as in the earth;
except there is a denial of water
  even in ground-air: only whirls
of liquefied heat [. . .]
[. . . . .]
  [. . .] Tiny streams
start at the hoof point of beasts –
  mirages and fractured mirrors.
On the plain she glimpses
  air rivers and flat inland oceans
of light above which mountains
  flicker
(Morley *Enchantment* "The Lucy Poem" 17 15-19, 21-27)

Although she can feel the presence of water, water is denied to Lucy by nature. What is perceptible to her eyes is just heat waves which are described in terms related to water. Words such as whirls, liquefied streams, air rivers and inland oceans underline her need. Walking in the African heat, Lucy has visions of rivers and oceans. Looking at "the roof / of Africa," capped with snow (Morley *Enchantment* "The Lucy Poem" 17 28-29), she remembers her mother's stories concerning the mountains:

[. . .] The summits
  themselves diminished too: they wept so hard they
no longer kept the season
  but wore their water as snow-
necklaces, ice pearls…
 (Morley *Enchantment* "The Lucy Poem" 18 49-54)

Like "Archaeologies," it is the stories that make these mountains memorable to her. The frozen mass of water that is situated on the summits due to a physics phenomenon is associated with oral tales fabricated by Lucy's mother. From this point onwards, the poem focuses on a band of wolves that are as parched as Lucy. Searching for water, the wolves, too, head "upwards / seeking the wet tongue / of that voice" (Morley *Enchantment* "The Lucy Poem" 18 61-63). The wet tongue of the voice that the wolves hear indicates a body of water that is located on the summits of the mountains. Years pass,

  [. . .] while below
the plains wilted to sand;
  the forest breathed

its leaf-litter in and out
  until one day it breathed in
maggots and breathed out
  blowflies, and our walker woke.
(Morley *Enchantment* "The Lucy Poem" 19 72-78)

In fact, it would be more appropriate to say that millions of years have passed. During Lucy's sleep, plains give way to deserts owing to drought, trees shed their leaves, and maggots and blowflies turn out to be the only inhabitants of the scenery. Morley defines his aim in positioning the poem in a distant past as follows: "In order to find a truer timeline for writing a poem about global warming, I began thinking about previous climactic transformations, and how our ancestral species dealt with them" (Morley *Enchantment* 82). The reference here is evidently to the discovery of Lucy's skeleton in the 70s and to global warming. The allusion to maggots confirms that it is her body that Morley is referring to, while the reason of her re-awakening is identified as the melting waters:

Overhearing melt-water
  our walker wakes; she balances
her thirst against the night's dew,
  [. . . . . .]
  [. . .] Shadows moisten
her heeled hollows; the moon's
  sun sets her prints as stone,
and she senses herself neither
  walk nor walker, striding the hill
in the light of all she knows
  [. . . . .]
the crouched wall
  of wolves;
the high snows,
  their wells
of prayed-for
water.
(Morley *Enchantment* "The Lucy Poem" 19 79-81, 84-89, 93-98)

The change in form in the final stanza of the poem reflects the melting body of water which Lucy readily embraces. However, considering that Lucy is already dead and that millions of years later global warming has triggered radical climate changes, the poem's ending stands as neither a warning nor a happy ending, but simply as a scientific account. According to Morley, Lucy's presence within the poem serves as "the story, a

timeline that predicted our own present. The story and the name of 'Lucy' represents our story but with these differences: we have a timeline, we possess a little knowledge, and we know that our ability to continue the story of our own species lies in our hands" (*Enchantment* 81). Although Lucy is unaware of the contemporary environmental problems, the melting body of water definitely signals an imbalance in the world's equilibrium. As stated earlier by Morley, because "everything effects another thing," shortage in water resources is only one of the effects of global warming which will eventually lead to famine, sickness and ultimately death. By combining scientific observations with Lucy's mother's and eventually Lucy's own stories, Morley, thus, brings sciences and humanities together to draw attention to contemporary ecological problems. However, instead of passing judgment on the tactless consumption of the world's resources, he suggests that the evolutionary process continues still, and that perhaps there is nothing that humanity can do to avoid a similar fate.

Interdisciplinarity is also central to one of Morley's untitled poems. Identified as the fiftieth poem in the collection, the poem is not so much a poem as it is a quotation by one of the most remarkable characters of the twentieth century: Albert Einstein. The poem reads: "*Where the world ceases to be the scene / of our personal hopes and wishes, where we face it / as free beings admiring, asking and observing, / there we enter the realm of art and science*" (Morley *Scientific* "50" 83 1-4 italics original). Einstein's statement draws attention to the parallels between sciences' and humanities,' attempts to explain the world. Not preferring one over the other, he rather underlines the collaborative efforts of the sciences and humanities to interpret the world for the masses.

3.4. INTEGRATED WORLDVIEW

Similar to N. Walker and M. Walker Fulton's earlier claim, Hawthorne Deming once again emphasises the similarity of the sciences and humanities in terms of their creative process, despite their use of language to different ends, and adds that truly "a divide separates the disciplines of science and poetry. In many respects we cannot enter one another's territory. [. . .] But a border is both a zone of exclusion and a zone of contact

where we can exchange some aspects of our difference, and, like neighboring tribes who exchange seashells and obsidian, obtain something that is lacking in our own locality" (189, 191). Otherwise, what is awaiting humanity is a failure of communication between different disciplines. So long as "language continues to become more specialized within professional disciplines to the extent that we become less and less able to understand one another across the many divides, and the general public becomes less and less willing to try to understand what any of the experts are saying," societies face the threat of performing better in terms of specialised arenas, yet, failing to obtain a general vision, are doomed to fail since, the whole will be "lost in one of its aspects" (Hawthorne Deming 191, 191-2).

The idea of the whole has to do with the conviction that life is inter-connected and co-dependent on other forms of elements that together make up the universe. So, today the challenge concerning sciences and humanities has to do with "taking on the complexity of the most interesting questions (formal, technical, theoretical, and moral) within our fields without losing connection with people outside of our fields" (Hawthorne Deming 193). Morley's "Fulcrum/Writing a World," provides an example of an integrated worldview by bringing several allegedly unrelated images together and searching for a connection between them:

> a seagull catches a fish at the mouth of the Amazon,
> a tree falls in the Adirondack wilderness,
> a man sneezes in Germany
> [. . . . . .]
> What does that mean? Does the contemporaneity
> of these events with one another,
> and with a million others as disjointed,
> form a rational bond between them,
> and write them into anything
> that resembles for us a world?
>
> (Morley *Scientific* 49 2-4, 6-11)

Offering images from the life sciences, Morley's short poem emphasises the interdependency of all life forms on Earth. Animals, plants and humans, in spite of their differences, share the same environment to survive, and they should do so in the literary arena as well. Elements, flora and fauna should be the subjects of poetry, just as easily

as any human subject. Identifying the animal, plant, and human worlds as the fulcrum upon which the world in general rests in balance, Morley stresses the importance of interdisciplinarity in the poem.

Another poem which is concerned with presenting an integrated world outlook is "Climbing Zero Gully." Dedicated to Morley's acquaintance P. C. who was killed on Ben Nevis in 1982, the poem indirectly points to environmental problems by identifying the climbers' hubris as their hamartia. The poem deals with a group of climbers who attempt to climb the highest mountain of Britain. The stones, although "terrified" by the climbers' advances, remain "unchallenging," whereas the climbers themselves challenge the mountain (Morley *Releasing* "Climbing Zero Gully" 25 2, 4). Making their way to the top upon the glacier, they feel "absolutely competent, nursed / by Japanese equipment" which shows their over-dependence on technology (Morley *Releasing* "Climbing Zero Gully" 25 13-14). Feeling over-confident, the climbers realise the danger only too late: "Rock: screw-faced and water-brained. / They: complete in mountain-power / stand, chin in hand, / suddenly vigilant" (Morley *Releasing* "Climbing Zero Gully" 25 17-20). Till the last stanza there is no implication of danger but with it, danger starts to loom over the group. Constantly underlining their over-confidence in themselves and their technological gadgets, the speaker criticises the climbers for underestimating the mountain throughout their journey and realising the danger only when it is too late, when "[o]n comes a night, / bleating, unchallenging" (Morley *Releasing* "Climbing Zero Gully" 25 15-16). Considering themselves as central to the world, the climbers' disregard for the mountain ultimately results in their end which illustrates how equally vital an understanding of nature is to an expedition that is undertaken by technological tools.

Conversely, "What You Do and What You Say" is concerned with a scientist who shows humility before nature throughout her/his journey. The poem is about her/his recruitment for an expedition to examine the ocean floor. Like "Climbing Zero Gully," however, this speaker's expedition is also threatened by several factors which cause problems for some other scientists who, similar to the climbers of the preceding poem, show hubris. To start with the speaker her/himself, s/he is described in the following

manner: “A marine biologist, seaweed in my hair, / I have circled miles in this deep sea bell / waiting for its pressure to equal my blood, / feeling its strength when it arrives” (Morley *Scientific* “What You Do and What You Say” 12 1-4). Evidently, the speaker is in a pressure chamber which attunes her/his body pressure to the oceanic pressure. Nonetheless, this is not the only adaptation that s /he goes through. As the seaweed in her/his hair indicates s/he is becoming one with the ocean organically, too. This is confirmed by the statement, “[w]hat you do, do it as though you mean it” (Morley *Scientific* “What You Do and What You Say” 12 9). Contrary to the climbers of the previous poem who proudly scorned the mountain, the speaker of this poem proposes becoming one with the ocean instead. The perks of her/his intimate approach are made obvious, when information is provided on the fate of the rest of the scientists. While s/he restlessly searches the ocean floor,

> [o]thers more qualified [stay] on the surface,
> trained in the arts of oxygen and grapples.
> The first of them to dive heard the language of coral,
> bobbed up and sang bubbles in an inland bar.
>
> The second to try it felt a tug on his air pipe
> and swam up crying for the mother who held it.
> The third was for sharks and a fourth stopped a sub
> that split him like a mullet. The rest took to shore.
> (Morley *Scientific* “What You Do and What You Say” 12 17-24)

The fate of the rest of the crew suggests that one should not rely on scientific knowledge alone but also should respect her/his environment. Knowing about things and acting upon these, as is already identified with the title, are two different things which shape the fate of the people involved in accordance with their choices. In contrast, the speaker is regarded as

> [h]ooked (they said), I was hooked
> [. . . . . .]
> What I did, said, that I was a born diver,
> a porpoise, a scientist,
>
> meant nothing to the boys in the engine room,
> [. . . . . .]
> who [. . .] put the questions:
> how deep I was diving? and in whose ocean?”
> (Morley *Scientific* “What You Do and What You Say” 12 25, 27-28; 13 29, 31-32)

The poem depicts a dilemma between culture and nature. The speaker truly knows about things but also knows better than solely relying on facts contrary to factual scientists. Its biological adaptation is stressed once again, as he dives like a porpoise into the ocean. Accordingly when s/he dives, s/he dives

> as seals, porpoises,
> lampfish: let the fins rainbow
> from my arms, gills from the ribcage
> What I say is how tides say it,
>
> how the sea started us counting
> as though we were meant to
> (Morley *Scientific* "What You Do and What You Say" 13 33-38)

By associating her/himself with sea animals, s/he shows a kind of humility and respect which lack in the behaviours of the dead crew members and the climbers. In this manner, her/his continuous references to sea animals, call for a biocentric worldview that is integrated and gives equal importance to animals, plants and the environment in general.

"In Cold Dimensions" lives up to the Einsteinian standards. Borrowed from Theodore Roethke's "The Minimal," the title and the epigraph of the poem which likens lives on a leaf to "*the little sleepers, numb nudgers in cold dimensions*," introduces a gardener who first talks of her garden in literary terms (Morley *Invisible* "In Cold Dimensions" 78, 3 italics original):

> A strange way to see.
> A stranger's way.
> Her garden is an exhibition
> with lit rooms, masterpieces
> [. . . . .]
> the shape and size of their levels
> calculated to the soil-grain,
> the spaces between shadowed
> gnomons; those data-breaks
> called seasons hold
> hallmarks and prints
> (Morley *Invisible* "In Cold Dimensions" 3 1-4, 6-11)

Morley defamiliarises the garden, whereby the speaker's garden is described in terms of an artist's studio where plants are perceived as masterpieces, their sizes and shapes are depicted as harmonious and the seasons hold the key to the flowering of certain plants during specific periods. Then, the comparison expands to one between a garden and a scientific experiment:

> She explains that there are masters
> as there are spadesmen,
> that both are speculators;
> that the gruff grafters
> who break soil, sieve weed,
> are the salts of creation. Yet
> that is not actual work –
> this arises by intangible
> skill, by flaw, flawed
> experiment even, and her own
> interventions. The stranger:
> she must always be welcomed
> (Morley *Invisible* "In Cold Dimensions" 3 13-24)

According to the speaker the real work rests upon her experiments, which in turn rely on trial-and-error method. Juxtaposing the portrayal of the garden in artistic terms with the latter depiction of it in scientific terms, the poem problematises the perception of the garden continually. As the speaker and her guest walk around the gardens, the flowers gradually start to blossom, or rather "storytellers and artists / begin to erupt" (Morley *Invisible* "In Cold Dimensions" 4 38-39). The plants and animals in the garden are described in literary terms writing a story of their own:

> [. . .] [C]ramoisy
> abstracts from peony and poppy,
> dripped inks of algae
> igniting on a dew-pond;
> butterfly narratives
> of flight, where they settle
> to sip, unfold wings
> on illuminated parchment
> on a comparison of palettes
> (Morley *Invisible* "In Cold Dimensions" 4 39-47)

Thus, associating each plant with a literary element while walking in the garden, the speaker draws inspiration from the diverse range of flora to write her poem. Later on

referring to the "rich fables" of her gardens' winds; the speaker then turns her gaze to a lily-pad which represents "two poles of a planet – / one in loom, one in radiance – half-conceiving the other" and lastly draws attention to colonies of miniature ants before expanding to space and the future (Morley *Invisible* "In Cold Dimensions" 4 49; 5 66-68). It is here, in these final lines, that the gardener is identified as a mentor who accompanies the visitor

> [. . .] to the space
> where she will let you
> stand apart from yourself.
> At the lip of the world.
> She releases your hand.
> (Morley *Invisible* "In Cold Dimensions" 5 92-96)

The emphasis she has put on in obtaining new vistas to see a "stranger's way" and making her feel comfortable during the process, then, gains another dimension, for Morley, through the gardener-mentor figure advises writers and scientists to combine their respective powers so that they may come up with multifaceted answers to universal problems. The poem, in this respect, embodies the idea that there is no singular way to understand anything but that there are multiple means which itself is representative of the versatility of the Earth.

As Hawthorne Deming puts it, "[w]e may have gained much in terms of technical and artistic refinement through our specialized disciplines, but we have lost the belief that we can speak a common language or sing a common healing song" (193). For this reason, Hawthorne Deming condemns the insular activities of both the humanities and sciences. Then, she suggests, "[i]f poetry today needs anything, it needs to move away from its insular subjectivity, its disdain for politics and culture and an audience beyond its aesthetic clique. A poem reaches completion in finding an audience. The challenge today is to reach an audience not comprised solely of members of one's own tribe" (Hawthorne Deming 193). Correspondingly, what science needs to do is "to move out of its insular objectivity, its pretence that it only deals with facts, not with ethical implications or free-market motives. What science creates is not only fact but metaphysics – it tells us what we believe about the nature of our existence, and it fosters

ever new relationships with the unknown, thereby stirring the deepest waters of our subjectivity" (Hawthorne Deming 194).

Morley's "Ozymandias to You" presents an integrated worldview in that sense. The poem opens with the deliberations of a capitalist landlord who allows a poet to stay "a month in my half made building: / a trellis of iron, my hopeless skyscraper-to-be. / The poet liked girders, said they were line endings" (Morley *Scientific* "Ozymandias to You" 56 1-3). As is the case with the variety of perceptions "In Cold Dimensions," the speaker's view of the building strictly differs from that of the poet's who resembles girders to line endings. The juxtaposition of the two figures' opinions continues throughout the poem:

> I told him of my cement mixers, two years in coming
> and look, damn it, at all this Industrial Sand.
> He said, useless, Egyptian, and went about in shorts.
> It was a murderous summer, he said,
> a crucial time to be planning and restructuring
> or poems in couplets.
>
> Leave it to Nature, he said. I did. I hopped it
> and left the building site open to the weather.
> (Morley *Scientific* "Ozymandias to You" 56 7-14)

The central allusion of the poem that is evoked at once in the title becomes even more visible as Morley adapts P. B. Shelley's "Ozymandias" to contemporary society. In Morley's re-writing of Shelley's poem, the grand statue of the great Ozymandias is much more valuable as a sky-scraper today, while the landlord's permission to leave the construction of the building to nature upon the poet's insistence reproduces the central irony of the original poem. Naturally, the building site ends up destroyed by one big storm and becomes "an overnight fairground for all the local children" (Morley *Scientific* "Ozymandias to You" 56 16). Carnival atmosphere dominates the area, while

> [. . .] employees lorried in from satellite villages!
> How you picnicked with vodka, your wives and girls,
> hatched natterjacks under my corrugated iron,
> belched incorrigibly, made love by the brick piles.
> Roman love, the real thing.
>
> They liked me for allowing it and came to me singing.

> I was suddenly famous for all the wrong reasons.
> All the wrong reasons were rightly too tempting.
> The poet wrote my eulogy or was it an elegy?
> He lifted it from the *Collected* of Percy Bysshe Shelley,
> a Party Man apparently.
> (Morley *Scientific* "Ozymandias to You" 56 20-30)

As is indicated by the capitalised letters of "a Party Man," the poem has political overtones. Parallels between Shelley's poem and Morley's continue, as the capitalist replaces Ozymandias as the figure of authority –albeit accidentally. However, unlike Ozymandias, the capitalist has no intention of being remembered as a great man by the crowds. Therefore, calling the police he lets them gas the construction site to drive his unwanted guests out. The poet gassed in the face delivers several statements including "[o]ur position in Time was sufficient to justify, / well, expeditions into anything, if it lead to lucidity" (Morley *Scientific* "Ozymandias to You" 57 45-46). Putting the emphasis on the present rather than the future, then, the poet threatens the speaker saying that he would write a poem about him "by charring every word" (Morley *Scientific* "Ozymandias to You" 57 48). Surely, that is what he does a few lines later, but not before the speaker tears the blueprints of the skyscraper and starts tearing it down. The poem-within-the-poem which is entitled "Advice for all Young Poets" advises the poets to write as little as possible, unless they want to be selfish, for what remained of anyone is pure "semen" (Morley *Scientific* "Ozymandias to You" 57 55, 59). In the end, having no wish to become one, the speaker is ironically immortalised due to his betrayal via poetry and is remembered more for the poem than his futuristic sign of technological advancement. The speaker's charred words, in this sense, recall the final image of Ozymandias's statue in Shelley's poem, since in both cases works of art, which were supposed to immortalise certain values and figures of authority turn out to be worthless as pieces of art while what they represent is in truth invaluable, although their material form is subjected to damage over time.

3.5. EXPERIMENTATION, OBSERVATION AND THE PROVISION OF FACTUAL DATA: FIELD-TRIP POEMS

Morley's poems range from observations to experiments. As a part of his science poems, he makes an innovation and uses the techniques and methods of science in

poetry. His science poetry is rich especially in terms of what may be called his field-trip poems, in which he examines various kinds of fauna in terms of their biological aspects, migratory habits and physical structures. Accordingly, "Movings: A Field Observation" is concerned with a field observation of birds. Starting with an observation of the migratory patterns of kittiwakes, which are of the gull family, the speaker also notices turnstones, a plover, a blue tit and a black bird during the process. The speaker observes the migratory habits of the kittiwakes as follows: "It was the stronger tongue of Africa / made them drink shores clean / of limestone and gutturals / and prepare" (Morley *Releasing* "Movings: A Field Observation" 34 7-10). However, the speaker would rather watch turnstones than kittiwakes: "This season is their own. / They are time, these birds, / and hours and years: minute / particularity and perfect flight" (Morley *Releasing* "Movings: A Field Observation" 34 15-18). The poem ends with his sighting of a large group of migratory birds which accordingly ends the poem. Admiring the punctuality of turnstones, his observation leads to a judgment regarding the birds' regular habits.

"Runner," which was later on re-published as "The Motion of Deer" in *Scientific Papers*, provides information about a deer hunt by giving voice to the observations of the hunter and the hunted deer in turns. The first part of the poem, subtitled "1. Killing a Doe," relates the hunt by setting the scene:

> A stone takes all the hand, for stone
> wants to be down at speed
>
> or quickly placed. It requires
> knack to get it right –
> to split the difference
>
> between the stone's falling,
> and a precise cranial bone
> of a panicky deer –
>
> this is how it runs…
> (Morley *Releasing* "Runner" 38 13-21)

The stone which has to be at the same speed with the doe requires meticulous calculation. Giving information about the physics involved in killing a doe, the poem then describes how the doe runs:

> *This is how deer run*. There is no mystery.
> The leading hoof scouts forward
>
> in search for levels,
> the tailing three make do
> with taken ground.
>
> Sometimes the earth prepares
> mistakes: maze-sphagnum, pot-holes…
> so brakes are slammed on every hoof,
> the cleats close up like scared anemone;
>
> there is no cease but
> grace notes in their running
> (Morley *Releasing* "Runner" 39 22-32 italics original)

The description of the deer is given in minute detail, while her hoofs are likened to mechanic brakes. The dangers that surround the animal are not limited to the physics involved in hunting the animal but also include natural threats that may just as well get the animal killed. The second part is a re-writing of the first part but with slight differences and omissions:

> A panicky deer takes all the hand for stone,
> wants to be
> down at speed or –
>
> quickly brakes are slammed on every hoof,
> the cleats close up –
> scared anemone.
>
> Sometimes the earth prepares mistakes.
> This is not birth.
> the getting-up on legs, but
>
> split the difference between falling
> and precise cranial bone,
> there is no mystery.
> (Morley *Releasing* "Runner" 40 55-66)

Subtitled “In a Deer’s Eye,” this part reflects the same scene this time from the deer’s perspective. Because she is on the run, there are omissions in the poem which signify the deer’s panting. The major difference of the two perspectives is marked by the endings of the sightings. While the first one ends with the deer gracefully running, the latter part ends with a sense that the deer is hunted. The positioning of “there is no mystery” right after the mentioning of the cranial bone supports this, for the change in line structure, rather than moving forward to imitate the running deer’s movements, comes to a standstill that marks the deer’s ultimate stop. Thus, contrasting two aspects of a singular occasion, organic unity is preserved in the poem via the representations of the doe’s breathy final remarks.

The method of scientific observation is central to “Samizdat on the Nature of Ice,” too, which combines Mandelstam’s experiences during his exile years in Voronezh with the poet’s observations of his surroundings. A samizdat is a form of “underground publication” which became popular in the Soviet Union and the Eastern Bloc countries to escape the strict censorship practised by the Soviet government in order to restrict the freedom of expression and criticism of the state (“Creating”). The opening of the poem does not give away the political implications at once, but rather reveals them gradually. In the beginning, the poem playfully points to Mandelstam’s confusion over the words glacier and glazier in his own poetry by making a poetic connection between the two and showing this as the reason behind the confusion. Starting with a description of the glaciers on top of the mountains, Morley gradually replaces them with glaziers:

> I’d read about glaciers and I’d seen glaciers. How a stream runs
> under their bellies, sluices from their lower reaches. [. . .]
> [. . . . .]
> [. . .] And the taste of its water, both sweet and sullied
> or tender as blown glass. Which explains how in poems I confuse
> glaciers and glaziers.
> (*Mandelstam* “Samizdat on the Nature of Ice” 42 1-2, 4-6)

From here onwards, the associations with his exile become apparent. His confusion over glacier and glazier is apprehensible because, during his exile years, Mandelstam and his wife never owned a mirror as a consequence of which he would form “an ice-mirror from a puddle” to make themselves respectable to themselves (Morley *Mandelstam*

"Samizdat on the Nature of Ice" 42 12). So, glaciers are connected with glaziers in his mind. However, it is the third part of the poem that is the most significant, since it is here that Mandelstam gives scientific information about tricks to stop ice "melting from contact with live hands" or "being / flashed to crystal by every moment" (Morley *Mandelstam* "Samizdat on the Nature of Ice" 42 15, 15-16). Mandelstam has gained this knowledge during his

> [. . .] placement
> in the St Petersburg factories: a trick used by glaziers: slip
> plate-glass in silk and, between forefinger and thumb,
> gently pinch the opposing ends. It gives birth to a
> pressure: it tensions lines of force which are
> hurtling through the mass like waves.
> (Morley *Mandelstam* "Samizdat on the Nature of Ice" 42 16-21)

Morley implies that one does not necessarily have to be a scientist to understand or practise science but sometimes, due to limited resources and circumstances, or simply because of experience based on experimentation and observation, one may gain practical knowledge based on deductions.

Mandelstam's experiences are also a major concern of "Mathematics of Light," which combines his experiences with scientific observation:

> The wavelengths of daylight
> register on bright equipment:
>
> fluttering across a spectrum
> from infra-red to ultraviolet.
>
> Discover me at an ice age,
> at a midnight of colour,
>
> in a place where rainbows
> unbind themselves completely…
> (Morley *Mandelstam* 48 1-8)

Making references to Newton's *Opticks* which is primarily on the physics of light, the poem expands its references to Keats's "Lamia" and Dawkins's *Unweaving the Rainbow*. As daylight creates rainbows across a spectrum, the speaker talks in metaphors to tell her/his beloved/lover to meet her/him at midnight so that they can be

completely free. Contrary to Keats who accused science of replacing nature's beauty with cold philosophy, Morley as a contemporary poet disregards the perception of science as cold philosophy and regards it equally charming, as a subsequence of which he picks it up as a proper meeting ground for the lovers.

"Redwings and Magnetism" recalls "Movings: A Field Observation." The poem is also about a scientist who observing redwings enters data about them endlessly to her computer:

> How small is the god of those migrating bird-rivers:
> [. . . . . .]
> She will climb from her bed and airbrush their science.
>
> [. . . . . .]
> She makes herself dark coffee, taps in the data.
>
> How those ten thousand birds fleer in her thought,
> unfolded and healed by the heat of her argument.
> [. . . . . .]
>
> warmed the cold lives by a limpid knowledge:
> how small is the god of those migrating bird-rivers.
> (Morley *Scientific* "Redwings and Magnetism" 62 1, 3, 13-15, 19-20)

Similar to "Mathematics of Light," in "Redwings and Magnetism" information concerning the redwings' migratory patterns is revealed. It is due to the "heat" of the scientist's argument that the redwings' habits are identified which in turn warms the readers to their "cold lives" that is enlightened by the data that is submitted by science. Hence, contrary to Keats's argument, Morley once again sides with the idea that science is a warm philosophy rather than the other way round. Likening the huge flock of birds to a river, the speaker identifies the scientist as their "god," who, although small in size, provides invaluable information on the birds by filling in the gaps regarding their habitual patterns.

On the opposing page another poem on birds is placed. However, unlike the previous poem, the subject of this poem is quite familiar:

> Predation-strategies ‘rehearsed’
> i. e. activity diurnal, predatory;
> Rapid Eye Movement when dormant.
>
> Hierarchical niche-structure, theoretically,
> Habitat when inactive: forest canopy
> [. . . . . .]
>
> 100% attentive to prey stimuli;
> proactive at a feeding opportunity
> (Morley *Scientific* “‘Hawk-Roosting’ Revisited” 63 1-5, 7-8)

Entitled “‘Hawk-Roosting’ Revisited,” the poem is a re-writing of Ted Hughes famous poem, “Hawk Roosting,” strictly from a scientific perspective. Kennedy, considering Hughes’s outlook on nature just as romantic as Keats’s view, adds that the “language of Hughes’s poem – dream, manners, convenience, please – gives the hawk a consciousness it does not possess. Morley’s rewrite shows us hawk as an organism responding to stimuli and one that is vulnerable to change” (172-3). Introducing itself in an objective manner, the hawk is described like a machine whose robotic sound provides clear-cut facts about itself. Thus, giving information on its predatory habits, habitat and individual qualities objectively, Morley’s hawk, most significantly, lacks Hughes’s hawk’s over-confidence: “Highly-pressured, environmentally, / Future absence from food web: probably” (*Scientific* “‘Hawk-Roosting’ Revisited” 63 16-17). The ending of the poem contrasts directly with the ending of Hughes’s poem where the hawk, taking pride in itself, claims that it will not accept change but keep things as they are. Morley’s poem, on the other hand, not only shows the hunter as the hunted but also directs attention to current environmental problems which might probably lead to the birds’ extinction. Furthermore, Morley emphasises the fact that in a world regulated by Darwinian natural selection, even these birds might fall prey to circumstances, if they cannot adapt to the regressions in their habitat.

Morley’s interest in field habits of birds is stressed in “Whitethroat” as well. In this short poem, the speaker observes the birds as they glaze the leaves of a tree making it look like a whitethorn: “Whitesmiths work the tinct tin into leaves. / They could weave, if they chose, a whole whitten of it” (Morley *Invisible* “Whitethroat” 39 1-2). Likened to tinmen, the birds work as if they were factory workers making the leaves shiny via their release of bodily fluids. Observing the birds in action, Morley provides information

about their feeding habits, for the birds' release of colouring is a false charm to attract victims to their beguiling trap.

Among Morley's poems which rely on observation and experimentation, "A Static Ballroom" stands out, for the poem relates a laboratory analysis in action. Here the focus is on a speaker who analyses "a static ballroom" as she

> presses her eye to the lens of a microscope,
> [. . . . . .]
>
> Her sight stamps the earth where she has buried herself.
> Her visions rushes through its lenses; and she
>
> runs through those galleries, bursting the door
> where she finds them, it, a static ballroom – of dancers
>
> [. . . . . .]
>
> [. . .] She arcs
> across the glass floor of the scarlet ballroom
>
> in a micrograph of her own blood plasma
> (*Invisible* "A Static Ballroom" 51 3, 6-9, 13-15)

What the scientist observes through the microscope is a sample of her own blood within which she "buried herself." As a result, while she analyses the sample, she analyses herself, subsequently becoming both the object and subject of the poem. Separated with a dash, previously active state of the blood cells has come to a stand-still under her gaze. They are dancers, but no more active. Moreover, as her gaze glides on them, the scientist notices that this is the "first time she knows herself this thoroughly. / The last time she will be in such company" (Morley *Invisible* "A Static Ballroom" 51 17-18). Knowing oneself, here indicates knowing one's material body better. The scientist rejoices at the proximity of the experience knowing that she will never observe the same blood cells in her life again, for, once outside the human body, they will eventually die which also explains their static form.

Likewise, "It Requires Nothing" introduces death as life's last experiment:

> The last experiment needs no special equipment.

It won't take place in a laboratory or hospital.
Sterile or sullied surfaces: It doesn't matter.
You can remove those plastic gloves,
that white coat.

[. . . . . .]
Remove personal belongings: spleen, heart, pancreas.
This is the final experiment. It requires nothing.
Close your eyes.
(Morley *Scientific* 17 1-5, 8-10)

Drawing parallels with scientific research, the speaker recounts in an orderly fashion the steps to be followed. Leaving her/his clothes and then her/his material form behind, death becomes the "ultimate" experiment for the scientist who follows the steps of the experiment compliantly but has no idea what awaits her/him at the end of the experiment. The poem treating death in an objective manner reflects the scientists' obsession to know more about not only this life but also after-life and imitates scientific process which acquires data through observation and experimentation.

"The Water Measurer" is about a scientist who collects data on water resources. The speaker is observed, as he strikes

his pose and recalibrate[s] his estimates as if he has misplaced
his notebook, or perhaps his mind, with all that staring at water.

[. . . . .]
He tests and counts, counts and tests, [. . .]
never satisfied with the data of darkness of statistics of sunlight.
It seems he holds his nose at the thought of getting it right, or of not
getting it not right, never or not quite like the water-fly in Hamlet
(Morley *Enchantment* "The Water Measurer" 13 3-4, 11-14)

The lines mentioned above reveal the careful attention paid to the process of data collection. Never fully satisfied, the scientist is ever eager to continue her/his tests to develop a statistic. As for the reference to "the water-fly in Hamlet," it identifies the fly as important as The Water Measurer in the poem no matter how small it is. The water-fly scene in Hamlet occurs in Act V, scene ii, where Osrick, the royal fop, informs Hamlet about the duel that is going to take place between Hamlet and Laertes. Rambling as soon as Osrick makes an appearance, Hamlet criticises the artificial manners of the fop, and by extension the English court, via him:

> HAMLET: […] *(aside to Horatio)* Dost know this water-fly?
> HORATIO: *(aside to Hamlet)* No, my good lord.
> HAMLET: *(aside to Horatio)* Thy state is the more gracious, for 'tis a vice to know him. He hath much land, and fertile. Let a beast be lord of beasts and his crib shall stand at the king's mess. 'Tis a chough, but, as I say, spacious in the possession of dirt. (Shakespeare *Hamlet* V. ii 82-89)

Thus, associating Osrick with an unimportant creature which loiters around a body of water with no apparent aim in life, Shakespeare criticises the usurpers present at the court. The Water Measurer, who is seen in action as a scientist while collecting data and keeping records of these at first, transforms into a Hamlet-like figure in the final lines of the poem. In opposition to the water-fly, which has no aim in life, his constant deliberations of "getting it right or not getting it right," recalling the famous "to be, or not to be" soliloquy, posits him as such. In this respect, the scientist in Morley's view represents someone who seeks answers to the mysteries of the universe as a consequence of which he is much more valuable to humanity than a carefree water-fly.

"Moss Eccles Tarn, Far Sawrey, 1983" is also about two scientists on their way to collect data. Because their van breaks down, the scientists, instead of going uphill, end up at the bottom of a hill:

> Nick will back me up in this – when we finally get the van to roll
> against its natural earthward loll, when the farmer comes by
> at five with fodder and the god-like strength of his tractor –
>
> that we'd come up with every practical solution for the insoluble:
> [. . . . . .]
>
> and then wisdom dawned across the fields just before four
> so we dozed an hour, under the radar of owl and nightjar
> (Morley *Enchantment* "Moss Eccles Tarn, Far Sawrey, 1983" 16 4-7, 10-11)

Misfortune meets the scientists on their way to "an evening's field trip to observe emerging midges" which turns into "a nightlong skin-close study of their feeding habits" due to a malfunction in the van (Morley *Enchantment* "Moss Eccles Tarn, Far Sawrey, 1983" 16 2, 3). Thus, getting to know the midges better than they had expected, the scientists' lucky decision to sleep under the sky proves to be an illuminating experience for them, since they gain wisdom by becoming one with nature under the watchful eyes of an owl and a nightjar.

As has been illustrated, Morley's science poems are particularly innovative in terms of their reliance on scientific methods and techniques. His poems which rely on experimentation, observation and provision of factual data, as is the case with his field-trip poems, aim at illustrating the processes by which scientists gather data as well as emphasising interdisciplinary relations.

3.6. ECOLOGICAL ISSUES

Ecology is a central concern of Morley's poetry. Animals and plants, or life sciences in general, are among the most popular subjects of his poems. He relies on his knowledge of botany and zoology to represent nature in detail in his poems. While representing flora and fauna he presents them with an objective tone, interested more in the muscle movements of the animals or their characteristics rather than the sentiments that they arouse. His poetry, depending on fauna and flora largely aims to raise an ecological awareness.

In this respect, like "Runner," "Air Street" is concerned with the observation of a deer herd as the speaker follows their tracks in the pitch of the night: "Deer-tracks – I followed them: made / a forest slide through a deer's eye; felt / for myself the trodden dints of hoof, / shorthand codes cut on the frost…" (Morley *Releasing* "Air Street" 36 1-4). Resembling the hoof marks to shorthand codes, the speaker tries to decode their message. Next, "Bamboo" deals with the bamboo plant as well as raising questions in relation to the significance of scientific findings. First pointing to the way "light on a forest floor serves as a prism," the speaker proceeds to enumerate the features of a bamboo plant: "The knit of its weft and lattice is foolproof. / Its cage is a woodwormy pagoda with sliding splatter-tray. / And his lying tongue is the size of – *clasp it* – of a goldfinch" (Morley *Scientific* "Bamboo" 14 6, 12-14). Enumerating the many virtues of the plant, the speaker then wonders: "And when all this is weighed and attended to and voiced / what can't be tempered by these few facts and codes" (Morley *Scientific* "Bamboo" 14 15-16 italics original). Trying to decode the codes of plants and animals which are visible to the careful observer, Morley relies on scientific facts for inspiration in his poems.

"You Were Broken," on the other hand, aims to raise an ecological awareness. The poem opens with a description of how araucaria "smashed its way / by micrometers of birth-push / under five centuries of dusks / of carbon dioxide and rainfall" in a glacial valley (Morley *Invisible* "You Were Broken" 1 4-7). Earth giving birth to flora as such, then attracts the suitable fauna into the forest. Butterflies and grasses, with "foreknowledge of their brevity," are accompanied by gall-wasps, honey fungus, and tree-creepers within the forest. Five-centuries' of work almost comes to harm when "blights of summer lightning, / of fire damage and that dark / year's mark worn secretly, / a ring, forged inside a ring" (Morley *Invisible* "You Were Broken" 1 27; 28-30). The two-sides of nature as the benefactor and antagonist are evident here. While one aspect creates and nurtures, the other one threatens life forms' existence by causing damage to them. Although these two images are juxtaposed in the poem, the poem still ends on a happy note:

> [T]hen the winter's coronation closing
> in a swaying crown of redwings,
> cones, drab diagonals of pine-fall,
> the lead winds hardening, and while
> the stone children wept with rain
> the great tree sheltered them.
> (Morley *Invisible* "You Were Broken" 2 31-36)

It can be assumed that despite the fact that nature may be subjected to damage at times it also has the power to re-generate itself constantly. So long as humanity is careful with it, nature will continue to re-new itself.

When carrying out experiments, the scientist should have a rough estimation of the advantages and disadvantages of her/his findings. As is the requirement of being an individual in a collective society, one needs to think of the results of her/his actions in all respects. Talking about three major factors which triggered society's dissatisfaction with science in the nineteenth century, Walker suggests that the hostility of the poets to science was first due to the mechanical understanding of the universe largely, then on account of its technological outcome whereby industrialisation left a definitive mark on nature and lastly due to "the indifference of science," since "[s]cientists seemed to be completely unconcerned with the implications science had for society" and "progressed

uninterrupted" (271). This was also when "a tradition of critique of science's truth-claims developed" (Armstrong 77). Scientists are required to take societies into consideration, before they act upon their findings as was the case with theoretical physicist Robert Oppenheimer who was the head of the Manhattan project that produced the first atomic bomb, and was against the nation's post-war nuclear policy ever since, as a man who had solid reason "to contemplate the ethical implications of scientific advance" (Hawthorne Deming 195).

Morley's poem "Posterity" underlines the responsibility of the scientist towards society and nature as such. Divided into eight parts, the poem deals with different aspects of familial relations in each section. The speaker of the fourth section, recently woken up from a nightmare, resembles the developments of science and technology to records of a murderer's voice; "*your very own / cabbage-white, afloat on electricity, / your impossible unmanned flight, / the Atlantic, the tide's static, white noise / of your brain's knowing and forgetting*" (Morley *Scientific* "Posterity: Woken early Sunday morning" 41 3-7 italics original). Thus, recalling images from World War II, when aerial bombs rained down on cities, the poem reminds the readers and, indirectly, the scientists of their foremost duty towards the society which is to preserve the security of the public and use science for the advancement of generations rather than their destruction.

Waking up, the speaker associates the voice with the dead whose impossible art of not breathing is described in an oxymoronic statement as "a science unmade from the human" (Morley *Scientific* "Posterity: Woken early Sunday morning" 41 14). The speaker, then, is fearful of science not only because of its power to transform a symbol of innocence – a butterfly – to something dangerous, but also because it will eventually catch up with the speaker. Therefore, it is essential that the poets and the scientists collaborate in supplying the society with answers. Or else, one may come face to face with the problems that surfaced during the nineteenth century when society feared the rise of machine power for fear that they may be replaced by it. What needs to be done, then, is to make scientific knowledge available to the public, when "the mechanistic world of Newtonian physics [has been abandoned] for a new universe of invisible forces and energies: of electromagnetism ('Hertzian waves', 1888; X-rays, 1895), unstable

matter (radium, 1898); of atoms conceived as vortices in the 'ether' rather than as stable entities" (Armstrong 77). With these abstract notions, it proves harder to grasp the advancements in science. Yet, when the effects of scientific research are felt on such a large scale, as with the atomic bombs; the poets owe it to their public to act as mediators and bring them to people's attention.

More than anything else fear of techoscientific developments has to do mainly with the "speed at which scientific knowledge is growing and the widening distance between those who have a grasp of that expansion and those who have not a clue as to its significance. During the past three hundred years, [. . .] science has undergone exponential growth: the larger its size, the faster it grows" (Hawthorne Deming 194). To this end, Hawthorne Deming introduces the idea of "edge effect" which indicates "a place where a habitat is changing [. . .]. These places tend to be rich in life forms and survival strategies. We are animals that create mental habitats, such as poetry and science, national and ethical identity. Each of us lives in several places other than geographic locale, several life communities, at once" (196). Instead, what Hawthorne Deming proposes is "an ecology of culture in which we look for and foster our relatedness across disciplinary lines without forgetting our differences. Maybe if more of us could find ways to practice this kind of ecology we would feel a little less fragmented, a little less harried and uncertain about the efficacy of our respective trades and a little more whole" (Hawthorne Deming 197).

In attempts to make the public aware of the current scientific ideas, which ultimately affect society, Morley deals with the theory of relativity in his "Special and General Theory." The poem is set in a familiar setting which has been employed by Crawford as well. Set in the ancient Aztec civilisation of Tenochtitlan under the rule of Montezuma, the central characters of the poem are

> [. . .] *X* and *Y* in a box with their friends,
> their closed society.
> Of an alleyway
> where the traffic – that film – of history has to roll.
> That's where a box is upending itself constantly.
> (Morley *Scientific* "Special and General Theory" 50 1-5 italics original)

X and Y, which are travelling in time and space, are identified as spacetime coordinates in the poem. The box, travelling through history, first lands in Tenochtitlan where it observes people without being noticed. Then, it continues its travel until it comes across a volcano. Hereon, the "story" takes an abrupt turn: "The story won't be sustained, it will go off like a horse from a gunshot / taking with it characters X and Y. / It will marry them. It will turn them into conventional narratives, / and that figure like a father-figure is not a visual joke, / but an image of the box that has rocked up there" (Morley *Scientific* "Special and General Theory" 50 33-37). As parallels are drawn between sciences and humanities, X and Y from Einstein's box transform into two traditionally unidentified characters of a story, despite their unbeknownst radical nature.

Then "[i]nformation lopes across in its motley," while "[s]omebody draws a line. Somebody an equation," and "[y]ou find yourself in the landscape, in this time zone, or in the box" (Morley *Scientific* "Special and General Theory" 51 41, 44, 46). The box, as understood at once from the title, is Einstein's box. Yet, like theories of special and general relativity, the box itself is developed by Einstein out of his attempts to refute the German physicist Werner Heisenberg's principle of uncertainty. Using the example of a box with mirrors to refute Heisenberg's argument, the experiment came to be known as Einstein's box, although Einstein could not disprove Heisenberg's theory and admitted defeat in the end (Bynum 201). While the box is an allusion to this, the discovery of the curved structure of spacetime in theories of relativity "showed that all movement is relative," and Morley problematises this throughout the poem (Bynum 198). As for their differences, special theory of relativity is concerned with time and its observers which identified light as constant, whereas time is regarded as relative rather than absolute (Bynum 198). On the other hand, the general theory of relativity analysed the relationship between gravity and acceleration (Bynum 199). All of these developments were results of several steps as underlined in the poem: "The graph changes with your movements, it becomes a parabola" (Morley *Scientific* "Special and General Theory" 51 62).

The speaker observes various sentiments as s/he continues to gaze at the box: "You want to live, you want to get out of the box. / [. . .] The box becomes something to you.

You begin to value its progress. / [. . .] You want / to turn it off, the dangerous switch" (Morley *Scientific* "Special and General Theory" 51 47, 51, 52-53). The threat that the box posits is voiced every now and then reminding the reader "[h]ow things build up to things, build down" (Morley *Scientific* "Special and General Theory" 51 72). It expands into something dangerous that the onlooker wants to turn off. Looking for "a prop-up," the box

> comes into your hands in the form of a long bow,
> a scimitar, a claymore, a Kalashnikov.
> Of your history that tears you to pieces in limbfuls.
> Of your not being able to get away with anything.
> *So you want the graph to have you on it? –*
> go on
>
> you can use my pen.
> (Morley *Scientific* "Special and General Theory" 51 75, 76-82 italics original)

The final lines reveal that the onlooker who is addressed as "you" is none other than Albert Einstein himself. Although he did not take part in the development of the atomic bomb directly, it is a known fact that his fear of Nazi technology which might develop weapons of mass destruction urged him to sign a letter written by Leo Szilard to President Franklin Roosevelt which eventually gave rise to the start of the Manhattan Project that ironically killed many innocent people elsewhere (Bynum 194). Putting aside "science's core value of openness and sharing information" the use of uranium and plutonium bombs in Japanese cities of Hiroshima and Nagasaki in 1945 forced many of the scientists to worry about what they created as it resulted in the death of almost 300.000 people (Bynum194, 195). Keeping in mind the line regarding how "things build up to things, build down," it can be said that although technology enables progress, it also may lead to devastation depending on the will of people who wield its power. For, the same nuclear technology is also responsible for generating electricity "with only a fraction of the greenhouse gases released by burning coal and other fossil fuels" (Bynum 195). Nevertheless, what is repeatedly criticised in the final lines is the scientists' and engineers' use of science and technology solely for military purposes. Evolving from bows to guns and from guns to nuclear weapons, the scientist should be responsible for her/his actions as scientists of the Manhattan Project themselves were held responsible by the public. The ending thus makes a reference to the infamous letter

graphed by Einstein holding him, indirectly, responsible for the use of nuclear weapons and not only on account of his signature but also because of his theories which enabled the Manhattan Project scientists to base their theories on.

Another poem which shows the close association between life and science and science's immediate effects upon the public is "Darwinian" which observes Darwin's theory of evolution and natural selection in action:

> Two freshwater biologists in a smack, upstream.
> An hypothesis as thin as the paper they wrote it on.
> [. . . . . .]
>
> The observations: tiny, as essential as daybreak:
> [. . . . . .]
>
> I turned into a fish one morning and drowned.
> [. . . . . .]
> How I swam into unemployment.
> (Morley *Scientific* 59 1-2, 9, 13, 15)

The initial part of the poem which observes a scientist during his field observation then continues with his unemployment which eventually, with a Kafkaesque turn of events, transforms the scientist himself into a fish: "The humane director of the freshwater laboratory. / He was 'released from unemployment' with one week's notice. / His final task was to sack all his staff" (Morley *Scientific* "Darwinian" 59 17-19). The poem has distant echoes of Morley's own unemployment when his laboratory closed down due to Thatcherite politics. Despite the turn of events, the scientist is still hopeful: "Someone, somewhere has place for our knowledge" (Morley *Scientific* "Darwinian" 59 23). Similar to the transformation of the speaker to a fish himself which echoes Darwinian evolution, the latter part of the poem introduces another parallelism that is the idea of natural selection: "Christ calls from the kitchen. We make lunch together. / Fish. Let's grill them" (Morley *Scientific* "Darwinian" 59 25-26). Besides its Biblical allusions, in the end, the speaker himself, who has already been identified as a fish, eats another fish symbolically reproducing the idea of the survival of the fittest. The poem, in this respect, shows how social Darwinism victimises people within the society by letting the stronger species feed upon the weaker party.

Morley frequently turns current ecological problems into a popular subject matter. As has been revealed in most of his field-observation poems, he likes to raise awareness of current, as well as future problems. To this end, he urges scientists and readers to re-consider the results of their actions where nature is concerned. Ordering the scientist to "not start / one city or one single stone / before the central sum is known," Morley in his poetry pays special attention to the responsibility of the scientist who may regard her/himself guilt-free by claiming that whatever s/he does is done for the sake of progress (Morley *Releasing* "Long Division" 19 18-20). In contrast, Morley believes that scientists should consider the moral aspects of their innovations at all times and, having the necessary wisdom to see the outcome of their actions, they should be held accountable for the damaging results of these. Nature is amoral whereas humanity is not which is why humanity has a responsibility towards nature.

In this respect, "Thirteen Ways of Avoiding the Blackbird" introduces a set of environmental disasters pointing to the responsibility of the scientist in the contemporary world. The title is a play upon the American Modernist poet Wallace Stevens's poem, "Thirteen Ways of Looking at a Blackbird." Stevens's poem enumerates the numerous features of the blackbird as it flies around, whistles and perches on a cedar branch. Morley's poem, on the other hand, takes a completely different path by focusing on the environment rather than the bird itself. Morley, in relation to Stevens's poem, suggested earlier that "Wallace Stevens takes a blackbird and observes it in thirteen ways. Thirteen 'test conditions', each of which is loaded with multivariate data of perception. [. . .] The blackbird is a dynamic organism, as is the observer, and the poem that results from the collusion of the two is a dynamic, restless document" (Kennedy 171).

The poem starts with the image of "the black nib of a pen," meaning a beak and a pen point, and identifies the blackbird as "the only seeing thing" (Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 20 3, 2). The poem, thus, marks the blackbird as a tool through which several observations will be reported. The blackbird itself is mentioned for the first time humorously in the next section: "A man and a woman / are one. / A man and a woman and a blackbird / is an arrestable offence"

(Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 20 4-7). With this introduction, the blackbird disappears only to be evoked later again in the final sections of the poem. What is described in between, however, mostly centres on the advent of technology and the nuclear disasters that have followed it rather than the blackbird. Yet, its presence can still be felt:

> Data force-feeds the machine
> with incomprehensible lines.
> The shadow of the ribbon
> crossed itself, to and fro,
>
> Truth
> tears through the page
>
> – unmistakable claws
> (Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 21 21-27)

Describing a typewriter in action, the tear-marks on the page which are caused by "unmistakable claws" emphasise the blackbird's role in recording data. It is, however, in the next part that the central concern of the poem is revealed: "The river is moving – / Sellafield must be changing shift / [. . .] The chopper-blades whirled in the acid winds – / last part of the pantomime" (Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 21 28-29, 38-39). Sellafield is a nuclear site in England which has released radioactivity into the area as a result of a fire accident that occurred in 1957. Morley's reference to the incident, preceded by the ominous statement of change observed in nature, indicates that the poem, through the blackbird's observations, criticises the damage nuclear power stations give to the environment. This aspect is further confirmed by the following lines where the blackbird, flying over the area, is subjected to acid rains which are evidently the result of the poisonous gases that rise into the sky and mix with the clouds. Sense of doom increases in the subsequent lines where flying "locusts" are observed, implying a locust plague which causes damage to the land and is generally considered to be an indicator of environmental problems (Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 21 40).

The ending of the poem affirms the idea of environmental degradation which is caused by negative aspects of technology: "It was snowing / black snow. / The blackbird /

burning / in cedar limbs" (Morley *Releasing* "Thirteen Ways of Avoiding the Blackbird" 22 52-56). Snow is a central element of Stevens's poem. However, Morley's poem transforms the white pure form of the snow into something sinister. The fire accident in Sellafield is recalled with the images of black snow and burning "cedar limbs." Morley via this re-writing emphasises the moral role of the scientist who should take into consideration the results of his actions thoroughly.

Another poem which criticises the destructive effects of technology is "Water and Fire." This poem deals with the use of technology in war effort. The poem, which is divided into two parts, juxtaposes two images of fishing within the context of the Vietnam War. Initially, the reference is to one of Jesus's miracles concerned with the great catch of fish when Jesus ordered his disciples to throw their nets into the sea and they, unable to catch anything before, are rewarded with huge schools of fish as a result of their compliance (Luke 5: 4-7). The second part contrasts with the Biblical image directly. Portraying a group of soldiers travelling in a chopper "on the Napalm-run," the speaker notices a "gook," which is a derogatory term for a Korean, and upon catching him brings him into the authorities as a result of which the "gook" is executed (Morley *Releasing* "Water and Fire" 24 13, 15). Making a reference to the Napalm bomb and the advanced technology that is used by the soldiers to capture and execute the victim, the poem is satirical of war technology on both levels. The machine guns that are used to kill the man have just as devastating effects as the chemical bombs that are used to wipe out massive numbers of people including civilians.

"The Field-note," too, problematises the effects of technology on the environment. As warships are noticed while "breaking the ice-canals," "a trail of oil spidering from the hulls" is observed (Morley *Scientific* "The Field-note" 55 1, 5, 12). The oil also traps the inhabitants of the area as is indicated by "a seagull's moustache of offal" (Morley *Scientific* "The Field-note" 55). Oil spills have been a major problem endangering the deep sea creatures due to pollution as well as other species who depend on the sea for survival. In addition, the reference to warships reflect yet again the negative effects of wars on the environment. Specifically because these warships are observed while breaking the ice, they add to global warming on a large scale. In this regard, their

presence adds to Morley's criticism of wars and particularly the results of wars on the environment.

Concerned with a glacial valley in the Lake District, "Mardale Head" criticises the use of dams because of the damage they give to the environment: "A reservoir, filling, cut / out a village in a flag of grey, halo-ing folds, indulging walls / their done-with labour" (Morley *Releasing* "Mardale Head" 26 1-4). The poem's description of a village submerged because of a dam project presents a depressing picture. The villagers mourn the loss of their homes and land as well as their sheep which are still out there. What the dam provides in return barely makes up for the loss the villagers experience, as "[c]ompensation came like drizzle on water / and wouldn't add... / [. . .] Winds relevel / what water-blades cancel" (Morley *Releasing* "Mardale Head" 26 8-9, 11-12). Nature, in this manner, takes back what humans claim for their own, while the benefits and the disadvantages of the project cancel each other. Moreover, it is not only the villagers or the sheep that are suffering the results, but also an osprey which is victimised due to its confusion over where the fishlight ends and the surface starts. In this respect, Morley criticises the destructive effects of technology on nature and habitat which victimise humans and animals alike.

In "Proserpina," Morley's concerns about nature and his conservation politics are visible:

> 'I could write a cliché about our conservation here
> but I won't and I won't because I can't.' The gesture
> politics of that dead elm is sufficient and your own
> reasons for driving above walking and mine for typing
> on a laptop under fake light and not a typewriter
> under an electric summer noon.
>
> (Morley *Enchantment* "Proserpina" 21 1-6)

"Proserpina" stands singular in Morley's poems for its explicit criticism of all that is wrong about humans that makes the Earth falter. Proserpina is the Roman equivalent of Persephone in Greek mythology. Identified as the goddess of rebirth, Morley's choice of title gives hope. However, in order to be reborn one must die first. Criticising people who prefer driving to walking, the speaker does not exempt her/himself from criticism,

either. Observing a dead tree, s/he holds her/himself equally responsible for not protecting the Earth, the way humanity should. The references to "fake light" and "laptops," aside from unravelling our overdependence on technology, suggest how we tactlessly consume the world's resources without giving anything in return (Morley *Enchantment* "Proserpina" 21 1-6). The question, uttered at the beginning of the second stanza, then, becomes the central issue of the poem questioning where our usurpation will eventually take us: "Where does it get us, / this wood, and these winding paths so like the paths / we'd like to make through the woods of our lifetimes / with their borders on the unsure growth but clear / and cleared to make our movements easier" (Morley *Enchantment* "Proserpina" 21 7-11).

Underlining the fact that for the sake of progress, humanity keeps destroying nature in order to make things easier, the speaker wonders: at what cost? Next, presenting the readers with images of felled trees from the woods, the speaker stresses that no matter how small it is, whatever is done finds its reflection in nature in the long run. The double-edged sword of technology, then, is criticised for not being used for the better. Portraying "great gardeners in their bulldozers," s/he satirises the usurpers of technology who rather than using it for the benefit of humanity employ technology for their capitalist ends with no care about the future (Morley *Enchantment* "Proserpina" 21 17). Taking into consideration the microcosm and macrocosm relationship, the speaker then asserts:

> It is true
> that what we waste bends back to grind us. My rubbish
> is also here in me, and I shove and shovel it around
> every day, sometimes alert to its weight and stench
> but most of the time too busy or bored to see or scent
> the wealth and ruin of evidence [. . .]
> [. . .] Much of that time you won't notice it either
> unless you take against me which I'm hoping this conversation
> might prevent. [. . .]
>
> (Morley *Enchantment* "Proserpina" 21 18-26)

Ignoring the problem is not the right way to deal with it according to Morley, for sooner or later our waste will devour us, unless a solid solution is found. Triggering a set of questions, the speaker wonders "why we took against / that fell-side, and against / these

woods and small rivers," since the process will eventually kill us all: "We are dying out here together" (Morley *Enchantment* "Proserpina" 21 29-31; 22 48). Thus, emphasising the interconnectedness of everything, Morley via this poem satirises our tendency to smooth over the cracks. Considering that everything is interdependent, he argues that unless drastic measures are taken, humanity will suffer the same fate as the felled trees and countless other damages that are inflicted on nature by humans.

If the human will falters, the consequences may prove damaging. Fear of the misuse of technology finds its way into Morley's poetry mostly in terms of the fear of atomic bombs of which effects are tremendous on both humans and the ecology. As in "Posterity: Woken early Sunday morning," technology can go wrong, if the outcome is not thought through. When dealing with science and technology, ethics is a necessity to establish certain control mechanisms so that massive catastrophes can be prevented. One such poem that underlines this is "Ludus Coventriae." As an imitation of the Coventry Mystery Plays, the poem reveals the devastating effects of military technology. In the "Introduction" to the poem Morley presents his intention as follows: "This poem tells the story of the city of Coventry's destruction in World War / II. Coventry was one of the leading cultural and trading centres in medieval / England. Its mystery plays of that time were famed throughout the country" (Morley *Invisible* "Ludus Coventriae" 66 1-3).

"Ludus Coventriae," includes an "Introduction" and a list, and transforms into concrete poetry gradually. The poem deals with the attack and people's reactions to it, besides imitating the form of a Mystery Play. Followed by "The Charges on Midsummer Night," the atmosphere set by the "Introduction" is introduced at once in the poem in the form of a list:

> Item p*ai*d to Death
> [. . . . . .]
>
> Item payd to Jesus
> Item payd to Mary
> Item payd to Pylate
> Item to the litell dying Chyld
> Item payd for this Prologe

(Morley *Invisible* "Ludus Coventriae" 67 33, 44-48 italics original)

Preceded by bullets, this long list of "charges" pertains to war crimes committed during the Blitz. Therefore, the items paid to death indicate the death toll of the Blitz. In relation to the poem, Morley states:

> The movement 'The Charges on Midsummer Night' uses financial records Of medieval stagecraft for the Mystery Plays in Coventry. There are three time-frames within the movement: 'November the Fourteenth, Nineteen Forty-One': the morning of 14 November 1941 before the major blitz; the first few seconds of that bombardment; and medieval Coventry at the time of the midsummer Mystery Plays. (*Invisible* "Ludus Coventriae" 66 7-12)

Indicating that so many people have paid so much during the bombings with the final line of the poem, Morley skips from "The Charges on Midsummer Night" to the poems themselves which narrate the events of the night in detail:

> *Out of danger shall us release.*
> Out of whose dangers?
> The sword or sharpened cross?
>
> It is the bombers' cross-wires
> radio-signallers
> that drag those planes across.
>
> *He is come to set the world on fire.*
> Red, the town is fallen; alight,
> a light; and all its temples fired.
> (Morley *Invisible* "Ludus Coventriae" 72 88-96 italics original)

Combined with religious diction, which suits the Mystery Play format, the speaker speaks of the night of the attack by referring to the technology employed during the attacks. In the "Introduction," Morley mentions that

> [o]n the nights of the World War II raids, radio beams were transmitted from two distant points on the coast of Europe, intersecting at 90 degrees over Coventry, creating an invisible cross in the sky. This was used as a precise radar target for the Luftwaafe. The German code name for the operation was 'Moonlight Sonata.' (Morley *Invisible* "Ludus Covenriae" 66 13-17)

Recalling Biblical marking of doors to differentiate the Israelites from the Egyptians that is narrated in the Exodus, during the Blitz, the German army used technology to

imitate a similar ritual. The cross-wires that are mentioned above, then, refer to the crossing radio beams over Coventry which shows the devastating effects of technology that are used during warfare. Towards the end, the lines become scattered on the page with bullets separating sentences. These broken images segregated by bullets transform the poem into a concrete poem, while the bullets reflect the random bombs that are raining upon the city. The poem, in this manner, shows how war technologies can be manipulated in false hands to cause massive destruction, rather than employing technology for constructive ends.

3.7. BIOCENTRICISM

Previously cultures have

> told stories of magic, stories that explained everything by the motives and actions of ambient spirits inhabiting the natural world and fashioned in the image of humankind. The cosmology of mythology constructed a universe in which the spirits of magic retreated and became remote gods. Anthropocentric cosmologies pictured human beings at the centre of the universe, above the beasts, occupying a place of importance, next to the angels, possessing the attention of the creator of all things. (Rogers 2)

The anthropocentric approach has given way to biocentrism which puts emphasis on all sorts of non-human agencies as much as the humans. Abundant in flora and fauna, Morley's poems first of all intend to show "a poetic form that increases the species-diversity of a habitat; how we prompt a whole city to read poetry; and how we place poetry at the heart of what we do and who we are" ("Environmental"). His ideas, then, are compatible with biocentric viewpoints. What Morley attempts to do is to stress the significance of everything that occupies a part of the world whether big or small. To this end, Morley in his poems includes animals and plants as abundantly as humans as part of the universe.

His poem, "The Goodnight" introduces bestial inhabitants of the world in order to stress that the world is not solely occupied by humans:

> An owl unfolds across the bed:
> its eyes, hungover can see the dead;
> the swerving and the narrow hours
> are no longer mine, no longer yours:
> perfect ships of life and work
> butt each other in the dark
> (Morley *Scientific* 39 1-6)

The night-time, according to the speaker, belongs to the owl and by extension to nature. Caught up with life and work, night-time provides the speaker with a kind of peaceful serenity during when s/ he enjoys an "asthma of [death]" because "[w]e are not alive in sleep" (Morley *Scientific* "The Goodnight" 39 15, 16). It is during this temporary death that the owl owns the world, as its vision extends beyond what is hardly perceptible to people.

Likewise, "Snowfinches" draws attention to the presence of another bird species. As songbirds, the snowfinches are likened to vocal artists in the poem: "The musicians are late, delayed by snowdrifts [. . .] / Snowfinches are roosting in the hall's roof. Our warmth woke them. / [. . .] What shall we hear from our artists?" (Morley *Invisible* 46 1-2, 4). Besides making the birds a central concern, the poem is important, largely because it presents a harmonious co-existence between the household and the birds. Indicative of the general harmony in the macrocosm, the co-existence of different species, thus points to biocentricism.

Morley's poems embrace all sorts of creatures from elements to plants and animals in an all-inclusive manner. One major aspect of Morley's poetry is his reluctance to anthromorphise plants and animals. "Dragonflies" is an example of his field-trip poems. The poem is reported from the eyes of a group of field observers: "This water is steep and deep. There are signs in artery red. / [. . .] it's June and we have trod / ourselves senseless sampling some imaginary species of coleoptera… / So, there are cautions slung down like life-vests by the river" (Morley *Enchantment* "Dragonflies" 12 1, 2-4). The cautions that the scientists encounter while gathering samples to prove the existence of a new species of coleoptera gain a deeper meaning in the closing lines of the poem when the scientists come across "these / sparking ornaments hovering then islanding on our shoulders / [. . .] The old map mutters that Here Be Dragons, and it lies.

/ Here be Darters, Skimmers, drawn flame. Here, are Dragonflies" (Morley *Enchantment* "Dragonflies" 12 10-11, 14-15). The reference to the statement "Here Be Dragons" makes the reasons behind the cautions clear, since it denotes a popular statement in Medieval and Renaissance cartography which was used to dismiss uncharted territories as dangerous by filling people with a fear that these places were occupied by mythical creatures (Blake). Likewise, in Morley's poem, the uncharted territory is a reference to the unknown. However, the speaker is frightened of this place not because it is populated by mythical creatures, but because it is an uncharted territory of life sciences. Therefore, he attempts to right a wrong by exploring the place and discovering darters, skimmers and, what's more, dragonflies there.

Similar to "Dragonflies," "Mayflies" also introduces a group of scientists who are on their way to examine a riverbed, which is described as "the rain of all rivers, and the sea / of all weathers" (Morley *Enchantment* "Mayflies" 14 2-3). The process of collecting samples continues as follows: "We proceed / by feel so as not to light alarm. We drag the riverbed out, / capsize its stone babies on our sampling tray, then ignite / their world in unraveling, incinerating light" (Morley *Enchantment* "Mayflies" 14 5-8). Despite darkness that is settling down, the scientists are careful not to cause damage to the river and its inhabitants. One of those inhabitants that is specifically dealt with is the mayfly whose touch upon the stream feels like "a code, / unmade from sand grain and rain and particles / that swerve through this under-space like quite comets / each considered and caught or flung on a fresh trajectory" (Morley *Enchantment* "Mayflies" 14 11-14). Below the stream, night is felt due to the mayflies whose touch sends down "minuscule spirals" of darkness (Morley *Enchantment* "Mayflies" 14 10). In this respect, the mayflies play an important role in transmitting what is above to down below.

Placed on the opposite page "Alaskan Salmon" portrays the journey of the leaping Atlantic salmon to its origins. The poem opens with the image of an angler who catches a salmon: "*Salmo salar* – those lights that leapt from the solar flare / of a mid-Atlantic lighthouse; that swum – or strummed to landfall" (Morley *Enchantment* "Alaskan Salmon" 15 4-5 italics original). Thus, making its entrance to the poem, information regarding this specific species of salmon is given afterwards. "*Salmo salar*, / coiling

against arching voltages of an Alaskan river, / springing at their height like bending wands / casting themselves towards its spawning grounds, / plashing gradients until they nose the river's birthing vaults" (Morley *Enchantment* "Alaskan Salmon" 15 10-14 italics original). Alaskan salmon traveling from the Atlantic Ocean leap towards the upper parts of streams in order to spawn in these places. The poem, opening with the death of one of them, then, re-affirms the life-cycle of the Alaskan salmon by illustrating their reproductive process.

Morley's "Mermaid," on the other hand, blurs the line between not only fact and fancy but also human and animal. The poem unfolds the news of a mermaid sighted by a man who himself is seen "mewling [. . .] / 'It was neurosis, no, but her voice came swimming.' / She was a pillage of fish stinking his bed out" (Morley *Scientific* 70 6, 7-8). The male persona who is associated with a mewling cat early on indicates that the mermaid, who is part fish and part human, will fall prey to the advances of her feline counterpart. The mermaid is not alone in her animalistic features, then, but the man who catches her is just as bestial as her. Yet, it is only the mermaid who is taken into custody:

> She was dragged from the harbour, watched by children.
> She was probed by a forensic team down from Fleetwood.
> She was a woman but *it* was not a woman.
> It was taken to a shipping lane and slid overboard.
>
> In the fishery HQ, Doctors Z_____ and R_____
> were slow to bring up the arterial brightness
> of the wound, which they saw, or they said they saw,
> and her fishtail sliced and cut like a dress.
> (Morley *Scientific* "Mermaid" 70 9-16)

The sensation that is created by the discovery of a mermaid comes to an abrupt end when "it" is diagnosed with "behavioural psychosis. It was nothing more. / It was a sea-lane to nowhere and somebody saw" (Morley *Scientific* "Mermaid" 70 17-18). The sudden change in pronouns from "she" to "it" as soon as the mermaid is identified as a fish rather than a woman, extends Morley's criticism to scientists who, so focused on facts, are unable to see the equal damage they cause to the environment. Reminiscent of Wordsworthian lines "[w]e murder to dissect," the doctors dissect the body in the

fishery head quarters mercilessly (228). The doctors are so obsessed with finding out more about the mermaid that they disregard its subjective entity. A fish identified with psychosis behaving like a human being in the end turns out to be a woman who attempts to commit suicide but is caught because somebody saw her jump. Her diagnosis, then, has to do with the fact that the scientists are incapable of understanding the sentiments behind why someone might try to drown herself, despite their knowledge. Most significantly, however, Morley employs the mermaid as a means to emphasise how scientists victimise humans just as well as the animals in their quest for truth at times. After all, people cannot be considered separate from their environments and experiments carried out on animals for the sake of scientific advancement in the long run harm humanity as much as they harm the animals themselves.

3.8. FAITH IN SCIENCE

Morley's poems display a move which regards magic as the primary feature that helped ancient civilisations to explain natural phenomena. Magic is then replaced by religion, and ultimately by science. Both magic and religion being inexplicable phenomena, Conrad-O'Briain's statement that "science fiction really begins where myth ends" rings true in relation to Morley's poems (32). Science itself, in a way, is rationalised magic, for as soon as "magic or divine power begins to be explained in terms of the manipulation or understanding of natural law and technology, science fiction is at the door [. . .]. The wizard or supernatural being becomes the scientist, mad, benign, or otherwise" (Conrad-O'Briain 33). Thus, science itself has "a whiff of the superhuman/supernatural" in itself, especially where the technoscientifically-illiterate average citizen is concerned (Conrad-O'Briain 32). Analysing Edgar Allan Poe's *Eureka*, a lengthy prose poem, and his "Sonnet to Science," Matterson infers that

> Poe represents a fairly clichéd poetic theme, in which science is represented as the destructive enemy of the mythopoeic imagination. Science demythologizes our world and leaves it impoverished, leaves nature bereft of our enriching imaginings. Science is the enemy of imagination. [. . .] [However,] [w]hile science may be represented as a destructive force, it is also our contemporary in a way that the pagan gods of nature are not. (126)

Regarding Poe's perception of science as "the modern equivalent of the Grecian urn" which "expels pagan presences from nature" as a result of which the poet mourns the loss of these, Matterson posits that it is "nevertheless a vessel for truth and progress, a 'true daughter' of time" (Matterson 127). What is proposed by Poe, then, is "renegotiation," since hostility will lead to archaisms which any poet in her/his sane mind has to avoid, if s/he wants to capture the realities of her/his age (Matterson 127).

In this respect, a firm belief in science dominates Morley's science poems. Occasionally juxtaposing magic and science in his poems, Morley affirms that science has permanently replaced magic. In line with Conrad-O'Briain's notion that "however marvellous [. . .] machines are, they are not magic," according to Morley "[c]ompared to them magic is inferior and indignus, 'inferior and unworthy'" (30). Noticeable also in the titles of his poetry collections, Morley employs the clash between magic and science as a recurrent theme in his poems, such as "Second Sight," "Gypsy Woman's Death," "St Lucy's Day" and "An Ice-Queen."

"Second Sight" portrays the speaker's memories of her mother who closing the curtains and showing interest in a variety of paranormal books reveals her interest in occult:

> [O]ur neighbours' greedy sympathy
>
> on seeing the curtains shut all summer,
> strangers call by…
>
> Inside, my mother's book-lust
> Spread like weed; Paraquat titles:
>
> *The World, The Flesh, The Devil,*
> back-copies of WHICH?
>
> At twelve, I paired *Walpurgis*
> with 'the latest in slow cookers'
> (Morley *Releasing* 12 2-10)

Identified as toxic, the books that the speaker's mother reads contrast at once with the vocabulary the speaker adopts which relies on her scientific knowledge. Walpurgis, "a traditional holiday celebrated on April 30 in northern Europe and Scandinavia" and is in essence similar to Halloween, the pun on "witch" all strengthen the speaker's dislike for

all things supernatural ("Walpurgis"). To emphasise her dislike she even makes fun of her mother by listing their address as "'coven'" due to her mother's occult activities (Morley *Releasing* "Second Sight" 12). The mother, on the other hand, opening the Tarot, feels like she "open[s] futures / where she [holds] all the cards" (Morley *Releasing* "Second Sight" 12 19-20). The latter part of the poem extends the speaker's mockery to feigning an interest in her mother's activities:

> November's flood
> brought a flotsam of fresh business.
>
> Curled in a similar grace,
> I pretended an inheritance:
>
> served tea like sacrament,
> picked warts off the seed-cake.
>
> That first séance was nerveless
> cathartic giggles;
>
> we re-tuned our hands like surgeons,
> pulled up the dead like floorboards.
> (Morley *Releasing* "Second Sight" 13 27-36)

Despite the speaker's feigned interest, it is clear that her true interest lies with science as she draws parallels between a séance and a surgical operation talking about the props that are needed and the herbs that are necessary to make the séance look like a genuine one, as if it was truly a surgical process. Her lover's "resistance" and reluctance to join her in the final lines echo her own perception of her mother's activities (Morley *Releasing* "Second Sight" 13 44), as she keeps pointing to the ridiculousness of the whole affair herself. Although this is a part of her heritage and culture, the speaker will not be following in her mother's footsteps.

As for "Gypsy Woman's Death," the poem relates the gossip surrounding a gypsy woman whose curse results in the death of a man who apparently had a deal with her: "The carp of her tongue, the black shoal of gossip. / Her oath caught short by the district nurse's sly whisper" (Morley *Scientific* "Gypsy Woman's Death" 16 1-2). Positioning a woman of science against a woman of dubious origins as such, the poem, like the previous one, juxtaposes belief in science with faith in occult. While the husbands of the

woman's daughters, fearful of the woman, decide to set fire to her caravan, one of them appears and, realising that the gypsy woman is gone, sets fire to the court order that has sealed the caravan. What happens later fulfills the gypsy woman's oath as the man starts flensing himself: "His bond is his own, and the white bone. / The spaghetti about his wrist – more tubes and colours than a telephone cable" (Morley *Scientific* "Gypsy Woman's Death" 16 12-13). The oath is, thus, fulfilled with the image of a man dissecting himself surgically, while resembling his veins to spaghetti and a telephone cable during the medical process.

The title of "St Lucy's Day" refers to a religious festivity associated with northern Europe and Scandinavia that coincides with the winter solstice ("St. Lucy's"). Legends have it that St Lucy, whose name's origin means light in Latin (*Lucia*), blinded herself when a pagan nobleman claimed that he was haunted by her eyes ("St. Lucy's"). St Lucy's Day accordingly celebrates the ending of winter and the oncoming Spring on the 13th of December each year ("St. Lucy's"). Morley's poem employs winter imagery to associate the legend of St Lucy with contemporary society:

> Snow wakes you. [. . .]
> Fine parallels follow the shuffling cars.
> [. . . . .]
> The weather is a television with its aerial down.
> An iceman instructs the trees to play dead.
> Ponds are trapdoors you drop to death through.
> [. . . . .]
> The angels are above you with CCTV.
>
> [. . . . .]
>
> Christmas is the madman in red and a snowplough.
> (*Scientific* "St Lucy's Day" 81 1-2, 6-8, 10, 15)

Likening the sight of the snowy weather to a television which has fuzzy image and imagining the frost on the trees to be caused by an iceman, while ponds function as trapdoors through which people can fall through, Morley combines the supernatural with the technological. His playful associations continue as he presents a picture of contemporary society in which "angels" with close-circuit television watch over people and modern-day celebrations of Christmas are associated with getting drunk on duvets.

Presenting how current rituals and spiritual holidays are dominated by technological life-styles nowadays, Morley, yet, refrains from passing judgment.

With its title which recalls a fairy tale, "An Ice Queen" problematises faith and belief in a fairy-tale mirror world. However, this fairy-tale world has a major difference; its rules are regulated by science: "We, you, I – in our mirror she finds an error / nothing so trite as a crack or cross: its mass / of metal slips with her gravity's lunge" (Morley *Invisible* "An Ice-Queen" 53 1-3). The reflection in the mirror

> shifts in us, a craving; we long to serve,
> lounging in the cellar's dark matter, for any mark
> of notice [. . .]
> [. . . . . .]
> [. . .] she was ice-clear, those near
> the light of her work left off their own work
> to tend to hers, feed her starveling grate. How late
> she recognized their shades, who served, who paid
> (Morley *Invisible* "An Ice-Queen" 53 9-11, 13-16)

Optics is what is at work here as light and shadow collaborate to create the duplicated image on the surface of a mirror. The gazer of the poem, accordingly, is identified as an ice queen to whose service energy rushes to convert light in order to reflect the gazer's form. Explaining the physics behind mirror-imagery, Morley then deduces that both the gazer and her duplicate are one: "Those fascinated by her gravity, try / counting back to when you became so: so the same / vanity trips us, traps us in our error. She is that mirror / we grow hard to gaze into. Then melt through" (Morley *Invisible* "An Ice-Queen" 53 21-24).

Confirming the belief that science as explicable magic has its own charm, Morley's poems refuse to look back and acknowledge the fact that the only direction to move is onwards. Like science, technology, too, has an essence of something magical according to Morley. Hence, he employs the idea of technology as modern-day magic particularly in his dedicatory poems to his father. In these poems technology is encountered as a neutral agent which bends according to the will of the person using it. Morley's "Four Poems to My Father," subtitled as "Heirloom," "Errand," "Metal-Work," excluding "In

Loco Parentis," and "The Goodnight" show a fascination with the magical aspect of technology.

"Heirloom" draws parallels between the speaker's father's occupation as a lather and poetry writing. Calling his father's products his poetry, the speaker, who can easily be identified as Morley himself on account of the poem's title, remembers how his father "snicked his wrist of verse. / All I recall is the swarf / where he worked, / plumes of acetylene, / ghost-chatter of lathes..." (*Releasing* "Heirloom" 8 5-9). As a child the speaker remembers how he was captivated with these machines. Rather than working on metals, his father is more likely to produce poetry in the child's imagination: "this cutting / the metal of speech, / commas like weld-scars; / his life-work with steel: / *a rounding*" (Morley *Releasing* "Heirloom" 8 10-14 italics original). Parallels between working on metals and on poetry are made visible with his father's constant cutting, brushing and moulding of the materials at hand. Likened to the process of working on poetic form, his father's poetry is also identified as the inspiration behind Morley's wish to become a poet. Similarly, "Errand" relates his visit to his father's workplace and his spellbound reactions to the way the machines work:

> Earth moved like sugar, boiling
> against the metal of a dumper.
>
> A machine dropped, dropped its yellow snout,
> nuzzling at joists
> it hammered in.
>
> When I got to my father, I would learn
> the heat of that impact, how you might
> light paper from it two hours on...
>
> The air meanwhile would shiver with fire
> a fineless dust, the shouts of impact
> (Morley *Releasing* 10 3-12)

Shimmering air, resembled to "a fineless dust" in his childish way because it is an outcome of the machine, arouses the child's curiosity. The machine which is anthropomorphised with the image of a yellow snout and earth boiling in a dumper serve as a series of wonders for the child. Subsequently, the child's marvel at how these machines work triggers his hunger to learn more about science. Noticing his father

among the welders, as he is "cutting thin-plate / to microns. Not visored, he / stood out from that coven / of kneeled and sparking men," the speaker's comparison of the group to a "coven" emphasises the magical aspect of science for the child (Morley *Releasing* "Errand" 10 14-17). The last of the series, "Metal-Work," also recounts one of his visits to his father's workplace. As the lathe "kept cutting-out / [. . .] little deaths," of sheet-metal, the speaker

> watched calipers twitch
> legs skinny,
> an avocet's;
>
> but looked beyond:
> to drill-heads primed,
> fluted like wands
> of steel
> (Morley *Releasing* "Metal-Work" 11 2, 3, 14-20)

The association of the primed drill-heads with wands of steel illustrates the speaker's perception of science as explicable magic. Finalising the process by halving the work, his father's drills speak for themselves in the end which indicates the moulding of science in human hands. As is also repeated in "The Goodnight," the idea is that science and technology bend according to human will: "Light we taught to obey our touch / is surrendered to the switch" (Morley *Scientific* "The Goodnight" 39 13-14). Although preservation of nature is a central concern of Morley's, he does not condemn the use of technology, because the way he sees it, it is the human agency that is responsible for the damage that is visited upon nature. Accordingly, so long as the human will does not waver, science and technology will continue to mesmerise humanity by proving beneficial for them.

3.9. MICROCOSM-MACROCOSM RELATIONSHIP

Rogers observes that "[w]e see ourselves as very tiny beings made up physically of groupings of other even tinier entities, atoms, molecules, cells, and organs. We are made from the dust of old stars. Most of us believe we have risen through natural selection and mutation of genes over many, many million of years, our bodies being related to all other living bodies on Earth" (3). As such, if, for instance, a bird is suffering from the

effects of an environmental disaster, it indicates that humanity suffers from it equally. In this respect, Morley's poems reveal a Coleridgean concern with nature observing one in all and all in one. The particular in this respect becomes a representative of the universal.

His poem "Friendly and Equitable Insurance" presents an example of microcosm-macrocosm relationship. The speaker, having been to the woods, brings an unidentified creature home. Then, he asserts:

> I've been digging, not to lay a ghost
> or to find a father, but to uncover the taproot
> of that famous tree from the book of memory.
> I post myself a report on its territory:
> a nervous system of root, the brain of leaf,
> perennial synapses of forgettings and rememberings
> (Morley *Scientific* "Friendly and Equitable Insurance" 34 3-8)

In this manner, the speaker denies an interest in the past but rather reveals what he hopes to find by digging into the past; that is a key to the future. The tree in this respect represents the tree of life by way of which s/he can make logical deductions about what the future may bring. Her/his next statement confirms these ideas: "In everything I do, I offend something" (Morley *Scientific* "Friendly and Equitable Insurance" 34 19). If the past is what has shaped the present, the present itself is what is shaping the future. Consequently, every little act changes the course of history as even the smallest activity sends ripples through space and time.

The idea of a minor act affecting a bigger one is also reproduced in "Posterity: v" which brings Chaos Theory to mind immediately: "'In the lightbulb over your desk, / one of those "chaos-butterflies" / startles some minor ink-storm / off the coast of her page, / a marginal note" (Morley *Scientific* "Posterity: v" 42 1-5). The ripple effect triggered by the butterfly's wings finds its reflection in a larger scale on the notebook. However trivial a thing may look, its effects still find their reflections in nature and society. Similarly, "Long Division," besides recording contemporary urban life, examines microcosm and macrocosm relationship from the perspective of atoms: "*New Scientist* / warns me there is only this / last particle to uncover, (but goes on) / how we are just that

one / unthought-of matter multiplied" (Morley *Releasing* "Long Division" 19 9-13 italics original). As Kennedy further suggests, the poem presents "poetry and science as aspects of the same discourse" (171). Thus, emphasising the microcosm and macrocosm relationship, the poem also promotes an integrated worldview on account of this contingency.

Although change is not a recurrent concern in Morley's poetry it is still visible. "All This is Happening" underlines the fast-paced change that occurs as a result of technoscientific developments in contemporary society:

> Avenues. Lawns. Parterres.
> Lanterns in all the known trees
> [. . . . . .]
>
> all this is happening
> in a different Siberia
>
> [. . . . . .]
> The cities recline
>
> in a pragmatic circle
> from which the labour camps
> are barely visible.
>
> [. . . . . .]
> an ocean once covered
>
> this entire continent
> (Morley *Mandelstam* 66 1-2, 5-6, 9-12, 21-22)

Morley observes that what once covered Gaia is now covered with pragmatic cities or worse; with labour camps where those who are sent into exile are doomed to work to change this already unfamiliar place some more. With science and technology urban life changed fast and drastically. The firm acknowledgment that "an ocean once covered / this entire continent," however, implies a possibility of nature re-claiming what it used to own.

Although Morley's poems occasionally reflect urban experiences, his poetry is mostly focused on the ecological world. As for computers, they make an appearance in Morley's poems every now and then, although their presence is mostly due to practical

reasons, since especially his field-observation poems rely on them in order to enter and preserve data. The use of computers as a reliable safe for long-time preservation of information and their ability to transmit knowledge easily mark them as invaluable tools for Morley so much so that the speaker of "Posterity: Pollen" types "I will not die, on a computer screen," as if it would make it true (*Scientific* 42 13). The speaker's vain attempt to make her/himself immortal, ironically enough, works though, because after her/his material death, her/his existence continues to subsist in the virtual realm.

In conclusion, like Edwin Morgan and Robert Crawford, in his science poems Morley uses technoscientific language and topics in order to emphasise the role of science and technology in contemporary age. Employing technoscientific language for this purpose, Morley also experiments with form by including mathematical formulas and numerals in his science poetry as well as writing concrete poems. Like Morgan and Crawford, Morley's science poems exemplify an interdisciplinary approach which defends an integrated worldview that embraces all things big or small. In his field-trip poems specifically, Morley observes the scientist-speakers in action, giving the readers information about experimentation, observation and data provision processes within an analytical framework. Due to his close interest in ecology, flora and fauna frequently populate his poems, in addition to possible environmental problems. Alerting his readers to contemporary environmental problems, his poems are mostly concerned with presenting scientific papers, as one of his poetry collections aptly points out. Occasionally his poetry juxtaposes faith in magic with a firm belief in science, thus, proving Sir James Frazer's earlier views that magic will be eventually replaced by science. Instead of having futuristic settings, his poems are topical set against the backdrop of urban lifescapes. Lastly, microcosm-macrocosm relationship is visible in his poetry, which underlines, how a small act has its effects on a larger scale, such as nature.

CONCLUSION

Contemporary British Science poetry which developed out of British postmodernism reflects recent interests in science and technology. While postmodernism erased the boundaries between several dichotomies by challenging grand narratives and blurring the lines between them, science poetry took form by positing questions regarding the viability of sciences in humanities. Disregarding notions that marked the sciences as inappropriate subjects for poetry, science poets emphasise the necessity of their presence in poetry because science and technology now constitute a major part of contemporary life. From widespread use of computers, smart phones and all kinds of telecommunication technologies to wireless technologies and medical advancements, the technologies that are visible in the last quarter of the twentieth century require that contemporary experiences are reflected in poetry. As a result, from the turn of the twenty-first century onwards, there has been a tendency to include scientific and technological elements in poetry. In their poetry, Edwin Morgan, Robert Crawford and David Morley represent attitudes and ways of engaging science and technology to allow a poetics of science poetry to emerge. Accordingly, the reading of their poetry in this vein has formulated a poetics of contemporary British science poetry based on the individual poetries of Edwin Morgan, Robert Crawford and David Morley.

Despite their differences Morgan, Crawford and Morley emphasise some similar points in their science poems. First of all, defending unity of knowledge and the idea of an integrated world, all three poets deem interest in singular intellectual disciplines as reductive and encourage the co-existence of sciences and humanities via their work. They believe that for a deeper understanding of the world, an interaction between separate disciplines is required, and for this reason they consider unity of knowledge as essential. Secondly, owing to their views regarding an integrated world outlook, all three poets consider interdisciplinary studies an enriching experience and regard the philosophical perspectives provided by humanities as a requirement of the sciences. Thirdly, the poets act as mediators between the sciences and humanities, showing that it is not only possible but also imperative to enable communication between separate disciplines, if fear and alienation are to be prevented among the members of the public.

By using elements from science and technology in their poems, the poets call attention to issues and viewpoints related to the sciences, and raise questions as to the moral implications of scientists' acts. Lastly, as has been stressed through their poems, they try to illustrate that the creative energies of the scientist and the poet, who perform both in different and similar manners, can inspire one another for more creative work.

As identified in the poetry of Edwin Morgan, Robert Crawford and David Morley, contemporary science poetry is chiefly concerned with either genuine or fabricated scientific data and recent developments in science and technology. It incorporates these in the form of subject matter, language, viewpoint, theory and method in poetry. As argued, with his keen interest in computer technologies and space exploration, Morgan's poetry shows a concern for fabricated data. In his science poems, Morgan relies on scientific data which inspires the poet to imagine the consciousness of a computer, an alien or the experiences of a dematerialised man who has settled in a distant planet. Accordingly, while his computer poems observe Artificial Intelligences transmitting religious messages, his space poems regard space settlement, alien encounters and teleportation as possible. In a few limited examples Morgan's poems observe science in the laboratory. In contrast, both Crawford and Morley rely on genuine scientific and technological data in their poems. Whereas for Crawford the use of authentic facts serves solely figurative purposes, like metaphors and similes, in Morley's case they are utilized for both literal and figurative purposes.

Accordingly, in accordance with its scientific and technological subject matter, science poetry depends on technoscientific language which refers to terms, ideas, theories, viewpoints, findings and methods borrowed from the sciences, and as such technoscientific language is central to the poetries of Morgan, Crawford and Morley all. However, while Morgan and Morley rely on science and technology mostly for literal ends, Crawford's poetry relies on science mainly for its figurative resources. Moreover, due to the contemporaneity of their subject matter, Morgan, Crawford and Morley employ daily language in their science poems. Specifically, science poems may rely on technical language and mimicry of computer-generated language, as in Morgan's

poetry, and defamiliarisation as in Crawford's poetry. Morley, on the other hand, relies on both literal and figurative aspects of technoscientific language equally.

It is observed that science poetry makes use of unusual poetic source materials. It involves experiments with form and style. In addition to topical innovations, formal innovations are also part of its poetics. Edwin Morgan's poetry, in its formal aspects, is broad in its range and is highly experimental. Morgan's poems suggest that science poems are devoid of sentiment due to his rejection of anthropocentric views particularly in his computer poems. Crawford does not experiment with form as much as his fellow poets, although there are a few examples. However, Crawford rejuvenates a traditional form, that is lyric poetry, with his reliance on objective sciences to transmit subjective experiences. In Crawford's poetry sentimental values are frequently attached to technoscientific discourse. Unlike Morgan, Crawford's tone is quite subjective in his lyric poems. Crawford's poetry makes use of personal anecdotes, and makes references to Scottish scientists and literary figures. Of the three poets, his poetry is the most subjective as he aims to build a high-tech history of Scotland. Like Morgan, Morley, too, experiments with form and writes poems in the shape of formulas and posits mathematical questions in others. Morley's tone is not as objective as Morgan's, yet neither is he as subjective as Crawford. If anything, his poetry stands somewhere in between Morgan's objectivity and Crawford's subjectivity. Like Morgan, Morley's stance is objective in his depiction of the processes and methods of data acquisition, in his field-observations poems specifically, via fly-on-the-wall technique. Then again, his attempts to show the sciences as the magic of the present age display a somewhat subjective tone that is similar to Crawford's sentimental tone. Concrete poetry is yet another popular device that is used specifically by Morgan and Morley for innovative purposes. Although Crawford's poetry, too, exemplifies a few examples, their number is far from being anywhere near Morgan's or Morley's.

In terms of their treatment of subject matter, contemporary science poems may closely observe scientific methods during the process of data acquisition. As a consequence, the poems may be scholarly, systematic and precise in approach. Neither Morgan nor Crawford is concerned with the acquisition of scientific data in their poems. In this

regard, Morley's poems stand out due to the scientific methods employed in the writing of these poems. Morley's poems can be read as scientific experiments which give information to the readers about the materials and methods employed. Unlike the other two poets, Morley's poetry is particularly concerned with life sciences and represents field-trip observations, laboratory experiments, graphics, statistics and reports of factual data. In the acquisition of data, he follows the example of the scientist whereby he sets the scientific principles, directs a question, shows the relationships between the activating elements and reaches deductions while documenting these processes like an impartial observer.

As for subject matter, these poets consider everything as suitable topics for poetry. Morgan's poetry embraces biocentricism in opposition to anthropocentricism and extends even further by embracing a posthuman view of the world as his computer poems exemplify. Giving equal value to animate and inanimate objects and intrigued by the idea of communication with non-human and alien species, Morgan shows an early interest in posthumanism. Likewise, suggesting a recovery of the bond between man and nature, Crawford's poetry, too, displays a biocentric perception of the world due to his inclusion of plants, animals, elements and atoms in his poetry. Morley's poetry displays a similar approach due to his extra-sensitivity towards animate and inanimate objects alike.

Set against the backdrop of technologically advanced present, the science poems of the three poets are essentially urban. Positioning Glasgow at the heart of his poetry, Morgan's various sonnet dedications paint a techno-science driven urban picture of the city. Despite making references to various historical sites, Crawford's poems are decisively urban as well, for through the past he opens vistas to the present. Like Morgan and Crawford Morley's poetry is also concerned with urban lifestyles which rapidly change due to the use of science and technology. Contrary to Morgan and Crawford, however, in Morley's poems urban life is not easily identifiable.

Another point that can be defined as a characteristic of science poetry is its use of futuristic settings. Of the three poets, Morgan's poetry makes use of futuristic settings

the most. His space poems provide some of the finest examples of these settings in their representation of space travel and computer technologies which anticipate a far more advanced future. Oscillating between past and present, Crawford's belief in the future is different from Morgan's because he considers the past as a key to the future of his semi-dependent country. Unlike the Scottish poets, Morley has no interest in the future other than the planet Earth's ecological future.

It can also be said that change is central to science poetry. Whether identified as resignation or excitement, Morgan's willing acceptance of change echoes Darwinian theory of evolution whereby species that are adaptable to change survive, whereas the rest perish. Regarding change as a beneficial phenomenon, there is no place for nostalgia in Morgan's poetry. Presenting a positive attitude towards change, Morgan's poems exhibit an optimistic view of the universe as a place of perpetual change. In this sense, Morgan desires to create new connections with alien species and planets in the future rather than feeling overwhelmed by a nostalgic past. His speakers are always too eager to explore new frontiers or communicate with aliens, despite the tragedies they may have left behind. Crawford's notion of change strictly differs from Morgan's for he believes that, despite their altered façades, anything carries within itself a trace of the past. In this respect, science and technology, according to Crawford, change the country in order to help preserve the national heritage of Scotland by creating a new one that both carries echoes of the past and is more suited to the demands of the contemporary age. Contrary to the notions entertained by Morgan and Crawford, in Morley's poetry change in some cases have negative connotations which are visible mostly through environmental deterioration. However, like Morgan, Morley considers change as a necessity of evolutionary process.

As for subject matter, negative effects of science and technology are also central to contemporary science poetry, although, contrary to Crawford and Morley, Morgan does not concern himself with them. If there is any criticism of the harmful effects of science and technology in Morgan's poetry, it is only covertly there. Planets may have been destroyed in his poems but Morgan gives no indication as to what may be the reasons behind such an occurrence and presents the conditions as they are, bereft of any

subjective sentiment. In Crawford's science poems, negative effects of science and technology are felt especially in terms of alienation. According to Crawford, recent communication technologies are the reason behind this alienation. In a few cases, environmental problems that are presented as the results of nuclear sources and weapons are also addressed. As for Morley, negative effects of science and technology in his poetry are for the most part felt through environmental disasters. Like Crawford, nuclear weapons and power plants are an unsettling issue for Morley which he frequently turns to poetic subject matter. Respecting all life forms equally, Morley aims to raise an awareness of contemporary ecological disasters via his science poems.

The microcosm-macrocosm relationship is also central to contemporary science poems. Morgan's poetry points to the relationship between microcosm and macrocosm in relation to Morgan's interest in urban life and his unshakable faith in futuristic settings. On account of his interest in the urban, Morgan bases his poetry in the industrial and technologically-advanced Glasgow, or else in Scotland in general, marking the place as *the* centre and perfect representative of adaptability to change, from where he opens up to space. Crawford's poetry is also interested in opening Scotland to the world through microcosm-macrocosm relationship like Morgan. Crawford's poems expose the idea of microcosm and macrocosm relationship through flora and fauna, in addition to urban experience. Morley's poetry illustrates the microcosm-macrocosm relationship as well which, in most cases, is restricted to the natural world. Thus, rather than an interest in the future or concern for the urban, his poetry emphasises biocentricism through a microcosm-macrocosm relationship.

This study concludes that a poetics of contemporary science poetry can be identified in the poetry of Edwin Morgan, Robert Crawford and David Morley based on the qualities of their poems. As is shown by the similarities and differences identified in Edwin Morgan, Robert Crawford and David Morley's individual poetries, science poetry is varied in its forms, subject matters and attitudes. Edwin Morgan, Robert Crawford and David Morley's poems, which reflect contemporary experience with their technoscientific language, subject matter and manner, when considered together, demonstrate a keen interest in scientific data, high technology, computer technologies

and cyberspace and space as well as a fascination with change, a keen interest in urban experience and faith in future.

Emphasising the interconnectedness of all and defending the idea of an integrated worldview which rejects the reductionism of singular disciplines, science poems of Morgan, Crawford and Morley, thus draw attention to contemporary environmental issues. Appreciating what science and technology have to offer to humanity, science poetry promotes a mutual understanding of the necessary co-existence of sciences and humanities in a complementary world order. Together with their experimental form and style, the scientific and technological elements of Edwin Morgan, Robert Crawford and David Morley's science poems demonstrate a poetics of contemporary British science poetry which relies on technoscientific language and subject matter to reflect contemporary experience.

WORKS CITED

Primary Sources:

Crawford, Robert. *A Scottish Assembly*. London: Chatto & Windus, 1990. Print.

Crawford, Robert. *Full Volume*. London: Cape Poetry, 2008. Print.

Crawford, Robert. *Spirit Machines*. London: Cape Poetry, 1999. Print.

Crawford, Robert. *Talkies*. London: Chatto & Windus, 1992. Print.

Crawford, Robert. *The Tip of My Tongue*. London: Cape Poetry, 2003. Print.

Morgan, Edwin. *Poems of Thirty Years*. Manchester: Carcanet New Press, 1982. Print.

Morley, David. *Enchantment*. Manchester: Carcanet, 2010. Print.

Morley, David. *Mandelstam Variations*. Todmorden, Lancashire: Littlewood, 1991. Print.

Morley, David. *Releasing Stone*. Todmorden, Lancashire: Nanholme Press, 1989. Print.

Morley, David. *Scientific Papers*. Manchester: Carcanet, 2002. Print.

Morley, David. *The Invisible Kings*. Manchester: Carcanet, 2007. Print.

Secondary Sources:

"A bit about White." *ISMACS News*. Issue 62. n. p. n. pag. WEB. 09 November 2014.

"About W R Tullock." *Ford: W R Tullock*. n. p. n. pag. WEB. 09 November 2014.

"About Willard Wigan MBE." *Willard Wigan*. n. p. 2009. n. pag. WEB. 13 January 2013.

"Ada Lovelace." *Computer History Museum*. n. p. 2008. n. pag. WEB. 14 February 2015.

"All about Entrophy, The Laws of Thermodynamics, and Order from Disorder." *entrophylaw.com*. n. p. n. pag. WEB. 13 November 2015.

Allan, David. "'The Divine Fury of the Muses': Neo-Latin Poetry in Early Modern Scotland." *Literature and the Scottish Reformation*. Eds. Crawford Gribben and David George Mullan. Surrey: Ashgate, 2009. 63-80. Print.

"Apples, pears and other pome fruit." *Primary Industries Agriculture*. n. p. n. pag. WEB. 24 October 2015.

"Argyll Motor Works, Alexandria." *Heritage Locations*. n. p. n. pag. WEB. 09 November 2014.

Armitage, David. "The Scottish Diaspora." *Scotland: A History*. Ed. Jenny Wormald.

Oxford: Oxford UP, 2005. 272-303. Print.

Armitage, Simon. "Modelling the Universe: Poetry, Science and the Art of Metaphor." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 110-122. Print.

Armstrong, Tim. "Poetry and Science." *A Companion to Twentieth-Century Poetry*. Ed. Neil Roberts. Malden, MA: Blackwell Publishing Ltd., 2001. 76-88. Print.

Arnold, Matthew. "The study of Poetry." *Selected Essays*. Chicago: Lexicon Publications Inc., 1985. 65-90. Print.

"Avagadro's Number." *Encyclopædia Britannica*. n. p. n. pag. WEB. 20 April 2014.

Balfour, Michael. *Mysterious Scotland: Engimas, Secrets and Legends*. Edinburgh: Mainstream Publishing, 1997. Print.

Barker, Sebastian. "Afterword." *Mandelstam Variations*. Todmorden, Lancashire: Littlewood, 1991. 75. Print.

Bell, David. *Cyberculture Theorists: Manuel Castells and Donna Haraway*. London: Routledge, 2007. Print.

Bellchamber, Jason Nigel. "The Pictish Symbol known as the 'Crescent V-rod' and its possible use as a Seasonal Sundial or Farmers Almanac." *bellchamber.net*. London, Ontario: n. d. 1-22. WEB. 24 February 2015.

Benson, L. D. “Chaucer: Astronomy/Astrology.” *The Geoffrey Chaucer Page*. n. p. The President and Fellows of Harvard College, 12 May 2000. n. pag. WEB. 24 January 2016.

Black, Annetta. “Objects of Intrigue: Beggar’s Benison Princk Glass.” *Atlas Obscura*. n. p. 04 April 2013. n. pag. WEB. 20 November 2014.

Blackwood’s Edinburgh Magazine, 1879. 1879. Reprint. London: Forgotten Books, 2013. 770-1. Print.

Blake, Erin C. “Where Be ‘*Here be Dragons*’?” *MapHist*. n. p. April 1999. n. pag. WEB. 17 February 2015.

Boddy, Kasia. “Edwin Morgan’s Adventures in Calamerica.” *The Yale Journal of Criticism*, Vol. 13:1, Spring 2000. The Johns Hopkins University Press, 177-194. WEB. 18 May 2013.

Bova, Ben. “The Role of Science Fiction.” *Science Fiction, Today and Tomorrow*. Ed. Reginald Bretnor. New York: Harper & Row, Publishers, 1974. 3-16. Print.

Brackett, Virginia. *The Facts on File Companion to British Poetry: 17th and 18th Centuries*. New York: Facts on File Inc., 2008. Print.

Braidwood, Alistair. “We’re All Henry Jekyll’s Bairns: Robert Louis Stevenson’s Enduring Influence on Scottish Literature. *The Bottle Imp*. Issue 12, Nov. 2012. Glasgow. 1-3. Print.

Brecht, Bertolt. "*On the Infanticide* Marie Farrar." *A Gathering of Poets*. Eds. Maggie Anderson and Alex Gildzen. Trans. Ed Ochester. Kent, Ohio: The Kent State University Press, 1992. 168-171. Print.

Bridgstock, Martin, et al. "Introduction." *Science, Technology and Society: An Introduction*. Eds. Martin Bridgstock, et al. Cambridge: Cambridge UP, 2000. 3-14. Print.

Broadie, Alexander. "Introduction." *The Cambridge Companion to The Scottish Enlightenment*. Ed. Alexander Broadie. Cambridge: Cambridge UP, 2003. 1-7. Print.

Burnside, John. "A Sense of Belonging: Poetry as Ecology." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 91-106. Print.

Burrows, Wayne. "Sep 8 2011: *Nothing Not Giving Messages*: Edwin Morgan's Collected Poems ." *The Serendipity Project*. Sheffield, Thursday No.8, 1999. n. p. n. pag. WEB. 18 May 2013.

Bush, Douglas. *Science and English Poetry: A Historical Sketch, 1590-1950*. New York: Oxford UP, 1950. Print.

Bynum, William. *A Little History of Science*. New Haven: Yale UP, 2013. Print.

Cambridge, Gerry. "Edwin Morgan in Conversation: Interview." *The Dark Horse*, 34,

Summer 1997. 34-43. WEB. 06 June 2014.

Campbell, James. "Review of Edwin Morgan: Northern lights." *The Guardian*. Saturday February 28, 2004. n. p. n. pag. WEB. 07 June 2014.

Campbell, Jill. "Women Writers and the Woman's Novel: The Trope of Maternal Transmission." *The Cambridge Companion to Fiction in the Romantic Period*. Eds. Richard Maxwell and Katie Trumpener. Cambridge: Cambridge UP, 2008. 159-176. Print.

Carter, Steven. *Bearing Across: Studies in Literature and Science*. Bethesda, MD: 1998, International Scholars Publications. Print.

Cartwright, Mark. "Tenochtitlán." *Ancient History Encyclopedia*. n. p. 25 September 2013. n. pag. WEB. 07 November 2014.

Chandler, James. "Wordsworth's great Ode." *The Cambridge Companion to British Romantic Poetry*. Eds. James Chandler and Maureen N. McLane. Cambridge: Cambridge UP, 2008. 136-154. Print.

Chandler, James and Maureen N. McLane. "Introduction." *The Cambridge Companion to British Romantic Poetry*. Eds. James Chandler and Maureen N. McLane. Cambridge: Cambridge UP, 2008. Print. 1-9.

Cherry, Kelly. "The Two Cultures at the End of the Twentieth Century." *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of

Georgia Press, 2001. 24- 37. Print.

Chilvers, Ian and John Glaves-Smith. "Conroy, Stephen." *A Dictionary of Modern and Contemporary Art*. Oxford: Oxford University Press, 2009. n. pag. WEB. 13 March 2013.

"Chinoiserie." *Encyclopædia Britannica*. n. p. n. pag. WEB. 03 March 2015.

Clareson, Thomas D. "The Other Side of Realism." *SF: The Other Side of Realism: Essays on Modern Fantasy and Science Fiction*. Ed. Thomas D. Clareson. Bowling Green, Ohio: Bowling Green University Popular Press, 1971. 1-28. Print.

Clark, Timothy. *Literature and the Environment*. Cambridge: Cambridge UP, 2011. Print.

Cockburn, Ken. "Dialogue: 'The First Men on Mercury.'" *Edwin Morgan Archieve at the Scottish Poetry Library*. n. p. April 2009. n. pag. WEB. 06 June 2014.

Coleman, Philip. "'I'm an experiment': Reflections on Science in American Short Fiction." *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin, Four Courts Press, 2007. 173-189. Print.

Conrad-O'Briain, Helen. "Chaucer, technology and the rise of science fiction in English." *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin: Four Courts Press, 2007. 27-42. Print.

Crawford, Robert. "Introduction." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 1-10. Print.

Crawford, Robert. "*Spirit Machines*: The Human and the Computational." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 52-68. Print.

Crawford, Robert. "'to change / the unchangeable' – The Whole Morgan." *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990. 10-24. Print.

"Creating an Underground Press: Samizdat in the Soviet Union and The Eastern Bloc." tavaana.org. n. p. n. pag. WEB. 13 March 2015.

Crompton, Samuel Willard. *Sputnik / Explorer I: The Race to Conquer Space*. New York: Chelsea House Publishers, 2007. Print.

"D'Arcy Wentworth Thompson." *darcythompson.org*. n. p. n. pag. WEB. 13 January 2013.

"David Morley: Biography." n. p. n. pag. WEB. 17 November 2014.

"David Morley." *Templar Poetry*. Derbyshire: n. p. n. pag. WEB. 07 January 2015.

"David Morley's *The Night of the Day*." *Peony Moon*. n. p. n. pag. WEB. 13 December 2014.

Davidson, Neil. *The Origins of Scottish Nationhood*. London: Pluto Press, 2000. Print.

Davie, George. *The Scotch Metaphysics: A Century of Enlightenment in Scotland*. London: Routledge, 2001. Print.

Davidson, Ian. *Ideas of Space in Contemporary Poetry*. New York: Palgrave, 2007. Print.

Dósa, Attila. *Beyond Identity: New Horizons in Modern Scottish Poetry*. Amsterdam: Rodopi, 2009. Print.

Duncan, Ian. "Scotland and the Novel." *The Cambridge Companion to Fiction in the Romantic Period*. Eds. Richard Maxwell and Katie Trumpener. Cambridge: Cambridge UP, 2008. 251-264. Print.

Duncan, Lesley. "Poetry - Edwin Morgan at 90." *Herald Scotland*. n. p. Tuesday 27 April 2010. n. pag. WEB. 13 November 2012.

Dvoretzky, Aryeh. "On Some of Einstein's Non-Scientific Opinions." *The Impact of Modern Scientific Ideas on Society: In Commemoration of Einstein*. Eds. Colette M. Kinnon, et al. Dordrecht, Holland: D. Reidel Publishing Company, 1981. 182-187. Print.

Edgecombe, Rodney Stenning. "Some Early Vision Poems by Edwin Morgan." *Studies in Scottish Literature*. Vol. 32: 1. 2001. 13-25. WEB. 20 September 2013.

Elfenbein, Andrew. "Romantic Poetry and the Standardization of English." *The Cambridge Companion to British Romantic Poetry*. Eds. James Chandler and Maureen N. McLane. Cambridge: Cambridge UP, 2008. 76-97. Print.

Enticknap, Leo. "Grierson, John (1898-1972)". *screenonline*. n. p. 2013-2014. n. pag. WEB. 17 February 2014.

"Environmental Poetry, Guerrilla Poetry and Poetry Bombing." Monash University. n. p. 25 August 2014. n. pag. WEB. 12 December 2014.

Erickson, Mark. *Science, Culture and Society: Understanding Science in the 21st Century*. Cambridge: Polity, 2005. Print.

Farmelo, Graham. "Dafty - the forgotten physicist." *Times Higher Education*. n. p. 1-2. WEB. 16 January 2004.

Fazzini, Marco. "Alba Literaria and the New Canon: An Introduction." *Alba Literaria: A History of Scottish Literature*. Ed. Marco Fazzini. Venezia, Italy: Amos Edizioni, 2005. xiii-xxii. Print.

Forge, John. "The Industrial Revolution in Great Britain." *Science, Technology and Society: An Introduction*. Eds. Martin Bridgstock, et al. Cambridge: Cambridge UP, 2000. 111-131. Print.

Fox, Stephen. "Edwin Morgan and the Two Cultures." *Studies in Scottish Literature*. Vol. 33: 1. 2004. 71-86. WEB. 01 December 2011.

Frazer, James George. *The Golden Bough: A Study of Magic and Religion*. Auckland, New Zealand: The Floating Press, 1890. Print.

Fulford, Tim. "Poetry, Peripheries and Empire." *The Cambridge Companion to British Romantic Poetry*. Eds. James Chandler and Maureen N. McLane. Cambridge: Cambridge UP, 2008. 178-194. Print.

Galbraith, Iain. "Scottish Poetry in the Wider World." *The Oxford Handbook of Contemporary British & Irish Poetry*. Ed. Peter Robinson. Oxford: Oxford UP, 2013. 558-575. Print.

Gander, Forrest. "The Nymph Stick Insect: Observations on Poetry, Science, and Creation." *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 38-46. Print.

Gardiner, Michael. "Towards a Post-British Theory of Modernism: Speech and Vision in Edwin Morgan." *Pretexts: literary and cultural studies*. Vol. 11: 2, 2002. 133-146. WEB. 17 May 2012.

Gish, Nancy K. "Modernism and Nationalism: Literature and Society in Scotland 1918-1939, and: Modern Scottish Poetry (review)." *Modernism/modernity*. Volume 13, Number 1, The Johns Hopkins University Press, January 2006. 942-945. Print.

Glover, Janet R. *The Story of Scotland*. London: Faber and Faber, 1977. Print.

Goldsmith, Maurice. “Einstein and Social Change.” *The Impact of Modern Scientific Ideas on Society: In Commemoration of Einstein*. Eds. Colette M. Kinnon, et al. Dordrecht, Holland: D. Reidel Publishing Company, 1981. 178-181. Print.

Goodman, Kevis. “Romantic Poetry and the Science of Nostalgia.” *The Cambridge Companion to British Romantic Poetry*. Eds. James Chandler and Maureen N. McLane. Cambridge: Cambridge UP, 2008. 195-216. Print.

Gough, Evan. “Ion Propulsion: The Key to Deep Space Exploration.” *Universe Today: Space and Astronomy News*. n. p. 03 November n. pag. 2015. WEB. 13 December 2015.

Graham, Gordon. “The Nineteenth-Century Aftermath.” *The Cambridge Companion to the Scottish Enlightenment*. Ed. Alexander Broadie. Cambridge: Cambridge UP, 2003. 338-350. Print.

Graham, James. “Virtuoso: the poetry of Edwin Morgan (1920-2010).” n. p. n. pag. WEB. 07 June 2014.

Gregson, Ian. *Contemporary Poetry and Postmodernism: Dialogue and Estrangement*. New York: St. Martin’s Press, 1996. Print.

Grosholz, Emily. “Poetry and Science in America.” *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 69-89. Print.

Guibbory, Achsah. "John Donne." *The Cambridge Companion to English Poetry: Donne to Maxwell*. Ed. Thomas N. Corns. Cambridge: Cambridge UP, 1993. 123-147. Print.

Guibbory, Achsah. "Preface." *The Cambridge Companion to John Donne*. Ed. Achsah Guibbory. Cambridge: Cambridge UP, 1993. ix-xi. Print.

Gurr, Andrew. "The Grapheme Conquest: Literature and the Post-print Age." *Byron Foundation Lecture for 1992*. Nottingham: The University of Nottingham, 2009. 3-17. Print.

Hammond, Norman. "Xenophon's Retreat." *archive.archaeology.org*. 1997. n. p. n. pag. WEB. 20 September 2014.

Hartman, Geoffrey H. *Wordsworth's Poetry: 1787-1814*. Cambridge, Massachusetts: Harvard University Press, 1987. Print.

Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: The University of Chicago Press, 1999. Print.

Hawthorne Deming, Alison. "Science and Poetry: A View from the Divide." *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 181-197. Print.

Henkes, Robert. "Subjectivity vs Objectivity/Concepts." *Art Education*. Vol. 16, No. 4

(April, 1963). 16-18. WEB. 29 October 2015.

"Henry Bell – Steamboat Pioneer." *Scotland.com*. n. p. n. pag. WEB. 13 August 2014.

"Henry Ford Changes the World, 1908." *EyeWitness to History*. n. p. 2005. n. pag. WEB. 13 January 2016.

Herbert, W. N. "Morgan's Words." *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990. 65-74. Print.

Herbert, W. N. "Testament and Confessions of an Informationist." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 72-87. Print.

Hiebert, Erwin N. "Einstein as a Philosopher of Science." *The Impact of Modern Scientific Ideas on Society: In Commemoration of Einstein*. Eds. Colette M. Kinnon, et al. Dordrecht, Holland: D. Reidel Publishing Company, 1981. 83-99. Print.

Hoeller, Stephan A. "The Gnostic World View: A Brief Summary of Gnosticism." *The Gnossis Archieve*. n. p. n. pag. WEB. 13 November 2015.

Holmes, John. *Darwin's Bards: British and American Poetry in the Age of Evolution*. Edinburgh: Edinburgh Press, 2009. Print.

Holub, Miroslav. "Poetry and Science: The Science of Poetry / The Poetry of Science."

The Measured Word: On Poetry and Science. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 47-68. Print.

Holub, Miroslav. "Rampage, or Science in Poetry." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 11-24. Print.

Hoselitz, Bert F. "The Social Sciences in the Last Two Hundred Years." *A Reader's Guide to Social Sciences*. Ed. Bert F. Hoselitz. New York: Free Press, 1959. 7-25. Print.

Huk, Romana. "Introduction." *Contemporary British Poetry: Essays in Theory and Criticism*. Eds, James Acheson and Romana Huk. New York: State University of New York, 1996. 1-15. Print.

Huxley, Aldous. *Literature and Science*. New York: Harper & Row Publishers, 1963. Print.

"Internet Pioneers: Vannevar Bush." *ibiblio*. n. p. n. pag. WEB. 17 June 2013.

"John Napier." *Famous Scientists: The Art of Genius*. n. p. n. pag. WEB. 07 November 2014.

Jones, Russell. "Computer Error: Voices and Translations in Edwin Morgan's Science Fiction Poetry." *University of Edinburgh Postgraduate Journal of Culture & the Arts*, Issue 09, Autumn 2009. n. p. WEB. 17 June 2014.

Kapitza, P. L. "The Impact of Modern Scientific Ideas on Society." *The Impact of Modern Scientific Ideas on Society: In Commemoration of Einstein*. Eds. Colette M. Kinnon, et al. Dordrecht, Holland: D. Reidel Publishing Company, 1981. 49-68. Print.

"Kate Whiteford (1952 –)." *British Council: Visual Arts*. n. p. 2014. n. pag. WEB. 24 February 2015.

Kease, John. "Some Comments on 'The Computer's First Code Poem' by machine employed by Mr. Edwin Morgan." *Poetry Nation*, No 2, 1974. 135-137. WEB. 06 June 2014.

Keatinge, Benjamin. "Surrealism, psychiatry and the science of the irrational." *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin: Four Courts Press, 2007. 148-161. Print.

Kelly, Stuart. *Literary Exchanges: Scotland, Europe and World Literature*. n. p. n. pag. WEB. 12 January 2013.

Kennedy, David and David Morley. "Introduction." *The New Poetry*. Eds. David Kennedy and David Morley. Newcastle upon Tyne: Bloodaxe Books, 1993. 15-28. Print.

Kennedy, David. *New Relations: The Refashioning of British Poetry 1980-94*. Bridgend, Mid Glamorgan: Seren, 1996. Print.

Kraszkiewicz, Claudia E. "The Catalysts: Beat Poets, Experimental Poetry and Edwin Morgan." *Ecloga,* Issue 3, Autumn 2003. 1-12. WEB. 11 November 2013.

Kuhfield, Jemima. "David Morley: (United Kingdom, 1964)." *Poetry International Rotterdam*. n. p. 30 June 2013. n. pag. WEB. 13 December 2014.

Kwon, Diana. "Ten things you might not know about antimatter." *symmetry*. Batavia, IL. 28 April 2015. n. pag. WEB. 29 May 2015.

Lahanas, Michael. "History of Diving: Alexander the Great and the Bathysphere." *hellenicaworld.com*. n. p. n. pag. WEB. 20 September 2014.

Lake, Paul. "The Shape of Poetry." *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 156-180. Print.

Landow, George P. "Replete with Meaning: William Holman Hunt and Typological Symbolism." *The Victorian WEB*. n. p. December 2001. n. pag. WEB. 18 April 2015.

Leavis, Frank Raymond. *Two Cultures? The Significance of C.P. Snow with An Essay on Sir Charles Snow's Rede Lecture by Michael Yudkin*. London: Chatto & Windus, 1962. Print.

Lindsay, Maurice. *History of Scottish Literature*. London: Robert Hale, 1977. Print.

Lucas, John. “A Larger Assembly.” *Dream State: The New Scottish Poets*. Ed. Donny O’Rourke. Polygon, 2nd Ed., 2002. 74-81. Print.

MacDiarmid, Hugh. *Selected Poetry*. Eds. Alan Riach and Michael Grieve. Manchester: Fyfield Books, 2004. Print.

Mackay, James. Pocket *Scottish History: Story of a Nation*. China: Lomond Books, 2014. Print.

Mackie, Robert L. *A Short History of Scotland*. London: Oxford UP, 1930. Print.

Magnusson, Lynne. “Donne’s Language: The Conditions of Communication.” *The Cambridge Companion to John Donne*. Ed. Achsah Guibbory. Cambridge: Cambridge UP, 1993. 183-147. Print.

“Margaret Fay Shaw.” *Undiscovered Scotland: The Ultimate Online Guide*. n. p. n. pag. WEB. 22 December 2014.

Marsack, Robyn. “A Declaration of Independence: Edwin Morgan and Contemporary Poetry.” *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990. 25- 38. Print.

Marsack, Robyn. “Edwin Morgan; poet.” *Herald Scotland*, Friday 20 August 2010. n. p. n. pag. WEB. 07 June 2014.

Marsh, David C. “Introduction: The Social Sciences.” *The Social Sciences: An Outline*

for the Intending Student. Ed. David C. Marsh. London: Routledge and Kegan Paul, 1966. 1-15. Print.

Matterson, Stephen. "Edgar Allan Poe and the orang-utan." *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin: Four Courts Press, 2007. 115-128. Print.

Mayr, Otto. "Maxwell and the Origins of Cybernetics." *Isis*, Vol. 62, No. 4. (1971), The University of Chicago Press. 425-444. WEB. 18 February 2013.

McAllister, Andrew. "Carol Ann Duffy Interview." *Béte Noire* 6. Hull, U. K.: University of Hull, 1998. Print. 69-77.

McCarra, Kevin. "Edwin Morgan: Lives and Work." *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990. 1-9. Print.

McCracken-Flesher, Caroline. "Scotland as Theory: Otherness and Instantiation from Mackenzie to the Last Minstrel." *International Journal of Scottish Literature*. Issue: 3 Autumn / Winter, 2007. 3-17. WEB. 12 January 2013.

McCrone, David. "Tomorrow's Ancestors: Nationalism, Identity and History." *Scottish History the Power of the Past*. Eds. Edward J. Cowan and Richard J. Finlay. Edinburgh: Edinburgh University Press, 2002. 253-271. Print.

McFerran, Noel S. "The Sobieski Stuarts." *The Jacobite Heritage*. n. p. 2003. n. pag. WEB. 13 February 2013.

McGonical, James. “Recovering the Divan: Structure in Edwin Morgan’s Long Poem.” *PN Review 194*, Volume 36:6, July-August 2010. n. p. n. pag. WEB. 17 June 2014.

McGovern, Iggy. “Science and poetry: not so different?” *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin: Four Courts Press, 2007. 211-222. Print.

“Metal Fatigue.” *science.jrank*. n. p. n. pag. WEB. 23 October 2015.

Michaelis, Anthony R. “The Interdisciplinary Impact.” *The Impact of Modern Scientific Ideas on Society: In Commemoration of Einstein*. Eds. Colette M. Kinnon, et al. Dordrecht, Holland: D. Reidel Publishing Company, 1981. 167-177. Print.

Michaelis, John U. and A. Montgomery Johnston. “The Social Sciences: Foundations of the Social Sciences.” *The Social Sciences: Foundations of the Social Studies*. Eds. John U. Michaelis and A. Montgomery Johnston. Boston: Allyn and Bacon Inc., 1966. 1-24. Print.

Middleton, Peter. “Can Poetry be Scientific?” *On Literature and Science: Essays, Reflections, Provocations*. Ed. Philip Coleman. Dublin, Four Courts Press, 2007. 190-208. Print.

Midgley, Mary. *Science and Poetry*. London: Routledge, 2001. Print.

Mitchison, Rosalind. *A History of Scotland*. 3rd Ed. London: Routledge, 2002. Print.

Morgan, Edwin. *Essays*. Chatham: A Carcanet New Press Publication, 1974. Print.

Morgan, Edwin. "Poetry and Virtual Realities." *Contemporary Poetry and Contemporary Science.* Ed. Robert Crawford. Oxford: Oxford UP, 2006. 27-47. Print.

Nagaraju, Ch. and K. V. Seshaiah. "A Study of Sylan Thomas's Poetry." *IOSR Journal of Humanities and Social Sciences*. Vol. 1, Issue 2 (Sep.-Oct. 2012). Chittoor, A. P.: n. p.WEB. 6-10. 24 January 2016.

Nicholson, Colin. "Remembering the Future: Edwin Morgan's Science Fiction Poetry. *The Yearbook of English Studies*, Vol. 30, Time and Narrative (2000). Modern Humanities Research Association. 221-233. WEB. 01 December 2011.

Nordqvist, Christian. "What are pheromones?" Do humans have pheromones?" *Medical News Today*. Bexhill-on-Sea, UK: MNT, 26 September 2014. n.pag. WEB. 28 April 2015.

"Nuclear Development in the United Kingdom." *World Nuclear Association*. London: 2013. n. pag. WEB. 07 November 2014.

O'Brien, Sean. "Contemporary British Poetry." *A Companion to Twentieth-Century Poetry*. Ed. Neil Roberts. Malde, MA: Blackwell Publishing Ltd., 2001. 571-584. Print.

Ohanian, Hans C. *Einstein's Mistakes: The Human Failings of Genius*. New York: W.

W. Norton & Company, Inc., 2008. Print.

Oliver, Neil. *A History of Scotland*. London: Phoenix, 2009. Print.

Otter, Chris. *The Victorian Eye: A Political History of Light and Vision in Britain, 1800-1910*. Chicago: The University of Chicago Press, 2008. Print.

"Osip Mandelstam (1891-1938)." *Poetry Foundation*. Chicago, IL: n. p. n. pag. WEB. 13 March 2015.

"Pan cratch and griffs." *Scottish Building Traditions*. n. p. 16 Jun. 2014. n. pag. WEB. 07 May 2015.

"Paul Celan (1920-1970)." *Poetry Foundation*. Chicago, IL: n. p. n. pag. WEB. 14 April 2015.

Pemberton, S. George and Murray Gingras. "The Reverend Henry Duncan (1774-1846) and the Discovery of the First Fossil Footprints." *Ichnos*. Vol. 10, No 2-4 April-December Alberta, Canada: Taylor and Francis Ltd., 2003. 69-75. WEB. 14 March 2014.

Pittock, Murray G. H. "Historiography." *The Cambridge Companion to The Scottish Enlightenment*. Ed. Alexander Broadie. Cambridge: Cambridge UP, 2003. 258-279. Print.

Pow, Tom. "The driving spirit of Morgan." *New Statesman.* Scotland, 15 May 2000. n.

p. n. pag. WEB. 18 May 2013.

Ramsay, Rona R. “Introduction.” Contemporary Poetry and Contemporary Science. Ed. Robert Crawford. Oxford: Oxford UP, 2006. 69-70. Print.

Reeves, Robert. *The Superpower Space Race: An Explosive Rivalry through the Solar System*. Plenum, US: Springer Science, Business, Media LLC, 1994. Print.

Reid, George. “Edwin Morgan 1920–2010: A Eulogy.” *The Association for Scottish Literary Studies*. ScotLit 40, Winter 2010. n. pag. WEB. 14 July 2014.

Rillie, Jack. “The Kind of Poetry I Want: Morgan as Critic.” *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990.105-117. Print.

“Rivers of Ayrshire: River Stinchar.” *Ayrshire Fishing Guide*. n. p. 2011. n. pag. WEB. 24 February 2015.

Rogers, Pattiann. “Twentieth-Century Cosmology and the Soul’s Habitation. *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 1-13. Print.

Ross, David. *Scotland: History of a Nation*. Broxburn, Scotland: Lomond, 2014. Print.

Sadun, Hande. “Where Science Meets with Fancy: The Atomic Poems of Margaret Cavendish, Duchess of Newcastle.” *Edebiyat Fakültesi Dergisi/Journal of the*

Faculty of Letters 22, no. 2 (2005): 187-202. Print.

Sassi, Carla. "Re-establishing Complexities:Researching and Teaching Scottish Literature inside/outside Scotland." *International Journal of Scottish Literature*, Issue I, Autumn 2006. 11-16. WEB. 18 May 2013.

Shakespeare, William. *Hamlet*. London: Penguin, 1980. Print.

Shklovsky, Victor. "Art as Technique." *Modern Criticism and Theory: A Reader*. Ed. David Lodge. London: Longman, 1988. 717-726. Print.

Siddiqi, Asif A. *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*. Washington, DC: NASA, 2000. Print.

"Sir James Murray: Scottish Lexicographer." *Encyclopædia Britannica*. n. p. n. pag. WEB. 20 June 2013.

Skoblow, Jeffrey. "Scottish Poetry." *A Companion to Twentieth-Century Poetry*. Ed. Neil Roberts. Malde, MA: Blackwell Publishing Ltd., 2001. 318-28. Print.

Snow, Charles Percy. *The Two Cultures and A Second Look*. Cambridge: Cambridge UP, 1963. Print.

Somerset Fry, Peter and Fiona. *The History of Scotland*. London: Routledge, 1982. Print.

Spencer, Neville. "On the Significance of Distinguishing Ontology and Epistemology." *ethicalpolitics.org*. n. p. March 2000. n. pag. WEB. 24 February 2015.

Stafford, Fiona. "A Scottish Renaissance: Edwin Morgan, Douglas Dunn, Liz Lochhead, Robert Crawford, Don Paterson, Kathleen Jamie." *The Cambridge Companion to Twentieth-Century English Poetry*. Ed. Neil Corcoran. Cambridge: Cambridge UP, 2007. 230-244. Print.

"St. Lucy's Day." *Encyclopedia of Christmas and New Year's Celebrations*. n. p. 2nd Ed. 2003. n. pag. WEB. 20 May 2015.

Strickland, Stephanie. "Seven-League Boots: Poetry, Science, and Hypertext." *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 105-109. Print.

"The Beano." *D. C. Thomson*. Dundee: D. C. Thomson & Co. Ltd. n. p. n. pag. WEB. 13 January 2013.

The English Standard Version Bible. New York: Oxford University Press, 2009. Print.

"The History of Ecurie Ecosse: About Ecurie Ecosse." *Ecurie Ecosse*. n. p. n. pag. WEB. 20 November 2014.

"The Photographs of John Thomson." *National Library of Scotland*. n. p. n. pag. WEB. 20 January 2013.

Thomson, Alex. "'You can't get there from here': Devolution and Scottish Literary History." *International Journal of Scottish Literature*. Issue: 3 Autumn / Winter, 2007. 1-20. WEB. 12 January 2013.

Wacior, Slawomir. "From Slate to Jupiter: Poetic Patterns of Edwin Morgan's *Sonnets from Scotland*." *Scottish Literary Review*, Vol. 5:1, Spring/Summer 2013. Association for Scottish Literary Studies, 47-57. WEB. 07 June 2014.

Walker, Marshall. "The Voyage Out and the Favoured Place: Edwin Morgan's Science Fictions." *About Edwin Morgan*. Eds. Robert Crawford and Hamish Whyte. Edinburgh: Edinburgh UP, 1990. 54-64. Print.

Walker, Noojin and Martha Fulton Walker. *The Twain Meet: The Physcial Sciences and Poetry*. New York: Peter Lang, 1989. Print.

Wallace, Gavin. "New Currency or Old? 'The Coin', by Edwin Morgan." 16 March 2014. n. p. n. pag. WEB. 07 June 2014.

"Walpurgis Night: Holiday." *Encyclopedia Britannica*. n. p. n. pag. WEB. 07 March 2015.

Watts, Peter. "Allen Ginsberg, LSD Poetry and Sacrificing Chickens: The Birth of the '60s Hippie Underground Revealed." *Uncut*. 29 May 2015. 1-5. WEB. 30 May 2015.

Watson, Roderick. “Edwin Morgan: Messages and Transformations.” *British Poetry from the 1950s to the 1990s: Politics and Art*. Eds. Gary Day and Brian Docherty. New York: St. Martin’s Press, 1997. 170-192. Print.

Watson, Roderick. “Living with the double tongue: contemporary poetry in Scots.” *The Edinburgh History of Scottish Literature, Volume Three: Modern Transformations: New Identities (from 1918)*. Edinburgh: Edinburgh University Press, 2006. pp. 163-175. Print.

Watson, Roderick. “Scottish Poetry, 1982-1984.” *Studies in Scottish Literature*. Vol. 21:1. 226-261. WEB. 17 May 2012.

“What is angstrom (unit)?” *aqua-calc*. n. p. n. pag. WEB. 25 May 2015.

“What’s in a name? Sgùrr-mongering.” *The Edinburgh Geologist*. Issue 42. n. p. n. pag. WEB. 18 October 2014.

Williams, M. L. “*Knowers and Makers: Describing the Universe*.” *The Measured Word: On Poetry and Science*. Ed. Kurt Brown. Athens, Georgia: University of Georgia Press, 2001. 13-23. Print.

Wolfe, Cary. *What is Posthumanism?* Minneapolis: U of Minnesota P, 2010. Print.

Woolgar, Steve. *Science: The Very Idea*. Chichester, West Sussex: Ellis Horwood Limited, 1988. Print.

Wordsworth, William. “The Tables Turned.” 228. *The Norton Anthology of English Literature*. Eds. M. H. Abrams et al. 7th Ed. 2 Vols. New York: W. W. Norton & Company, 2000.

Van Duisen, Michael. “The Worst Inventor In History.” *KnowledgeNuts*. n. p. 03 October 2013. n. pag. WEB. 14 March 2014.

“Vestiarium Scoticum.” *Scottish Tartans Authority*. Perthshire: n. p. n. pag. WEB. 13 February 2013.

Vigue, Lynne, C. “Towards a More Realistic View of Science and the Scientific Method.” *The American Biology Teacher*. Vol. 42, No. 4 (April 1980). 235-237. WEB. 29 October 2015.

“Zymogen.” *Encyclopædia Britannica*. n. p. n. pag. WEB. 20 April 2014.

APPENDIXES

APPENDIX 1: ETHICS BOARD WAIVER FORM

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
ETHICS BOARD WAIVER FORM FOR THESIS WORK

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
ENGLISH LANGUAGE AND LITERATURE TO THE DEPARTMENT PRESIDENCY

Date: 21/01/2016

Thesis Title / Topic: A Poetics of Contemporary Science Poetry: The Poems of Edwin Morgan, Robert Crawford and David Morley.

My thesis work related to the title/topic above:

1. Does not perform experimentation on animals or people.
2. Does not necessitate the use of biological material (blood, urine, biological fluids and samples, etc.).
3. Does not involve any interference of the body's integrity.
4. Is not based on observational and descriptive research (survey, measures/scales, data scanning, system-model development).

I declare, I have carefully read Hacettepe University's Ethics Regulations and the Commission's Guidelines, and in order to proceed with my thesis according to these regulations I do not have to get permission from the Ethics Board for anything; in any infringement of the regulations I accept all legal responsibility and I declare that all the information I have provided is true.

I respectfully submit this for approval.

21. 01. 2016

Name Surname: Merve Sarı
Student No: N09148594
Department: English Language and Literature
Program: English Language and Literature
Status: ☐ Masters ☒ Ph.D. ☐ Integrated Ph.D.

ADVISER COMMENTS AND APPROVAL

Prof. Dr. Burçin Erol

HACETTEPE ÜNİVERSİTESİ
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TEZ ÇALIŞMASI ETİK KURUL İZİN MUAFİYETİ FORMU

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İNGİLİZ DİLİ VE EDEBİYATI ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 21/01/2016

Tez Başlığı / Konusu: Çağdaş Bilim Şiirinin Şiir Tekniği: Edwin Morgan, Robert Crawford ve David Morley'nin Şiirleri.

Yukarıda başlığı/konusu gösterilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır,
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne müdahale içermemektedir.
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Gereğini saygılarımla arz ederim.

21. 01. 2016

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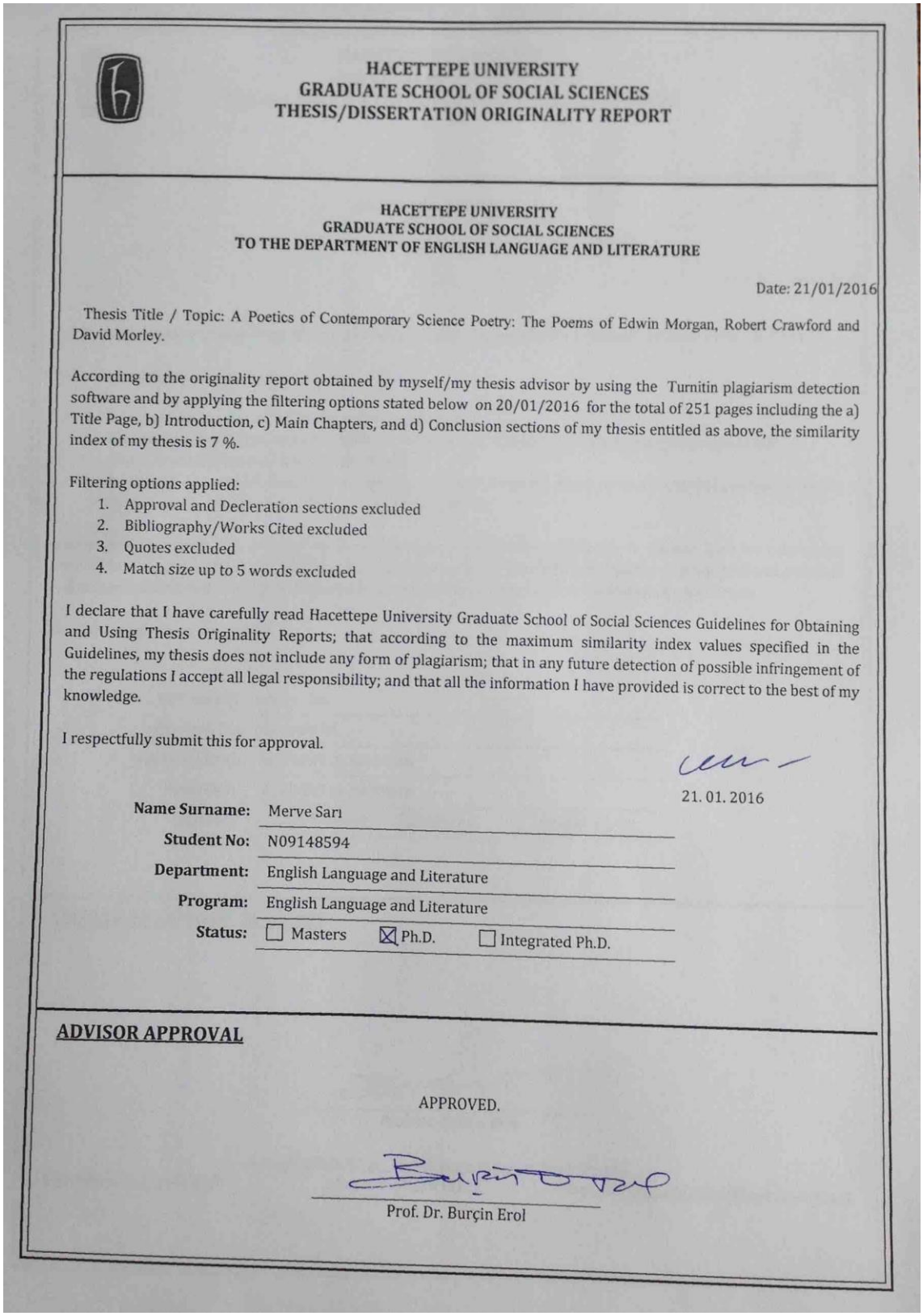
APPENDIX 2: ORIGINALITY REPORT



HACETTEPE UNIVERSITY
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THESIS/DISSERTATION ORIGINALITY REPORT

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
TO THE DEPARTMENT OF ENGLISH LANGUAGE AND LITERATURE

Date: 21/01/2016

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21. 01. 2016

Name Surname: Merve Sarı
Student No: N09148594
Department: English Language and Literature
Program: English Language and Literature
Status: ☐ Masters ☒ Ph.D. ☐ Integrated Ph.D.

ADVISOR APPROVAL

APPROVED.

Prof. Dr. Burçin Erol

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İNGİLİZ DİLİ VE EDEBİYATI ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 21/01/2016

Tez Başlığı / Konusu: Çağdaş Bilim Şiirinin Şiir Tekniği: Edwin Morgan, Robert Crawford ve David Morley'nin Şiirleri.

Yukarıda başlığı/konusu gösterilen tez çalışmamın a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 251 sayfalık kısmına ilişkin, 20/01/2016 tarihinde şahsım/tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda belirtilen filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 7 'dir.

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Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orjinallik Raporu Alınması ve Kullanılması Uygulama Esasları'nı inceledim ve bu Uygulama Esasları'nda belirtilen azami benzerlik oranlarına göre tez çalışmamın herhangi bir intihal içermediğini; aksinin tespit edileceği muhtemel durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

21. 01. 2016

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