

# **Science, Fiction and Curriculum Innovation**

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## *Abstract*

The academic world is now becoming so specialized that the advantages of a cross disciplinary education are being lost in the tidal wave of scholarship concentrating upon narrow subject fields whilst displacing the values of connected disciplines from the sciences and humanities. The almost rigorous segregation of science and the arts at degree level is being felt not only within academia, but within society. The more a subject is concentrated, the less profound and applicable it appears to the public who should ultimately be the beneficiaries of such knowledge. In order to achieve a form of parity through which our modern world can be examined, the University of Glamorgan has introduced an innovative degree course aimed at developing a multidisciplinary knowledge of science and the arts via an exploration of the science, history, philosophy, religious, artistic, literary, cultural and social endeavours of the fields of astronomy and fantastic literature.

## ***Introduction***

As a theme for undergraduate study, science is a giant within the academic world. It has acquired a generic status through representing not only its pure knowledge areas - such as mathematics, physics, and biology - but also through its method associated with the pursuit of truth through systematic attempts to publicly refute or verify hypotheses and theories.

Science also extends beyond the laboratory, the academic community, and associated scientific professions: it positions itself within popular culture. Scientific discoveries, problems and methods fascinate what might arguably be called the general public. The museum, interactive science centre, television documentary, toy, or book, become artefacts for popular understandings of scientific facts.

Many traditions and perspectives within social science question the positioning of scientific knowledge within society, and within popular culture. A common dialectic is used: science against art, and the continual comparison of paradigms associated with what at first seem to be such different traditions within academia. An effective technique for exploring this kind of academic debate involves a critical exploration of the boundaries and barriers, which define what at first glance, appear to be discrete subject areas and methodologies.

Our BSc Science and Science Fiction pursues one such area, and seeks a critical but multidisciplinary understanding of science fiction genres and texts whilst continually testing out the validity and appropriateness of scientific theories and methods. In so doing, students and their teachers will explore a multitude of links between deductive and inductive reasoning, truths and half-truths, the actual and the possible, and ultimately between prophesy and fantasy.

The use of a broad theme for the application of scientific ideas and methods is commonplace within higher education. At the most powerful levels it has led to the creation of new disciplines

associated with - for example - the study of behaviour (psychology) and society (sociology). The selection of science fiction represents a new endeavour within our own academic community, and it represents an important challenge to conventional curriculum design. There is a wealth of knowledge and evidence to draw on within this academic pursuit, as well as myths and controversies, which span numerous subject and discipline boundaries. There are also popular beliefs and common sense assumptions which have to be rigorously challenged and analysed at the outset, simply because science fiction has acquired such a prominent profile within non-academic communities, mass media audiences, and what might be loosely referred to as fringe ideologies.

### *Context*

The BSc in Science and Science Fiction emerged out of one initiative led by the University of Glamorgan, in partnership with community groups, schools and other higher education institutions (HEIs) in South Wales. This has come to be known as the Community University of the Valleys, and was cited by a British Govt Report as an example of good practice in increasing access and widening participation within Higher Education in the UK. Courses are offered within local learning centres located at community venues, and where possible a new curriculum has been offered to a wide range of learners. They include disadvantaged youth, as well as those who have retired or who have been made redundant after many years of employment.

One of the new community of the valleys courses which proved to be a success was entitled "Life in the Universe", and through studying this module over 200 learners became very interested in the subject area of Astronomy. In many cases these individuals had no formal qualifications in science related subjects, and yet they demonstrated understanding and pronounced interest in aspects of science. It became apparent that these community students had interpreted a wide range of science fiction texts. They had used knowledge sources that reach beyond the more conventional and obvious source literature of 'books'; extending into the critical reading of film, magazines, fanzines, and video games.

The community experience led to the creation of an entire course in astronomy which is now contained within the University of Glamorgan's curriculum portfolio. Detail of our innovative astronomy programme has been reported to:

- the Colloquium of the International Astronomical Union at London, 1996;
- 110<sup>th</sup> National Conference of the Astronomical Society of the Pacific at Albuquerque, New Mexico, 1998;
- Apocalypse 2000: Art, Bible et Société, Colloque International Interdisciplinaire, Université Catholique de l'Ouest, ANGERS, 2000;
- Science Fiction education conferences at New York and Liverpool, 2001;
- "Broad Horizons: The Role of the Imagination in Bioastronomy Education" Bioastronomy, Great Barrier Reef, 2002

The programme has attracted much interest from students as well as staff, and it was realised quickly that science fiction is a recurring and even dominant academic theme for discussion. Furthermore, other areas of the University have much relevance to the critical analysis of issues and perspectives emerging out of science fiction work. Staff from the Schools of Humanities and

Social Sciences, Computing, Mathematics, and from the School of Art and Design formed a network which strengthened and developed confidence about actually proposing a complete degree award dedicated to this curriculum area.

### ***Aims and Objectives of the Degree***

The Science and Science Fiction degree award primarily focuses on science, both historical and contemporary, as an integral part of culture. The vast majority of degree awards in science - and particularly 'pure science' - specialise exclusively in the science domain paying little regard to the context in which science is developed, practised and received.

This degree is an award *about* science as much as it is an award *in* science, since it encompasses the many influences brought to bear on the continuous creation and consumption of science. In particular, the award uses a number of contrasting methodologies to explore the relationship between science, culture and society. The science fiction modules provide, in one sense, an imaginative forum that focuses on this relationship.

#### ***Aims***

The aim of the "Science and Science Fiction" degree award is to produce graduates who not only have a dynamic and pluralistic understanding of the nature and evolution of science, but can also critically develop and communicate ideas about science and its cultural context. Science fiction is the vehicle for our exploration of the relationship between science and culture.

The award provides the students with the conceptual and methodological frameworks necessary to achieve these aims. These frameworks include science: its methodology, philosophy and sociology, and critical theories from media and cultural studies.

On completion of the award, it is hoped a student will have:

- gained a dynamic and critical understanding of science, recognising that events and issues in science require scientific, social and cultural analysis;
- specifically cultivated a critical analysis of science fiction, which recognises its scientific, philosophical, cultural and social influences;
- developed an ability to imaginatively communicate the nature and evolution of science, science fiction, and media and cultural studies, and their interrelationship.

#### ***Objectives***

On completion of the award, a student will be able to critically:

- understand the social development of science and science fiction, both historically and currently;
- examine the nature of science and its relationship with science fiction;

- understand how science and technology are represented within various forms of media and culture, in particular science fiction;
- assess many of the social implications of the practice of science and technology through the context of science fiction;
- understand issues relating to the public understanding of science especially those presented within the context of science fiction.

### ***Degree Structure and Cognate Strands***

The award encompasses two cognate strands: the science strand, and the science fiction strand. The students are provided with the necessary research tools, frameworks and methodologies to enable them to construct differing interpretations, paradigms and perspectives on the nature of the subjects under study.

The award represents a unique mixture of skills since it brings together science and the humanities therefore challenging the "two culture" myth. It is hoped that graduates will possess flexible and practical abilities to respond to a dynamic and evolving cultural working environment where artistic creativity and science often meet.

#### ***Science Strand***

The modules chosen for this strand are drawn from the physical sciences, particularly astronomy. There is an appropriate rationale for this choice. As well as being a fascinating and challenging study in its own right, astronomy can also be used to teach the principles of the nature and philosophy of science.

Furthermore, our account of the physical sciences is pluralistic, and that is probably its most important innovation. We recognise that the scientific revolutions have influenced, or have been influenced by, conceptual changes in cosmology, chemistry, biology, physics, philosophy, and religion. Specialised accounts are perhaps inhibited from analysing the nature of these links and their influence upon the growth of human knowledge and endeavour. Indeed, pursuit of this pluralism has led to a second innovation - our modules repeatedly cross the institutionalised boundaries which separate "science" from "history" or "philosophy".

Our astronomy programme provides multidisciplinary modules, based on the physical sciences, but using an innovative syllabus balanced between the scientific and historic/cultural aspects of each topic. The modules are open to students of all disciplines. The programme explores the development of scientific ideas and beliefs through the use of social and historical frameworks, thereby lending clarity to the nature and evolution of scientific concepts and methods, whilst also embracing the wider cultural influences and impact.

Students also have access to the University's Robotic Telescope and Observatory, linked to giant robotic telescopes in both Hawaii and Australia (Faulkes)

#### ***Science Fiction Strand***

*"... if we know the jargon, we also daily experience the reality. We live in a science fiction world."*

(May, 1998)

The aim of this strand is to present a critical perspective on the creation, development and cultural context of science fiction, by providing the students with an imaginative opportunity for analysis using contrasting frameworks.

Science fiction has been variously defined – there probably exist as many definitions as there are science fiction authors according to Brian Aldiss. A typical example is that of Mark Rose (1981) who stated: *“Instead of thinking of science fiction as a thing, an object to be described, it is perhaps more useful to think of it as a tradition, an evolving complex of themes, attitudes and formal strategies that, taken together, constitute a general set of expectations”*

Even though students will be discouraged from the naive notion of science fiction as simply reflecting science, our emphasis shall be on the relationship between science, science fiction and society. Science fiction questions science, examines individuals and communities often in terms of technological systems, and those systems and technologies in terms of identity and consciousness. For example, Judith Merrill (1971) defines the heart of science fiction as: *“the mode which makes use of the traditional ‘scientific method’ (observation, hypothesis, experimentation) to examine some postulated approximation of reality, by introducing a given set of changes - imaginary or inventive - into the common background of ‘known facts’, creating an environment in which the responses and perceptions of the characters will reveal something about the inventions, the characters, or both.”*

Sam Moskowitz (1957) suggests a definition that is useful because of its varied conception of science, a conception which was not always as broad nor as acceptable to practitioners and readers of science fiction as it is today: *“science fiction is . . . identifiable by the fact that it eases the ‘willing suspension of disbelief’ on the part of its (audience) by utilising an atmosphere of scientific credibility for its imaginative speculations in physical science, space, time, social science, and philosophy.”*

Joanna Russ (1995) holds that science fiction *“attempts to assimilate imaginatively scientific knowledge about reality and the scientific method, as distinct from the merely practical changes sciences has made in our lives”*. Patrick Parrinder (1997) suggests *“up to the present, SF has continued to be moulded and shaped by scientific thought, even in its moments of rebellion against it”*.

In short, science fiction has been used as a way of imagining the relationship between technology, science and society, both as an inspirational source guiding the direction of scientific development and a way of popularising and disseminating scientific ideas. It is the contention of our degree award that a student with a socio-scientifically informed criticism would find the extrapolations of SF more intriguing, rewarding and challenging.

As a consequence, the criteria for selecting works is not solely on literary merit, but rather the ways in which works articulate this relationship between scientific thought and society. Author Thomas Disch, writing about this marriage of art, science and society made the point that : *“A new harmony is sometimes achieved, a coming together of invention and awareness. Not only are the*

*(metaphorical) figures and the landscape resonantly congruent with each other, but now there is a sense of greater understanding (of our world).*" (Disch 1973)

### ***Cultural Analysis of SF***

Traditionally, works of, and awards in, science fiction have been legitimated within a literary tradition, i.e., the creation of canonical works, and an evaluation of works in terms of their contribution to the development of a humanistic aesthetic. However, for all of its imagination and innovation, science fiction would have remained the province of a limited readership had it not been for the expansion of the genre to the visual media.

Consequently, within the award literature is not prioritised; common materials also involve SF works from television, film and other media. Nor are literary techniques especially used to analyse these materials. As Joanna Russ (1995) points out: *"criticism of science fiction cannot possibly look like the criticism we are used to. It will - perforce - employ an aesthetic in which the elegance, rigorousness, and systematic coherence of explicit ideas is of great importance. It will therefore appear to stray into all sorts of extra-literary fields: metaphysics, politics, philosophy, physics, biology, psychology, topology, mathematics, history and so on."*

and Russ again: *"(medievalists) enjoy ... (SF) ... much more than do students of later literary periods. So, in fact do city planners, architects, archaeologists, engineers, rock musicians, anthropologists, and nearly everyone except most English professors."*

Therefore, our degree award focuses on the concept of fiction as an "invented idea or statement or narrative; an imaginary thing" and as "the act or process of inventing imaginary things, or a conventionally accepted falsehood." The award addresses science in a number of ways:

- physical limits of realising imagined scientific invention;
- connections between fact and fictional work; this leads to deeper questions about science's dependence on narrative to support/justify scientific thought and activity;
- possibilities of achieving a mimetic relationship between reality and representation.

## ***Award Content and Curricular Analysis***

### ***Content of Level 1***

Students normally read these 6 modules.

#### ***Curricular Analysis of Level 1***

The award has been structured so that each cognate strand presents at each level modules whose curriculum themes run concurrently with one another. So, for instance, the themes and sub-themes presented in the science fiction strand reflect the major themes of study in the science strand.

At level 1 the main themes in the science strand start with the evolutionary development of science, particularly physical science, in a cultural context, from the Greeks through the Renaissance and

the determinism of the Newtonian synthesis to the less deterministic models of C20th. The critical method and sceptical tradition of science is presented by communicating not only the findings and products of science, but the actual, tortuous history of its great discoveries along with the frequent misapprehensions and occasional stubborn refusal by its practitioners to change course. Scientific development may also be characterised by parallel acceptance (development) and denial (dogma). The students will be encouraged to realise that the populariser and communicator of science may use its history to enable communicants to distinguish science from pseudoscience: the method of science is as important as the findings of science. The study of the home planet enables the student to critically examine the various causes and processes, both proximate and ultimate, of globalisation: human migration, cultural and socio-political. Case study material allows the students to understand the modern world's inequalities without reverting to Euro-centric or even racist stereotypes.

With this science curriculum in mind, the science fiction strand introduces its concurrent themes against a changing socio-scientific background. We introduce the themes and sub-themes to be studied in the strand, and present an examination of how science fiction has used its influences throughout its 200-year history, particularly the C20th.

### ***Content of Level 2***

Students normally read these 6 modules.

### ***Curricular Analysis of Level 2***

The main themes presented at level 2 in the science strand are: the emergence of cosmology as a C20th science, the emerging role of women in science, and the parallel development of stellar nucleosynthesis and the hydrogen bomb in the first half of the C20th. These ominous trends in science theory and practise are assessed in terms of their influence on the socio-political landscape of the Cold War epoch. The space race and subsequent space exploration is considered in this political light.

We use this opportunity to examine, in more detail, concurrent themes in science fiction: the re-emergence of the utopian/dystopian tradition is considered against a backdrop of rampant totalitarianism and the post-apocalyptic scenario. The unfolding drama of the space race and the emergence of cosmology as a science in the mid-1960s enable a more dynamic consideration of SF's travels in space-time.

### ***Curricular Analysis of Level 3***

The award presents a challenging curriculum at level 3. The focus at this stage is the way in which culture and society have shaped C20th science.

In the science strand, we present to the students the many faces of modern science: the conceptually challenging subjects of relativity and quantum theory. A main theme is the search for

extraterrestrial life; the "Life in the Universe" module details the development of the C20th debate and looks to the C21st. The science themes are again reflected in the science fiction strand.

"CyberScience" assesses the impact of science and technology on definitions of life, intelligence, identity and consciousness. Two contrasting strategies will be used. The first is the concept of artificial intelligence (AI), its use and possibilities in science fiction, placed in the context of the development of computer science and the questions it raises for human intelligence and evolution. The second is the life sciences perspective, its use and reflections in science fiction, along with questions of socio-biology. The "cyberpunk" movement in science fiction is considered in the context of these contrasting perspectives. "Quantum Worlds" examines how our changing view of the cosmos, in particular relativity and quantum theory, has impacted on the portrayal of the alternate realities, histories, counter-factuals, beliefs and worldviews explored in SF.

### *Application in Lifelong Learning*

Higher education has undergone rapid and far-reaching change in the past decade. There has been a massive expansion of the student population. Universities and colleges have introduced credit accumulation and transfer frameworks which – theoretically at least – facilitate transfer between institutions and help learners to vie between full and part time modes of study, depending on their personal circumstances and financial pressures. Quality assurance has become a major educational industry, leading to subject specific assessments of teaching and elaborate institutional audits. New technologies have led to numerous distance learning programmes in order to make full use of the internet as well as multimedia production.

A unique era of consultation and policy can be identified within this context. Primary, secondary, tertiary and higher educational sectors have been subjected to detailed reviews leading to widespread policy recommendations for an all-embracing educational perspective called lifelong learning.

In light of the foregoing, this course has received wider application than HE level, becoming relevant to lifelong learning throughout the South Wales area since 1998. This has been achieved by the introduction at primary and secondary school level of the lessons discussed above via the innovative learning environment of the *Starlab* Planetarium, a mobile inflatable planetarium dome by way of which the cross curricular lessons detailed in this paper have been practiced. Since its inception, over 4500 children of ages 6 – 18 have had access to this resource (Griffiths *et al* 2001:10) provoking favourable comment from teachers and students alike, who have utilized the novel environment of the *Starlab* to develop a sustained interest in science, fiction and associated subjects beyond the class environment.

*Starlab* has recently been supplemented with the University of Glamorgan's *Robolab* – a collection of eight robot kits with allied laptops and software which enable students of 11 to 18 years of age to develop skills in electronics, construction, teamwork, communication, lateral thinking, product application, engineering and I.T. development via the environment of a simulated Martian landscape, attaining the goal of building and programming a robot to carry out specific rescue tasks in a situation which is not merely lifted straight out of science fiction, but could become valid as mankind moves ever nearer to human exploration of the red planet. These themes have been further

explored during the University's Space School, a forum for space science education drawing GCSE A level students from across the UK and Ireland in the summer of 2001, and again recently in primary schools during a 5 week exhibition at a local museum. The *Robolab* will have further application to educational initiative later in 2002 as it becomes a part of the *Star Trek: Federation Science* interactive exhibit at the National Museum of Wales.

Not neglecting adult learners in the community, the university has built up a very successful student outreach programme, with over 150 part time students in various community centres across South Wales partaking of the modules of the degree. These courses are accredited, enabling an adult learner who may be alienated from HE institutions by lack of qualifications, to experience a foundation which will enable him / her to go on to HE or remain within the community and take the full degree on a part time basis, the pace of learning being dictated by the recipient rather than the tutor. The cross curricular basis of the degree structure enables such community students to play to their strengths, bringing their wider experience to bear on their studies and perceiving how such seemingly esoteric subjects find application in the modern world. Such education also places the student at an advantage in comparison to constricted fields of study that consequently require narrowly defined employment markets and limited opportunities. The emphasis on multidisciplinary knowledge, the encouragement to research and broaden their subject, to gain knowledge of a variety of fields, fits the student into the modern workplace, where the ability to work as a team, multitask, think laterally and retrain themselves accordingly is regarded favourably by employers. Since the inception of these community courses, several students have moved from community based learning to full time degree courses, some even changing their employment patterns as a result of their experience.

### ***The Student Experience***

A common feature of the taught modules is the multidisciplinary approach. The modules, which comprise the science fiction strand, are delivered through the use of staff teaching teams. In this way, the students experience a variety of viewpoints from contributing fields personified by informed experts from those fields. It is hoped that the use of such staff teams help present the broadest possible selection from the genre, producing intellectual versatility in our graduates and encouraging them to approach SF from a range of different theoretical viewpoints.

### ***Conclusion***

On the eve of the millennium *The Times* asked a number of prominent scientists to identify major issues in science leading into the C21st. Professor Susan Greenfield, of Oxford University, and the first female head of the Royal Institution suggested *the* scientific breakthrough of the C21st would be: "*The engagement of the public in science and the expression of scientific ideas in a way they can understand and contribute to*"

We believe science fiction can be used to help demystify science, highlight its social and cultural context, and act as a bridge to public consciousness, providing an opportunity to tackle pseudoscience head-on.

Finally in this way we shall also address issues relating to the status of science itself. Why is science often considered culturally inferior to the arts? Why is science rarely appreciated as a cultural activity at all? If science is to be restored to its rightful place in our cultural heritage then science fiction can help to play an important part in bringing science "...out of the laboratory and into the culture."

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