SCIENCE FICTIONS, CULTURAL FACTS

A Digital Humanities Approach to a Popular Literature

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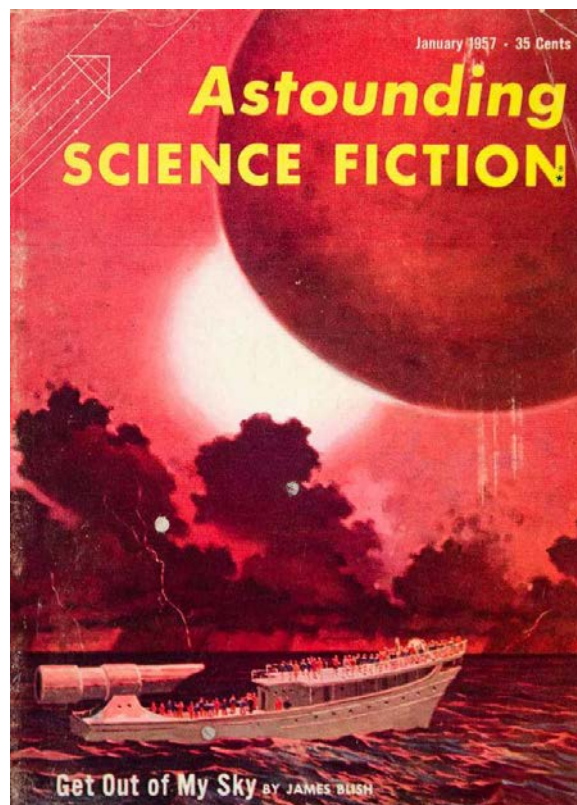
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To my father,
and the musty, neglected copies of *Astounding Science Fiction* I found in his study long ago

My first SF magazine: *Astounding Science Fiction*, January 1957

DECLARATION

This dissertation is the result of my own work. To the best of my knowledge and belief this thesis does not contain any material previously published or written by another person, or which is the outcome of work done in collaboration, except where specifically indicated in the text. It has not been previously submitted, in part or whole, to any university of institution for any degree, diploma, or other qualification.

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Ethics Approval

The James Cook University human research ethics committee granted approval on 19th October 2015, no. H6299 for the surveys undertaken for this thesis. The mandatory final report on the study was submitted to the ethics committee on 29th January 2019.

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ABSTRACT

Human culture has a necessary influence on the content of popular literature – if only because the interests of a contemporary public determine material success or failure. Authors are products of their time, and popular writers will tend to reflect the cultural expectations and values of their readership. It follows that we should be able to find the imprint of human culture in popular literature if we employ suitable methods. Science fiction (SF) is well suited for such investigation, as it is open in scope and subject, and less restricted by content conventions than other genres. As a publishing medium, magazines, specifically, are valuable literary artefacts of popular culture. They contain fiction, editorials, advertising, reader letters, and features on matters of contemporary importance. These all contribute to build an understanding of their cultural environment. In this thesis, I begin by assessing the relevance of SF as a relevant source of popular insights by tasking SF magazine content as a lens to focus on human culture, analysing the genre and its value in contemporary research and society. I review the uses of SF in academic literature, and analyse public surveys to identify the breadth and relevance of its popular appeal. I describe the phenomenological experience of developing a hybrid digital and traditional methodology from the perspective of someone with no history of digital research in the humanities and employ a series of case studies which test the validity of the approach. The case studies provide insights into the cultural history of two topics: the foundations and subsequent development of Scientology; and the changing representations of tropical environments and peoples.

An aim of this study is to devise and demonstrate methodology that respects the human experience of literature, but also integrates the value of employing technological approaches that expand the scope of investigation. The primary sources comprise more than 4,000 individual magazine issues – perhaps thirty percent of issues of magazines dedicated to SF in the twentieth century – and complete, or near complete runs of major titles. The value to the research process of having a significant number of sources is to counter the bias contained in the phenomenological bracket of the researcher. The expectations researchers are influenced by contemporary culture, and personal preferences, and this is likely to affect the perceived significance of specific historic texts. This selection bias could lead to the rejection of content that contains relevant

insights. To address these issues, I devised a digital humanities methodology for selecting primary sources, and to complement discussion of the results. The results of applying the methodology strongly support the proposal that SF can provide a valuable indicator of cultural values, preferences and expectations – being widespread and commonly appreciated by contemporary audiences. SF is confirmed to be a valuable and relevant source of information on the evolving history of human cultural interests.

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List of Abbreviations and Acronyms

CAQDAS   Computer Assisted Qualitative Data AnalysiS

Excel   Microsoft Excel

Nvivo   QSR NVivo, software principally used for coding text by categories

PRISMA   Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Pulp   Magazines and books printed on low quality, perishable, wood-pulp

              paper

R   The R statistical package

Magazine Titles

ASF/Astounding   *Astounding Stories, Astounding Science Fiction, Analog Science Fiction*: encompasses all appelations of this long-standing title.

Asimov's   *Asimov's Science Fiction Magazine*

Galaxy/ Galaxy Magazine   *Galaxy Science Fiction Magazine*

NW / New Worlds   *New Worlds Magazine*

F&SF   *The Magazine of Fantasy and Science Fiction*

IF   *Worlds of IF Magazine*

Amazing   *Amazing Stories*

Terminology

The wide range of science fiction content is paralleled by a similarly wide range of academic definitions. I will discuss later the existing academic theories of the science fiction genre, and how they contrast with, or support, the popular definitions derived from survey responses. For clarity, it is necessary to be able to be precise to avoid potentially confusing or misleading the reader. The specific terms "science fiction" and "fantasy" will refer to non-academic classifications of these works, including those of authors, publishers, retailers and editors. The term "SF" will be applied generically to all science fiction, except where explicitly stated, including academic and non-academic perspectives. Where it is necessary to clarify a distinction between academic and non-academic definitions, the term "Fiction of Estrangement" (FoE) will be applied to the collective historic academic approaches. This is to acknowledge that the battered crown of academic definition of the genre is most often found on the head of Darko Suvin, following his landmark work on genre analysis that he wrote in the late nineteen seventies in which he proposed "cognitive estrangement" as a quality which categorically defines SF (Suvin, 1979) – and it provides an easily remembered acronym.

INTRODUCTION

This thesis is infused with pragmatism, and my approach has been founded on a pragmatic goal – I wished to create an accessible and effective methodology for analysing a literary corpus that could be employed productively without necessitating detailed knowledge of digital methods. There has also been a necessity to be pragmatic to make the scope of the project manageable. Accordingly, I begin with a simple axiom: that human culture leaves an impression on contemporary popular literature. I argue that these historical "watermarks" record human values, beliefs and interests of their time, and that they become visible if examined under the right light. To test this hypothesis, I have studied what is arguably the most versatile of popular literatures: SF. This is a genre that features thought experiments on the consequences of human actions in various scenarios, including alternative versions of human realities. It is also less diluted by conventions in style and content that are prevalent in other fictional genres. It follows we may be able to find more detailed impressions of certain cultural influences in SF than we might in other genres, and that popular SF could provide texts likely to contain a recording of the dominant popular culture of their time.

THE HYPOTHESIS

1. The content and context of a popular literature significantly reflects the culture of a specific period.
2. Magazine SF provides an especially rich and relevant source of cultural information.
3. A methodology that combines digital and traditional methods can effectively enable identification and examination of this cultural content.

This study also adds to the body of work on the literary history of culture, computational text analysis, and the field of SF research.

THESIS STRUCTURE

This thesis is structured in two parts, bridged by a methodology, and bounded by this introduction and the concluding discussion:

Part I: Discussion and evaluation of the relevance of popular SF as a human cultural phenomenon – characteristics of the genre, prevalence in research culture and the demographics of readers.

Methodology: "Proximal reading" as a way of employing digital technology to enhance the cultural analysis of literature.

Part II: Case studies of the methodology, which seek to identify how specific cultural phenomena appear in the literature.

The first part of the thesis evaluates the position of SF in academic and popular culture, and establishes the public identity and relevance of the genre to cultural analysis. My literature review investigates the use of SF in cultural research between 1980 and 2016, and found SF employed in academic studies across multiple fields of both the humanities and sciences, and especially for communication, advocacy and education. The results of two surveys I created to identify the characteristics of contemporary readers of SF, and their views and opinions on this popular genre, are also included in Part I. Analysis of the surveys revealed the demographics of SF audiences, and identified how people experience and define SF. The demographics of respondents supports historic evidence of a trend in changing readership from a predominantly young male audience in the mid-twentieth century to one that correlates more closely to the characteristics of the general population today – revealing the widespread influence and penetration of the genre into the public consciousness. Responses also reveal a popular definition based on simple categorical distinctions between texts, and indicate what the genre means to an audience who are not influenced by a research tradition. The findings are that SF has over time broadened in appeal to a population that today

includes people of all ages, genders, nationalities, occupations, interests and levels of education, and also that the popular definition of the genre is extremely specific and well defined when compared to some academic versions.

The methodology serves as a cultural time-machine, isolating and inspecting the contemporary cultural values and expectations expressed in SF past, and drawing comparisons between these. The volume of primary sources necessitated digital approaches to sort and identify content on a large scale, but traditionally the research process in literature is subjective, and strongly influenced by selection bias on the part of the researcher. This is problematic when attempting to analyse a corpus of text that is too extensive to be physically readable, as it is inevitable that new and potentially significant sources may remain hidden, and the researcher will most likely select from the familiar, rather than the unfamiliar. A flexible methodology for exploring and analysing corpus text is required to address the issue of selection bias, provide a framework for replicating and validating the research, and yet to respect the human, complex, cultural context of the primary sources. To address this, I synthesised traditional and digital humanities approaches into a "proximal reading" methodology. This applies text mining, coding, word frequency, and matrix analysis to carry out an objective selection of relevant primary sources, facilitates the identification of connected and contextual information, and generates starting points for discussion.

As I will explain in the methodology section, the development and realisation of this aim has been a complex process, and fraught with difficulty. I found that many different digital technologies and approaches could be included beyond my original expectations, and realised that if I found this daunting, having some background in computer technology if not in digital research, it would be very discouraging to those who were less experienced. To present the methodology as a finished product without explaining the experience of creating it would maintain the illusion that digital approaches require special kinds of skills, and a special kind of researcher. For that reason, and to emphasise that digital approaches must be grounded in human experience to have meaning, I chose to include my experience of the development process in a discussion of the methodology. The applications of the methodology to specific subjects are presented more formally in subsequent chapters.

The second part of the thesis consists of case studies, based on research articles

published during the course of the study. The case studies question the validity of applying a formal methodology to the discovery of cultural insights, seeking to find if the static or changing beliefs and perspectives of a diaspora of English-speaking readers of SF have left traces in the content they consumed, and whether this may be correlated with prevalent ideas and beliefs of the time. The case studies apply the proximal reading methodology to focus the lens of SF on human culture. Each study integrates qualitative and quantitative methods proportionate to the specific topic being discussed, and together comprise a set of complementary examples, which demonstrate the scalable flexibility of the methodology.

The first case study, an assessment of fifty years of the appearances of Dianetics / Scientology in SF magazines (Dianetics was launched in *Astounding Science Fiction* in May 1950) reveals that readers, writers and editors held polarised views from the outset, and were not as receptive an audience as may have been assumed. A second investigation, into SF set in jungles and deserts, discovers parallels to a changing public landscape of attitudes toward environmental protection and conservation, gender stereotypes and the value of civilisation. A parallel examination of tropical-styled cover art confirms the perspectives identified in magazine content, and adds how arbitrary the notion of "the tropics" becomes if imagined anywhere other than Earth, or from a cultural history that does not include Aristotle.

The discussion of the findings of the case studies, and the evaluation of SF in the first part, leads to the conclusion that SF is a valuable source of insights, and the methodology appears robust for the purpose of seeking these out. The appendices provide supporting data and tables that were included in the published articles from which chapters have been derived. These have been moved to appendices to increase readability. The appendices also include the survey questions, a bibliographic listing of primary sources, ethics approval and other process-related information, as well as technical information on digital conversion and preparation of text.

BACKGROUND

To explain the relevance and significance of this study it is necessary to describe my own phenomenological process, which I will discuss in more detail in the methodology section. This requires clarification of notions of culture, SF, magazines, popular and academic expectations of fact, and how digital and non-digital methods might be expected to provide better insights into what is primarily a study of human experiences. I have noted that there are stylistic shifts in my discussions of methods, content, and personal factors that have taken place in the course of this research, and I found that it was not possible to "correct" these into a unified style that would serve all equally well. An outcome of the process has been a recognition that attempting to integrate human and digital approaches results in describing both, rather than blending them into a uniform fluidity. That this should be the case is reflected quite clearly in my work on defining SF – which identified that people make clear categorisations between SF and fantasy, but also recognise combinations of both, despite there not being a third category. What emerges here is the product of working diversely across the *Two Cultures* of the Arts and Sciences defined by British novelist and polymath C.P. Snow (Snow, 1961), towards a common aim, and accepting differences in method and approach rather than attempting to subvert either. As much of this thesis is prepared from works published, or in review, and with different publishers and audiences, I have largely respected the style in which they were presented for publication. I have made changes to reduce duplication, to indicate the relationship between these works as parts of a greater whole, and to place related segments together where they form part of a larger argument. In all other respects, chapters that are based on specific publications or manuscripts are presented in their original form.

Culture and Science Fiction

Culture has been defined as "the symbolic, ideational, and intangible aspects of human societies. The essence of a culture is not its artifacts, tools, or other tangible cultural elements but how the members of the group interpret, use, and perceive them" (Banks and Banks, 2004: 8). Culture is expressed in the knowledge and behaviors shared within groups of interacting individuals (Useem, Useem and Donoghue, 1963). This shared

knowledge, interpretation and perception concerning the tangible elements of culture represents the "cultural fact" of the thesis title, as this is reflected in the content of popular literature.

SF is significant in studies of human culture as it is an ancient and enduring form of literature that has been part of what Brian Aldiss called our "cultural wallpaper" since the origins of recorded history (Aldiss and Wingrove, 1986: 14). Adam Roberts suggested that SF begins with the "voyages extraordinaires" of the Ancient Greeks (Roberts, 2005a: vii), but to become closer to the origins of the genre we might go back a millennium to the Sumerian creation story, with the supreme god Marduk "cloning" mankind from the blood and bone of the renegade god Kingu (Enûma Eliš, 5.26). My research indicates that we could go still further back, and my analysis of the popular definition of SF suggests our recognition of the underlying features of SF may even be a "hard-wired" by-product of the emergence of human technology.

The association of culture and society with SF content is made explicitly by Bruce Franklin in his treatment of Robert Heinlein (Franklin, 1980). Veronica Hollinger summarises this as a "historical-materialist reading of Heinlein's career within the context of the American socio-political and cultural scene which, in part, shaped him as one of the most successful SF writers of all time," seeing "Heinlein's career as paradigmatic of the fortunes of both American SF and America itself over the course of much of the twentieth century" (Hollinger, 1999).

Science Fiction Magazines

Fig. 1. *Astounding*. **July, 1939**

As cultural artefacts, the ephemeral qualities of the content of twentieth-century SF magazines are complemented by their physical fragility. The material character of aged magazines: the tactile roughness of pulp paper and the musty fragility of the pages themselves are tangible evidence of transience. Cover art that occupies a dreaming middle-ground between classical art and photography appears analogous to the collision of the "old" with the "new" that John Cheng describes in *Astounding wonder: Imagining science and SF in interwar America* (Cheng, 2012). Similarly, magazines include advertisements for patent cures, lucky charms and psychics, alongside correspondence courses in radio and electrical engineering – and, of course, there are the stories, which imagine the possibilities of the future, in terms familiar to readers who grew up in the past. The July 1939 issue of *Astounding Science Fiction* (Fig. 1), is considered by some to indicate the birth of "modern" SF. The first issue fully under the control of editor John W. Campbell, it features "Black Destroyer" –A. E. Van Vogt's first published story (Van Vogt, 1939a)[1]. I cannot safely read my own copy of this "modern" issue, as the pages crack and fragment in my hands. In my mind, the culture of the SF magazine in its own time occupies a middle space – the "now" between the brittle pages of the past and the

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[1] Van Vogt, whose second story, "A Study in Scarlet," was also published in *Astounding* that year (Van Vogt, 1939b) reportedly agreed a settlement with Twentieth-Century Fox (Brown, 1980) after pointing out the film *Alien* (O' Bannon and Shusett, 1979) included plot details that were very similar to those in Van Vogt's original works.

certain oblivion of the future. If it was not for the availability of digital technology to conserve these magazines it would be virtually impossible to carry out research on some early copies without damaging them.

The production of magazines is time-bound, generally monthly or quarterly. This rapid production contemporises the content – as Michael Ashley has commented in his compendium *The Age of Storytellers*: "given the relatively long production time of the book, the magazine was the more immediate and 'newsworthy,' and has an 'immediacy and cheapness' that can generate a significant audience" (Ashley, 2006: 3). Magazines are more adaptable to change and more exploratory than traditional forms of literature for which the investment in production may be higher. Magazines also feature content that includes indicators of external culture: articles, editorials, reader letters, reader feedback and advertising. Non-fiction articles commonly occur in SF magazines, and add to the cultural picture that emerges from analysing fiction alone, sometimes contributing evidence that independently supports, or contradicts, the fictional text[2]. A single issue of a magazine can offer an intriguing sample of the contemporary cultural and social environment that influenced content. This makes magazine fiction not only of its age, but also about its age. As a publishing format, I argue that magazines provide holistic illustrations of cultural values, identifying the changes in some, and the persistence of others, and are consequently highly relevant to cultural studies of any specific period. In the case of SF, rapid growth of popular interest in the middle part of the twentieth century led to many new magazines being published. Writers were under

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[2] The facility with which writers included human responses to future situations and technology was sometimes too closely linked to the activities of the time. In 1943, John W. Campbell requested a story from author Cleve Cartmill about a nuclear "super weapon." In March 1944, a year before the first atomic test, *Astounding* published an accurate description of the Manhattan Project bomb. The FBI visited Campbell (Schwartz, 1971: 1051), and determined the story was the product of inventive exploration of existing physics rather than a security breach. They did, however, reportedly request Campbell not publish stories of this kind for the duration of the war.

pressure to keep producing new material to satisfy demand, and this tended to further reduce the time that elapsed between writing and release to the public. Another important feature of SF is that it has developed a broad appeal, as I found in my survey analysis, and today is consumed by a demographic that demonstrates it is not an obscure fringe-interest literature.

The content of SF may be relatively unaffected by genre conventions in comparison to other literary genres (authenticity is not necessarily affected by anachronism, for example), and this may make the cultural influences on content more evident. SF also provides a mechanism for publishing taboo, or anti-establishment content, and portraying contemporary issues and interests that are sufficiently controversial to lead to censorship by those in authority if published in more "realistic" forms. Pat Mills, the writer/editor of *2000AD*[3]*;* had previously published *Action*, which failed in October 1976 following parliamentary investigation. *Action* had featured comic strips that portrayed a contemporary popular culture of football hooliganism and social violence, inequalities and prejudice. Mills' realistic representations of contemporary social problems were contrary to the public policy and political rhetoric of the time. On his decision to revisit these topics in an SF format, Mills has said:

> I felt, in a way, that SF could escape the heavy flak we had got with *Action*…With *Action*, the message was loud and clear because most of it was set in what was the present time. With *2000AD*, we could do the same sort of thing but if anyone complained we could say, 'Look, it's just some robots in the future.' (Barnett, 2017)

Nonetheless, objection to cultural observations that are politically embarrassing as indicators of governmental failure, or that portray social change and real-world occurrences that people might prefer to deny or at least ignore, could still affect SF magazines that depended on public funding. Mills was able to reflect cultural conditions in this alternative format that were too provocative to be discussed more publicly, and

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[3] An SF comic first published on 26th February 1977 by IPC, that created, among others, the now iconic character of Judge Dredd, and contained material that would have been transgressive in mainstream literature of that time.

individual access to content became subject only to parental control[4]. The capacity for SF to provide commentary on topics that may be outside of the acceptable scope of other genres, or even factual reporting, is a significant and valuable feature.

Sean Latham and Robert Scholes suggest that the additional information in magazines adds texture to phenomenological interpretation that is missing from novelised texts – it assists in putting the literary content in context (Scholes and Latham, 2006). As one of my case studies illllustrates, the editorials of John W. Campbell in *Astounding* leading up to the publication of L. Ron Hubbard's "Dianetics: A new science of the mind" (Hubbard, 1950a) add to the understanding of how the success of Dianetics (later Scientology) reflected the interest at that time in extra-sensory-perception, mind control and telepathy These interests are also featured in other editorials, advertisements and readers' letters.

It is evident that editorial bias must be considered in any discussion of magazines. *Astounding* was edited by John W. Campbell from 1937 to his death in 1971, and he was known for directing writers and requesting revisions to match his strongly held views. The profession of editor is precisely one that necessitates intervention and adjustment, and it is not possible to exclude editorial bias, although it can be identified – especially if content is inspected over a period of time as it is in this study. An effect of including a broad range of magazines in the study corpus is to reduce the specific impact of editorial choices on story content. The inclusion of reader letters and editorial responses adds insights into specific subject bias, as becomes clear with the investigation of the origins and growth of Scientology. As I will illustrate, the Scientology debate highlights how even the strongest editorial opinion could evolve over time, and that bias is not necessarily consistent or permanent. Campbell's opinions

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[4] I was an avid reader of *2000AD* from the very first issue in 1977, but it was banned after one of my aunts took a look inside. I had to resort to sharing secretly with friends to read about the riots, reality tv and partisan justice of Mega City One. The attitudes of government censors impacted twentieth-century pulp magazine and comic culture in both the US and UK – concerns raised by J. Edgar Hoover in the 1940s led to self-censorship by comic publishers in 1954. Later, *New Worlds* foundered once funding was withdrawn under political pressure.

on Scientology showed signs of change within a year, from enthusiastic advocacy to neutral observer, following sustained critical feedback from readers, and the occurrence of feature debates in both his own and competing magazines.

As a cultural product, the content and scope of SF magazines is subject to some conventional limitations. Taking the range of factors associated with SF into account, I argue that these are more than offset by the features of the genre – and especially in this format. Magazine SF is unbounded, rapidly written, quickly published, and immediately read by a diverse public who offer candid feedback on the relevance and importance of content. It is a democratic literature, enjoyed by a wide range of audiences, and contains additional contextual information as well as stories. These features make it a highly suitable source of material for studies of cultural values and change.

Culture and Fact

In popular literature, the state of cultural values and beliefs can be found in the statements people make about the nature and mechanics of the world of that time, and in SF this focuses on the interpretations which humans make of tangible, material and technological culture. The representation of reality in popular culture demands a lower burden of proof than might be expected in more serious, or scientific, discussions – and a defining feature of SF is to describe the currently impossible, or unknown, in terms of future plausibility. This makes popular literature likely to retain stronger impressions of the commonly held values and expectations of the culture of its production and consumption than might be found in scientific debate – which expects a higher degree of caution and qualification. As well as expecting cultural traces to be clearly defined, we can reasonably expect traces found in popular literature to reflect the contemporary world view of the general audience – the possibility of commercial success would demand this. To the people of 1942, it was a fact that the roaring gorilla in the jungle was a terrifying and vicious beast (Waldeyer, 1942), and the cultural assumptions and beliefs of people of the time are clearly visible in the content of the magazines they read. Today it is unlikely that readers would accept a similar portrayal of gorillas, now that their peaceful nature has become commonly known, and we would expect this to be reflected in more recent SF that describes ecology and environmental values. This

process of transformation in perception and understanding is made evident in my case study of the cultural history of tropical SF, and demonstrates this change in the cultural perspective is clearly visible in the mutating content of SF magazines.

When I define SF, I will explain how the core characteristics of the popular SF genre are not dependent upon the physical existence of tangible, current, functional, material technology. I found that "hard science" content is not a pre-requisite for categorisation of the genre, even though it may be strongly associated with it. The strongest association between SF and human culture is with the classical notion of *techne*, which is the human capacity to envisage and imagine the outcomes of exercising our ability to interact with and modify reality.

It is important to emphasise that I am not making a case for some sort of "scientific relativism" in my elaboration on cultural representations of the factual. I simply observe that the burden of fact in contemporary popular culture depends on a combination of factors that are not directly subject to scientific scrutiny. In the popular imagination, the state of scientific knowledge is augmented by "common sense," tradition, propaganda, and simple prejudice – cultural features that combine to establish commonly held truths about the world. For the purpose of this investigation, I imagine snapshots of these truths are archived in the ongoing, and continuous, history of the creative products of contemporary people and societies. The richness and variety of magazine content cuts across this wide range of material to reveal contemporary values and beliefs. SF magazines are especially useful in this regard. By adding a speculative dimension that can encompass a universe of social and physical possibilities, they open up the scope for imaginative expression, and provide more, and often more detailed or specific, opportunities to discuss topics of contemporary cultural interest.

Applied Digital Technology

My primary sources comprise a collection of over 4,000 individual digitised issues of magazines (listed in Appendix F), each running to approximately 150 pages, and a combined total of over 150 million words of text. This necessitated I make extensive use of computer software as without digital technology this corpus would not be accessible, or at least not in the period of time and with the resources available to most

researchers. As I will discuss in the methodology, rapid changes in the last fifty years in digital technology have revolutionalised the access to significant volumes of text, and the capacity to process it. Looking back to historic work in text analysis carried out in the 1980s offers a truly extraordinary perspective on how much the process has been transformed. Major projects from the early days of text analysis, that took years of investment, can now be duplicated in minutes by a single person using ubiquitous computer technology.

In process terms, I built a digitized corpus of primary sources from scanned images of individual magazines, searched this for relevant terms specific to themes of enquiry, sorted and cross-referenced these, prioritised, extracted and evaluated – visually, statistically and thematically. This required a method that respects human inputs and experiences as well as digital rigour. My original aims were to reduce selection bias on the part of the researcher, and to identify material that would otherwise remain obscure[5]. The input of colleagues across a range of disciplines led to identifying other methods I could borrow. Ironically, considering the focus of my methodology on reducing bias, I also adopted methods opportunistically that seemed well suited to following up on an impression or insight for which I could find no definitive evidence. This led to me revising the second survey to seek a clarification of whether the evident difference (in my mind) between public categorisation of genre and that of academic theorists, had substance.

I embrace an observance of literary-critical, phenomenological approaches more traditional to the Arts, and integrate digital and computational methods to explore the cultural interests expressed in SF texts and surveys. This has produced results that are original, and seem to offer human insights into the subjects under investigation. Content has been revealed by quantitative computational analysis that is not removed from

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[5] I also carried out word frequency analysis that compared decade-long sections of my SF corpus with Google NGrams (Michel et al., 2011) data across all genres, but this proved to be of predictably limited interest – I found that the words "planet," "Mars," and "space" occur far more frequently in SF than in more general literature. This was a tedious exercise, but the predictability of the results was a reassuring indication that statistical analysis would be practicable on a corpus of this size.

human context and relevance.

Scope

The scope of this study is subject to an interplay of constraints upon the availability of sources, their perceived relevance, and the technical requirements of analysis.

Primary sources

My primary literary sources are popular SF magazines written in English, following the first publication of *Amazing Stories* in 1926. My sources of contemporary cultural perspectives and human demographics are the people who responded to my surveys (Menadue, 2016b, 2017a). The questions and limitations of the surveys are detailed in Appendix E. Survey responses do not require the same critical evaluation of sources that is required to describe the selection of literature, as who responds to online surveying is a matter outside the researchers' direct control once the survey has been initially seeded (ideally in what might be considered to be appropriate online interest groups). The inclusion or exclusion of literary sources is subject to more specific choices made by the researcher. Analysis of survey responses is reliant on the decisions of the researcher regarding the questions to ask, however, and the limitations of surveys need to be recognised (Appendix E). The first survey was very general, the second more specific – with a significant focus on defining SF, but the valuable data – the responses – necessarily fall in scope due to the subject. The more difficult consideration of research scope was how decide which written literature to include.

The intention to use digital searches of text influences this decision, as the availability of a reasonably coherent corpus featuring many publications increases the reliability of the study. The rapid growth of SF publishing markets during the first half of the twentieth century provides a significant volume of text, and this improves the reliability of analysis over studies that are only able to examine a few, or even a few hundred, works. Due to the comparatively recent flourishing of SF in the 1950s and subsequent transformations towards the end of the twentieth century, many of the respondents to my surveys have been able to comment from the perspective of being participants in the cultural changes that took place over this time. This affords a

potentially richer perspective than would be possible when considering the attitudes and expectations of readers of earlier fiction. What might be criticised as a relatively restricted scope of investigation in terms of genre, is rendered in considerably more depth because of these features of relative abundance of text, and the possibility of personal recollection.

Historical range

The launch of Hugo Gernsback's *Amazing Stories* in 1926 – the first major title devoted to SF out of the many pulp magazines of that period – provides a natural commencement date for the study as it marks the beginning of rapid growth in the widespread distribution of SF magazines to meet increasing demand over the course of the twentieth century. This reached its peak in the 1950s and then declined slowly, today being complemented by online publications. The temporal scope of this study has been chosen accordingly to start alongside *Amazing Stories* in 1926, and to continue to the end of the twentieth century, with a smaller, indicative, number of post-millennial additions including data from reader surveys in 2002 and 2011 relevant to the demographics analysis. I have included other texts in analysis, outside the SF magazines, when they have been identified by the methodology developed for this thesis. The methodology allows for flexibility in scope for inclusion of related and relevant sources on the basis of explicable "degrees of separation" (Karinthy, 2011).

Classification of magazines

A tallying of the online *Science Fiction, Fantasy, & Weird Fiction Magazine Index* maintained by Stephen Miller, William Contento and Phil Stephensen-Payne (Miller, Contento and Stephensen-Payne, 2017) suggests the publication of commercially produced SF magazines, available in print from 1926 to the end of the twentieth century, might number between 11,000 and 15,000 issues out of the more than 24,000 issues listed in the database. My caution in describing a wide variance is because the inclusion criteria for the index are broad. It is exhaustive – reaching back before the 1920s, and it includes issues of magazines that have been occasional publishers of SF, and for which SF was not a major theme. Due to the tendency for publishers to include a wide range of content even in magazines that had "science fiction" in the title, manual

reading and categorizing would be an exercise beyond the scope of this thesis, so I have tended to be inclusive rather than exclusive. My reasoning is that on the closer examination that follows identification of potentially relevant content, any primary sources that are irrelevant will become clear. Choosing to use the PRISMA method (Liberati et al., 2009) for refining the selection of primary sources makes this inevitable, as all sources must be individually validated

Geographic scope

For this study, the digitised issues of SF titles includes complete, or near-complete, runs of all the major professional titles published in the USA and UK – issues that achieved the highest readership in those markets, if not worldwide. An explanation and elaboration of the primary sources is provided in Appendix F. The corpus for investigation is biased towards professional and semi-professional magazines as these are the most accessible to archivists. These predominantly published new work, not reprints, which makes their content more closely related to the context of publication, and they were also the most widely distributed titles, making them the most relevant by a measure of popularity.

Responses to my surveys came not only from American and British participants, but from a significant number of Australians. Ironically, I have had to omit Australian magazine SF as a specific area of study here. This is due to time and resource constraints, and the scope of my collection of SF magazines (which is almost exclusively American and British, or overseas editions of American publications).

Major American and (to a lesser extent) British SF magazine titles have found their way into the Australian market, but Australians also write SF, which includes magazines. Rather than including a limited (and consequently inaccurate), evaluation of Australian or other Anglophone literature, I have chosen to concentrate on the two primary SF markets of the twentieth century. However, the two published papers that explore tropical SF stories and artwork, which I have included here as case studies, include commentary from research into colonial impacts on Aboriginal Australians. I also have a book chapter accepted for publication (Menadue, 2019), which contrasts the recent *Clever Man* series with George Millers' *Mad Max* franchise. This also supports

the hypothesis that cultural change leaves a mark in SF, but is otherwise outside of scope as it discusses film and not literature; and for that reason is not included here.

The English language focus

Some American and British magazines were distributed world-wide, and even, in the case of *Galaxy*, translated into other languages (French and German), but with limited success. *Astounding* was published not only in the USA, but also in the UK and in Australia – albeit with some minor variations in publishing sequence, choice of content, and artwork. Possibly for copyright reasons, the covers of *Astounding* sold overseas were replicated from the originals by other artists. When paper was rationed during WWII and after, UK editions were edited down to stories and editorial introduction alone to reduce the page count, so I have preferred the US editions in my analysis as they were more complete. In cases where I have foreign English editions of issues that I do not have in their domestic version I have included these in searches, otherwise I have excluded them to avoid duplication.

The dominant culture of twentieth-century SF and fantasy was American culture and, more broadly, Anglophone culture. In the period under investigation SF, although well known outside of the English-speaking world, did not have the breadth elsewhere of publications and content that characterised the competitive magazine markets of North America and, to a lesser extent, the other primary native English-speaking countries: England, Canada, Australia, the Republic of Ireland and New Zealand (in order of population). There was a notable flourishing of SF in Russian literature – but it was very inconsistent, and *nauchnaya fantastika* was subject to the vagaries of political influence and policing to such an extent that at times there was no writing at all in this genre, and at others it was clearly directly linked to propaganda (Lin, 2013, Maguire, 2013, Nudelman, 1984). This provides an affirmation of the relationship between fiction and culture, but principally for one aspect (political) and in one direction (directed downwards from the leadership). The SF of countries that are not part of the traditional Anglophone SF diaspora is an area of strong academic interest at present, but difficulty of access to translated text has prohibited me from including it. In this field, the prevalence of thematic and mythological content has a strong bearing on the debate about how enduring and uniform these can be in a socio-cultural environment. This has

been clearly illustrated in the work of Elizabeth Ginway (Ginway, 2005, 2007) concerning Brazilian SF. For the majority of the period I have been investigating, large scale analysis of text has been of necessity limited in scope to the English–speaking western cultures, due to my lack of relevant language skills as well as resource limitations.

The focus on transatlantic publications in English should not imply a dismissal of SF magazines published in other markets or languages. The ready availability to me of digitized copies of major American and British titles compared to those from other regions has had significant impact on how rapidly it has been possible for me to proceed to digital analysis – digitizing a small number of issues from my own personal collection to fill small gaps in the sources available was feasible, but time-consuming. To prepare additional issues for analysis, it would have been necessary for me to source physical copies, photograph the pages and then convert the page images to text. Manual digitizing of text is a laborious process, and equipment that can digitise at speed necessitates dismantling magazines that may be rare and expensive.

The availability of digitised magazines for study varies significantly across years, decades, and titles. The typically chaotic patterns of distribution of digitised SF magazines is apparent when investigating the pulp magazine section of the Internet Archive (Scott, 2011) The Internet Archive is a non-profit library institution with the aim of archiving all human knowledge, starting with the internet. There are, however, many duplications, omissions and poorly attributed issues of SF magazines in their collection due to Archive policy that prefers easy access to readers and uploaders of content over rigorous controls. There is too much volume being shared for Archive staff to index it, so naming and cataloguing is left to the contributor, relying on their expertise and good intentions to ensure accuracy. This creates problems for investigators who require comprehensive sources of uniform quality, and imperfection has to be accepted. If my analysis were focused on statistical comparisons alone, this would introduce bias. But the methodology is primarily used to locate occurrences of key words in any context, and discuss the findings qualitatively. Content and context (what the issue contains regarding a topic, compared to other issues from different times) are of more value than quantity. Consequently, although there may be more or

less text available in any particular year or decade, this does not dramatically skew the findings, although it reduces the number of possible primary sources and the potential depth of the analysis.

Important Knowledge Gaps

That fiction reflects society is well known (Longo, 2016), and it has been argued this is the case for SF specifically (Mathews and Haedicke, 2014). There are many models of how personal interest, values and expectations influence the relationship between people and their contemporary environment, particularly the network of relationships between science and society (Callon, 1986, Latour, 1999, Law, 2008). There appear to be no previous studies that attempt to employ digital techniques as a primary method for selecting SF magazine content, and to add supporting analytical tools to the discussion and validation of qualitative interpretations of human culture. Also, to date, in the literature no publication has addressed a general, non-commercial, online survey of this population of readers. Empirical information on the characteristics of a population that has been theorised to have a significant influence on the pursuit and success of science, and who may reflect the contemporary cultural trajectory, is clearly valuable.

Computational analysis of text has been applied to both literary and scientific research, from Burrow's *Computation into Criticism* (Burrows, 1987) to more recent work (Clement, 2013, Hammond, Brooke and Hirst, 2013). Large scale literature analysis, "distant reading" as styled by Franco Moretti (Moretti, 2005a), has been criticised, however, for being too distant from the experiences and intentions of people. Moretti's work has also been described by some as "eccentric" and "idiosyncratic" rather than rigorous and compelling (Forum Mod Lang Stud, 2006). The application of computational analysis across a profusion of texts and genres tends towards a necessarily superficial interpretation of content. Applying a more specific genre-focused analysis is intended to ground the work more reliably to human experiences and, by applying phenomenological methodology, to explore individual themes and interests more deeply than might be the case if this were an approach based exclusively on statistical results. Analysis shifts from the distant reading of Moretti to focus on a specific point of interest from which to engage in the close and "outward" reading

approach advocated by Robert Scholes and Clifford Wulfman, who proposed adding analysis of readers, circulation, regular contributors, format, history, social and political references to academic assessment of magazines to create a richer interpretation (Scholes and Wulfman, 2010). These connections between sources of information, and even the sources themselves, may often be invisible if story content is the only focus, and the inclusive approach appears to be new in this context. The primary extension of existing work in the field of digital corpus analysis is the creation of a flexible methodology for moving from broad context to specific subjects and themes in a corpus, and the enhancement of qualitative assessment of these in their cultural context.

Demographic surveys of readers have also been a feature of SF magazines from the 1940s to the present day (Adams and Wallace, 2011, Campbell, 1949a, 1958b, Carnell, 1955, 1964, Hamilton, 1954, Van Gelder, 2003), but there has been a lack of general reader surveys carried out for non-commercial purposes. Single examples of contemporary fantastical fiction published in book form have been used as the basis for investigating how content might be related to characteristics of readers (Crysel et al., 2015), but novels are subject to external influences that are difficult to assess because the nature of book publishing creates a delay between the author's first ideas for the work and it reaching the public. I have argued previously that in contrast to traditional novelised forms, pulp SF might be the ideal genre for the investigation of social and cultural change for two reasons: it has been a rapidly produced literature (a short time passes between writing, publication and reader feedback), and the subject matter is comparatively open and unconstrained compared to other forms of writing. It might be expected therefore that SF could reflect broader concerns than other genres, and express clearer links between contemporary reader interests and their cultural environment. The open subject matter of SF has even been declared by some researchers to render it the only literature that can be meaningfully critically analysed (Freedman, 2000) – in my opinion an extreme perspective, but one that has some bearing on the selection of this genre for this project.

PART I. SCIENCE FICTION

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"Blood and Bone" (Enûma Eliš, 5.26)

Humans have been fascinated for thousands of years by myths and legends that are not readily distinguished from SF. The Sumerian creation legend, *Enûma Eliš* (c. 1900 BCE), says humanity was fashioned by Marduk from the blood of the renegade god Kingu. In the later *Epic of Gilgamesh*, a less equivocal procedure is described when Aruru, goddess of creation, fashions a clone of Anu, god of Uruk and casts him to the Earth where he grows up to be Enkidu, rival, and later friend, to Gilgamesh. Speculative fiction, be it myth, legend, folklore, fantasy or SF, is an ancient genre of human interest and it has immense resonance for human cultural ideas and values. But the story of SF is fundamentally aligned with the possibilities of creative acts, and begins even before human creation myths ascribed the authorship of reality to the divine. This leads us to our own modern comprehension, as I will describe in my approach to defining this genre later in this section. Features of human experience that we employ today to categorise SF have always been present. Literatures of speculation, imagination, innovation and magic have always been enmeshed with human culture and society, and it is this relationship that is explored in this thesis: specifically, the relationship between SF and the culture that creates and consumes it. In the following chapters I will explore the many facets of SF: in research culture, as a popular genre, and in the characteristics of the people who experience it.

THE LITERATURE REVIEW

For the purposes of the literature review, which aimed at identifying the perceived relevance of SF in academic uses, I accepted the necessity that the search terms employed would capture the definitions of culture that were understood by the authors of the articles I discovered. The results indicated that SF has become prominent in social and cultural research that is not purely focused on SF content, but which uses SF to complement academic approaches across a broad range of disciplines and research activities. SF became an increasingly significant genre for literary study after Darko Suvin's epochal publication of *Metamorphoses of Science Fiction: on the Poetics and History of a Literary Genre* (Suvin, 1979), which raised the profile of SF as a legitimate field of academic enquiry (Hassler, 1999). Suvin's work has become a core text around which the study of SF circulates, and I used it accordingly to define the limiting date for the scope of this review.

Introduction

The significance of the breadth of the relationship between SF and human reality is evident, and, as I mentioned earlier, to the extent that Carl Freedman freely described SF as the most legitimate genre for academic study (Freedman, 2000). SF has grown from a more or less plausible science focus in the early twentieth century to adopt more sociological and cultural factors over time. By the 1960s and 1970s SF generated by the "British New Wave" reflected dramatic changes in contemporary culture, especially the social and political aspects of gender, conflict, and freedom of expression. Colin Greenland has suggested that the need to provide some sort of manageable interpretation of an increasingly complex and unstable social and intellectual reality during that period, drove authors to create work that absorbed and softened the impact of that complexity – by depicting possible futures as being similarly iconoclastic and haphazard (Greenland, 1983).

SF questions the role, relevance, costs, and benefits of current and future technologies, and presents ideas that can influence public opinion. Brian Stableford claimed that SF could determine the worldview of individuals, by the modification of attitudes to the significance of current and future science and technology (Stableford, 1979). Marshall Tymn agreed that as a literature SF equips us to accept change as natural and inevitable (Tymn, 1985). As change is a natural outcome of applied scientific research, SF has been employed as a tool by researchers to provide metaphors, analogies, and models that describe the findings of their research (Bina et al., 2016, Hansen, 2004, Kotasek, 2015, McIntire, 1982, Toscano, 2011). Human acceptance of change is difficult and resists authoritative statements of fact, as has been identified in applied psychological and sociological studies (Nyhan et al., 2014, Prochaska, DiClemente and Norcross, 1992). SF is an effective agent for change, and as Stableford (Stableford, 1979) has suggested it also has a "directive effect" on people's interpretations of science. Ann Rigney described how Kurt Vonnegut's widely read 1969 SF novel *Slaughter-House Five* has educated readers about the scale and impact of the bombing of Dresden, despite the dubious accuracy of Vonnegut's depiction compared with historical records (Rigney, 2009). This is an example of how SF can

overwrite the cultural memory of historic events and has become "centrally relevant in many explorations of contemporary culture" (Hollinger, 1999: 1). In a more prosaic fashion, John Carnell, the founding editor of *New Worlds*, describes this relationship simply, including the relevance of SF, in his foreword to Issue 21 of *New Writings in SF*:

> In recent correspondence, Australian writer Lee Harding pointed out that many volumes of *New Writings In SF* have contained stories concerning sociological trends and he felt that this was a particularly rich vein for SF authors to explore, whether the locales concern today's world or are extrapolations into the future... naturally, we are all interested in the world of the future, especially that thin slice we are going to live in for our lifetime – and what we do about that immediate future is always rooted in what we do today… If you look for them, one sociological trend or another will turn up in every SF story. It is a form of literature which lends itself admirably to pointing out our own shortcomings and stupidity, but it also makes sensible suggestions as to how we may well circumvent some of the problems we are apt to bring upon ourselves. (Carnell 1972)

This "cultural wallpaper," as Brian Aldiss described it, exerts influence on society, which is persistent, and pervades the work of researchers in both the humanities and the natural sciences. Sheila Schwartz suggested that SF "is not *only* a bridge between the *two* cultures of science and the humanities; it is a bridge between all cultures as it summarizes and expresses the nightmare fears, myths, and inescapable concerns of all people today" (Schwartz, 1971: 1044). SF narratives also provide a historical record of changes over time in social and cultural values that can be used to map these to their original contexts (Menadue, 2017b, 2018a, 2018c).

If SF has penetrated deeply into the cultural consciousness, it should be expected to feature prominently in academic research across a range of disciplinary fields, not limited to science. To test this premise I carried out a review of the recent academic literature that did not differentiate between disciplinary fields, with the expectation that any body of academic research which examined science fiction would be identified by this broad approach. The article aimed to uncover the foci, themes, and findings of research literature that utilised SF content or concepts to describe and illustrate human culture. To capture a representative range of research, a systematic literature review – following the PRISMA process (Liberati et al., 2009) – was applied to database searches across a range of disciplines, not restricted to SF journals. Findings revealed

that SF literature has been used in research across disciplines including theology, semantics, natural sciences, and education. Two dominant characteristics of the use of SF in research became evident in the review: its role as a tool for advocacy and cultural insight and its effectiveness as an aid to learning and teaching. Purposeful integration of fictional representations of science (both natural and social) into research appears to have demonstrable benefits, but this integration calls for application of objective methodologies to determine what SF is most relevant, and how to best include it. This suggested that development of a more robust and replicable methodology for analysis of SF literature would be beneficial both in the study of the cultural content of SF and for reducing bias when choosing to include SF in studies in other fields.

The Review

There is evidently a relationship between science, SF, and the cultural imagination, and the significance of this relationship should be assessed. But searching failed to discover any previous literature reviews on these topics. This review was designed to provide an overview of research relating SF to culture across a range of academic disciplines, not limited to SF studies. I aimed to uncover the breadth and depth of the relationships between SF and human culture that have been expressed in peer-reviewed research that: investigated the uses of SF by researchers who described possible causal or correlational relationships between SF content, culture, and society; and/or employed SF concepts as analogies to explain or illustrate cultural activity.

Selected journal articles and book chapters indexed in four online databases were analysed. A limitation of the study was that unindexed publications were excluded, and consequently older publications might be underrepresented. This might include some journals that feature science fiction studies and is a limitation of the method applied here. The objectives of the review were to report the focus of research, theme of research, and summary findings. To add objective rigor to the study, I recruited a reviewing team that included members from multidisciplinary backgrounds.

Method

The PRISMA process was applied to identify papers and book chapters from JSTOR, PubMed, SCOPUS, and Web of Science databases. To ensure all relevant research literature was identified, an advanced search strategy was undertaken with librarian consultation, described in Appendix A, Fig. 50. Articles and book chapters published in English were included. Reviews, editorials, and conference papers were excluded.

The scope of sources to investigate was based on publications between 1980 (following Suvin's *Metamorphoses*) and 2016. The Web of Science Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI), SCOPUS, and PubMed databases were searched using the following search terms:

- Web of Science SSCI and A&HCI: Title Search = litera* AND (science AND ficti* AND cultur*)
- SCOPUS: Title Search, Abstract, Key Words = science AND Key Words ficti* AND Key Words = litera* AND Title, Abstract, Key Words = cultur*
- PubMed: ((litera*) AND science) AND ficti*) AND cultur*
- JSTOR: (((abstract:(science) AND abstract:(cultur*)) AND abstract:(litera*)) AND abstract:(ficti*))

Abstracts of retrieved publications were scanned for content that included overt or strongly implied themes related to SF and culture. Abstracts with no clear links between SF and cultural topics or with only peripheral references to SF and culture were excluded. Selected abstracts were distributed among the co-authors and an independent reviewer for validation according to three selection criteria. Did the publication: relate SF content or concepts to society or culture; employ SF to illustrate culture or society, or employ SF to illustrate, promote or otherwise advance science? For each criterion, reviewers individually assigned a value from zero to three to each paper by examining the title and abstract content only. Total scores were aggregated. Papers receiving a score of six or more points out of the nine available across all categories, or three points in any one category were selected for full reading, which examined the research focus, research themes, data sources, methodology, and research findings. Themes were classified into major headings using an iterative methodology of reduction from initially broad and descriptive themes to a list of summary themes.

Results

The use of controlled vocabulary thesauri or subject headings varies across databases. For example, SCOPUS, as an indexing database, may include subject headings originating from a source database. Often however, documents from the humanities and social science fields in SCOPUS contain only author keywords. Authors choose keywords representing what they regard as the most significant descriptors of the content of their work (Névéol, Doğan and Lu, 2010). This may result in duplication, as keywords are commonly terms appearing in the abstract (Mack, 2012, Strader, 2011). Furthermore, limitations on the number of keywords an author can nominate during the manuscript submission process, and whether these keywords/phrases are determined from a controlled vocabulary or using natural language might influence keyword selection (Peh and Ng, 2008). Author selection of keywords affects retrieval patterns, indicating authors should carefully consider their target reading audience when self-selecting keywords.

Considering these factors, I searched across the selected databases using a combination of terms for title, abstract, and keywords. My decision to restrict search parameters enabled more focused retrievals; however, a limitation of this method is that some papers published in journals with a SF focus may not have been retrieved. Performing full-text searching results in a greater number of retrieved documents but this can be at the expense of relevance (Beall, 2008). Researchers should, therefore, carefully consider search structure, working with individual database features to create an efficient search strategy that helps achieve their research objectives. The characteristics of the articles reviewed are extracted and summarized in Table 1.

Table 1.   Study Characteristics of Each Reviewed Article.

Author(s)	Date	Title			Publication
Bainbridge, W.S.	2004	"The Evolution of Semantic Systems"			*Annals of the New York Academy of Sciences*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
If scientific and cultural development can be assessed in terms of semantic and systematic systems, considering growing technological capabilities for computational analysis		Science and technology studies	A range of critical–historical texts and quantitative analysis of online recommendation systems, surveys, and government statistics	Quantitative	The convergence of social and natural sciences brought about through technological applications and concerns may enable the collecting together of disparate disciplines with different approaches into a more functional and effective way of approaching the world from a convergent scientific perspective
Author(s)	Date	Title			Publication
Banerjee, A.	2003	"Electricity: Science Fiction and Modernity in Early Twentieth-Century Russia"			Science Fiction Studies
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The depiction of electricity in twentieth-century Russia and how it reflects political and cultural values and change		Connections between SF and human culture	SF and historical texts	Qualitative	Seemingly radical elements of the Bolshevik vision, such as the construction of a technological utopia in a traditionally "backward" agrarian society, originated and developed in the era that it actively tried to negate"
Author(s)	Date	Title			Publication
Bina, O; Mateus, S; Pereira, L; Caffa, A.	2017	"The Future Imagined: Exploring Fiction as a Means of Reflecting on Today's Grand Societal Challenges and Tomorrow's Options"			Futures
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
On the use of SF to identify trends in human interest and concern that can be used to inform the development of government policies on science innovation		Influence of human culture on SF content	SF texts, government policy, and advisory papers	Quantitative	Changes in public concerns and attitudes toward science and innovation should be monitored through examination of SF film and text, and governments and funding bodies should use this information to guide policy development
Author(s)	Date	Title			Publication
Brandau, D.	2012	"Cultivating the Cosmos: Spaceflight Thought in Imperial Germany"			*History and Technology*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
How the boundaries between fiction and popular science became blurred in the 1900s: how this can be illustrated by the emergence of spaceflight as a popular fictional theme		Science and technology studies/two cultures	Primary texts and subsequent literary criticism	Qualitative	The links between science and fiction were of variable value in Imperial Germany but the relationship did demonstrate more general interests in science
Author(s)	Date	Title			Publication
Carpenter, C.	2016	"Rethinking the Political-/Science-/Fiction Nexus: Global Policy Making and the Campaign to Stop Killer Robots"			*Perspectives on Politics*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The influence of SF on global international relations policy—carrying out objective observational research on this topic		Science communication	Interviews, participant observation notes	Mixed	More reliable information is gained by primary interview and participant observation than other interpretative or pedagogical approaches. SF breeds familiarity but is not demonstrably causal of attitudes. This methodology exposes scope for further valuable work.
Author(s)	Date	Title			Publication
Coyer, M.J.	2014	"Phrenological Controversy and the Medical Imagination: A Modern Pythagorean in Blackwood's Edinburgh Magazine"			Scottish Medicine and Literary Culture, 1726-1832
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Studying the relationship between comparative representations of medical and fictional medical content in a single magazine and the resulting hermeneutic issues		Relationship between SF and science culture	Articles from Blackwood's Edinburgh Magazine	Qualitative	Popular science and real science reinforce and inform each other. Writers and public seemed quite sceptical of phrenology (among other

				medical approaches that were covered in the magazine).

Author(s)	Date	Title		Publication
Dunnett, O.	2012	Patrick Moore, Arthur C. Clarke and "British Outer Space" in the Mid twentieth Century"		*Cultural Geographies*
Focus of research		Theme	Data sources	Methods	Summary
How the notion of "space from Earth" is illustrated by the works of Patrick Moore and Arthur C. Clarke and is linked to the philosophy of the British Interplanetary Society (BIS)		Relationship between SF and science culture	History of the BIS, BIS publications, works of Clarke and Moore	Qualitative	This article seeks to rediscover trends such as the cosmographical connection to geography, working toward "a human geography of celestial space, a cosmography for the twenty-first century."

Author(s)	Date	Title		Publication
Erren, T.C.; Falaturi P.	2009	"Research Insights and Insides: "Science-in-Fiction" as a Contribution to the Third Culture Concepts"		*Medical Hypotheses*
Focus of research		Theme	Data sources	Methods	Summary
How SF may be an instructional/educational medium addressing Snow's two-culture issues (synthesis of humanities and science) of 1960 and extension into a "third culture" by Brockman in 1995		Pedagogy/two cultures	Historic texts and history of popularization of SF	Qualitative	SF can be used as an educational medium to promote science in two-culture and three-culture environments

Author(s)	Date	Title		Publication
Fendt, J.	2015	"The Chromosome as Concept and Metaphor in Amitav Ghosh's *The Calcutta Chromosome*"		Anglia-Zeitschrift Fur Englische Philologie
Focus of research		Theme	Data sources	Methods	Summary
To explore within the context of science studies how a subject of scientific research can be inscribed in a literary text and can offer insights beyond its "factual" or "hard" knowledge of the sciences		Science and technology studies/two cultures	Novel by Amitav Ghosh, history and philosophy of science, critical and analytical texts	Qualitative	That fiction may be a good way of linking the imagination and the concrete and that this is essential for the proper development of science, that it forms an essential part of the cultural ecology that enables science to progress and there is a strong interconnectedness between science and literature

Author(s)	Date	Title		Publication
Geraci, R.M.	2007	"Robots and the Sacred in Science and Science Fiction: Theological Implications of Artificial, Intelligence"		*Zygon*
Focus of research		Theme	Data sources	Methods	Summary
Whether human beings have elevated intelligent machines to divine status and if this is a threat to traditional Christian theologies		Connections between SF and human culture	Primary fictional sources in literature, film and drama, theological literature, and criticism	Qualitative	The allure and dread of technology often parallels human metaphysical and theological concerns and concepts. That our relationship with machine intelligence is ambivalent seeing it as both a source of fear and one of inspiration.

Author(s)	Date	Title		Publication
Ginway, M.E.	2005	"A Working Model for Analysing Third World Science Fiction: The Case of Brazil"		Science Fiction Studies
Focus of research		Theme	Data sources	Methods	Summary
Aims to create a critical model for analysing third-world SF		Literary criticism/influence of human culture on SF content	Brazilian SF texts	Qualitative	Brazilian ideas of national and cultural identity are strongly demonstrated by the representation in SF of analogues for slaves and neoliberal colonists and the application of mythological Brazilian notions of their culture and values to overcome and surmount problems that appear in the narrative

Author(s)	Date	Title		Publication
Guerra, S.	2009	"Colonizing Bodies: Corporate Power and Biotechnology in Young Adult Science Fiction?		Children's Literature in Education
Focus of research		Theme	Data sources	Methods	Summary
Cultural concerns about technology that are reflected in the content of SF		Relationship between SF and science culture	SF texts aimed at juvenile readers, statistics, government committee reports, and	Mixed	Juvenile fiction concerned with cultural developments and impacts of the applications of biotechnology warn that the future of humanity will be defined by corporate greed

| | | marketing sources | | and loss of individual freedom, and that the prevalence of these themes in fiction should be of concern to current policy and decision makers |

Author(s)	Date	Title		Publication
Hansen, B.	2004	"Medical History for the Masses: How American Comic Books Celebrated Heroes of Medicine in the 1940s"		*Bulletin of the History of Medicine*

Focus of research	Theme	Data sources	Methods	Summary
How comic book "real story" literature with medical heroes affected the perception of medical science and the attractiveness of a medical career to young Americans in the mid-twentieth century	Pedagogy/science communication	Historical sources and contemporary comic book, film, and radio examples	Mixed	It is very likely that the "true story" medical comics had a significant positive impact on the cultural value and profile of medical advances and medical scientists. That they provided simple but realistic information in an immediately accessible form and reflected the common themes in mass culture of the time.

Author(s)	Date	Title		Publication
Hills, M.	2003	"Counterfictions in the Work of Kim Newman: Rewriting Gothic SF as "Alternate-Story Stories""		*Science Fiction Studies*

Focus of research	Theme	Data sources	Methods	Summary
The distinction between the style and purpose of counterfictional, counterfactual, and fictional literature	Literary criticism	Works of Kim Newman, other historical literary texts	Qualitative	The cultural politics of existent fiction can be explicitly and directly questioned by counterfiction. When existent fictional worlds become the starting point for extrapolation, a wider, more intertextual, view of science fictional "alternate-story stories" is called for.

Author(s)	Date	Title		Publication
Hrotic, S.	2014	"The Evolution and Extinction of Science Fiction"		Public Understanding of Science

Focus of research	Theme	Data sources	Methods	Summary
Cognitive group membership of SF genres, possibility that genre SF no longer exists as a specific—Steampunk as evidence to support this hypothesis	Connections between SF and human culture	Various secondary literature and critical commentary	Qualitative	Familiarity with the disappointing outcomes of technological progress has led to a decline in the attractiveness of genre SF and this is reflected in a switch to an imaginative genre (Steampunk). This is rooted in an alternate reality that is able to conceive of a positivistic vision of technology and the future, borrowing this view from characteristics of Victorian culture.

Author(s)	Date	Title		Publication
Hull, E.A.	2005	"Science Fiction as a Manifestation of Culture in America"		*Foreign Literature Studies*

Focus of research	Theme	Data sources	Methods	Summary
The relationship between SF and broader American culture. The role of popular fiction as accessible cultural commentary	Connections between SF and human culture/two cultures	*The Gods Themselves* by Isaac Asimov, literary criticism	Qualitative	SF analysis is best carried out in a mixture of forms, that historical perspective is necessary for most interpretation, that SF contains rich examples and can be read from a number of different, mixed, perspectives.

Author(s)	Date	Title		Publication
Idema, T.	2015	"Toward a Minor Science Fiction: Literature, Science, and the Shock of the Biophysical"		Configurations

Focus of research	Theme	Data sources	Methods	Summary
Applying science and technology studies approaches (primarily) to the study of SF as a "minor literature," which is embedded in scientific and sociocultural constructs	Connections between SF and human culture/science and technology studies	Greg Bear's books: *Blood Music* and *Darwin's Radio*	Qualitative	SF, as well as other literature, can be read as a mode of thinking with science about the future of human life

Author(s)	Date	Title		Publication
Jameson, F.	1987	"Science Fiction as a Spatial Genre: Generic Discontinuities and the Problem of Figuration in Vonda McIntyre's 'The Exile Waiting'"		*Science Fiction Studies*

Focus of research	Theme	Data sources	Methods	Summary

					SF adds richness primarily due to the imaginary of space, being less to do with time than with more openly structured and flexible environments
What SF offers which goes beyond the formulas of soap opera and distinguishes it from what might be considered equally banal forms		Literary criticism/connections between SF and human culture	Vonda McIntyre's *The Exile in Waiting*	Qualitative	

Author(s)	Date	Title			Publication
Jonsson, E.	2013	"The Human Species and the Good Gripping Dreams of H.G. Wells"			Style
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
How early stories by Wells reflect upon evolutionary and cultural historical/biographical factors that give them their resonance and lasting success		Relationship between SF and science culture/connections between SF and human culture	Early works by H.G. Wells: *The Time Machine* and *The Island of Dr. Moreau*	Qualitative	Wells explored the differences between natural and artificial culture that were new and confronting during his period, the theory of evolution only recently having been published. That adventurous "gripping yarns" on these topics have become Wells' legacy due to their populist content.

Author(s)	Date	Title			Publication
Kohlmann, B.	2014	"What Is It like To Be a Rat? Early Cold War Glimpses of the Post-Human"			Textual Practice
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Ecology: Exploring the interaction and mutual reinforcement of cultural concerns in early cold-war literature and science		Relationship between SF and science culture/connections between SF and human culture	Four primary texts and the history of contemporary scientific and cultural views on ecology	Qualitative	Early cold-war fascination with the posthuman drove a preoccupation with nonhuman forms of human existence and consequently raised ecological concerns for the future

Author(s)	Date	Title			Publication
Kotasek, M.	2015	"Artificial Intelligence in Science Fiction as a Model of the Posthuman Situation of Mankind"			World Literature Studies
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The function of SF in shaping ideas about evolution, posthumanism, artificial intelligence, and the processes that define the human mind		Connections between SF and human culture/science and technology studies	Primary fictional texts and secondary critical literature	Qualitative	Connections between humans and technology, and fiction written about technology, exist in a hermeneutic relationship

Author(s)	Date	Title			Publication
Larsen, K.	2011	"Hobbits, Hogwarts, and the Heavens: The Use of Fantasy Literature and Film in Astronomy Outreach and Education"			Role of Astronomy in Society and Culture
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Use of fantasy literature to teach astronomy		Pedagogy	Fantasy literature primary texts and curricula content designed for astronomy education	Qualitative	That fantasy literature is a very effective tool for teaching astronomical science

Author(s)	Date	Title			Publication
Lin, T.H.	2013	"Beyond Science Fiction: Vladimir Odoevskij's The Year of 4338 as a Hybrid Text"			Russian Literature
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Classification of a specific work of SF as a genre hybrid		Literary criticism	Primary text	Qualitative	That the work in question is more effectively considered as a hybrid text than specific genre

Author(s)	Date	Title			Publication
Maguire, M.	2013	"Aleksei N. Tolstoi and the Enigmatic Engineer: A Case of Vicarious Revisionism"			Slavic Review
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Analysis of the relationship between SF featuring engineers and their status in contemporary society esp. Stalinism		Science and technology studies	Primary texts	Qualitative	There is a strong correlation between the socio/cultural environment of Stalin's Russia and how harshly or positively engineers were portrayed in fiction

Author(s)	Date	Title			Publication
McIntire, E.G.	1982	"Exploring Alternate Worlds"			Yearbook—Association of Pacific Coast Geographers
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
To examine how geographers might benefit from examining how SF treats notions of space and environment		Pedagogy/science communication	SF texts and geographical literature	Qualitative	SF provides a way of creating environments and ecologies and modeling human interactions with them that enables us to see our own geographical and

				environmental issues in a fresh light
Author(s)	Date	Title		Publication
Miller, T.S.	2011	"Preternatural Narration and the Lens of Genre Fiction in Junot Diaz's The Brief Wondrous Life of Oscar Wao"		Science Fiction Studies

Focus of research	Theme	Data sources	Methods	Summary
Examination of the role of SF as a lens through which to focus the narrative of the novel *The Brief Wondrous Life of Oscar Wao*	Literary criticism/two cultures	*The Brief Wondrous Life of Oscar Wao* by Junot Diaz, genre and secondary literature	Qualitative	SF serves as a very effective lens through which the narrative of the novel is focused, in part due to the expansive and imaginary qualities of the genre

Author(s)	Date	Title		Publication
Milner, A.	2009	"Changing the Climate: The Politics of Dystopia"		*Continuum-Journal of Media & Cultural Studies*

Focus of research	Theme	Data sources	Methods	Summary
To test theoretical models of utopia/dystopia in SF studies and assess the value of SF as the source of thought experiments on climate change	Pedagogy	*The Sea and Summer* by George Turner (1987), SF literary criticism and theory, historic literary dystopia novels	Qualitative	There are undervalued yet apposite tales of resonance and wonder, intelligence, and warning to be found in Australian dystopian SF. That these stories have resonance with the environmental questions and issues raised in contemporary society

Author(s)	Date	Title		Publication
Nerlich, B.; Clarke, D. D.; Dingwall, R.	1999	"The Influence of Popular Cultural Imagery on Public Attitudes Towards Cloning"		*Sociological Research Online*

Focus of research	Theme	Data sources	Methods	Summary
How existing human ideas about science, often expressed in metaphors and sourced from SF, influence public perception of and representations of science	Science communication	Literature and media reporting on cloning	Qualitative	Discourse on cloning is based on a network of metaphors and commonplaces that are provided by vivid images linked to SF media. We use common knowledge to provide meaning and cannot ignore the impact of public images of technology that have been created in fiction.

Author(s)	Date	Title		Publication
Newell, D; Lamont, V.	2005	"Rugged Domesticity: Frontier Mythology in Post-Armageddon Science Fiction by Women"		*Science Fiction Studies*

Focus of research	Theme	Data sources	Methods	Summary
How women represented domesticity and frontier themes in SF written by women pre-1970	Literary criticism/influence of human culture on SF content	Four primary SF texts by women	Qualitative	Female SF writers made strong contributions to feminist literary concepts before the 1970s, that they portrayed a characteristic "frontier" domestic style in the representation of women in the narrative

Author(s)	Date	Title		Publication
Parrinder, P.	2009	"Robots, Clones and Clockwork Men: The Post-Human Perplex in Early Twentieth-Century Literature and Science"		*Interdisciplinary Science Reviews*

Focus of research	Theme	Data sources	Methods	Summary
The distinction between the human and posthuman as portrayed in SF and from a historical perspective on the nature of humanity	Connections between SF and human culture	Historical cultural concepts of the posthuman, both literary and scientific	Qualitative	Consideration of the gradually changing historical concepts of what it is to be human informs the current (and complex) posthumanism debate and contrasts the postmodern approach to earlier perspectives. A historical view is invaluable for rationally examining current debates.

Author(s)	Date	Title		Publication
Piper, A.	2013	"Leo Perutz and the Mystery of St Peter's Snow"		*Time & Mind—The Journal of Archaeology Consciousness and Culture*

Focus of research	Theme	Data sources	Methods	Summary
Analysing the validity of belief that a specific work of SF was prophetic	Literary criticism	Primary source and comparative historical literature	Qualitative	That the author would have had ready access to preexisting information that would explain the narrative content without the need for prophecy

Author(s)	Date	Title		Publication

Rabkin, E.S.	2004	"Science Fiction and the Future of Criticism"			Publications of the Modern Language Association
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The future of criticism lies in making qualitatively more informed, imaginative, judgments that draw on systemic analysis of a vast, technologically mediated set of collective knowledge and experience		Literary criticism/connections between SF and human culture	Examples of cultural artifacts in science fictional culture. Analysis of 1,959 stories in American SF Magazines between 1926 and 2000	Mixed	SF is a "system" that reflects modes of modern science, and is fundamentally networked and collaborative. It is the most influential cultural system now that technological change "constantly provokes hope, fear, guilt, and glory." Analysis of SF texts may provide insights into cultural attitudes and contemporary society.

Author(s)	Date	Title			Publication
Rutten, K; Soetaert, R; Vandermeersche, G.	2011	"Science Fiction and a Rhetorical Analysis of the 'Literature Myth'"			CLCWeb: Comparative Literature and Culture
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
What SF tells us about cultural literacy and literary culture, analysed through work of rhetorician Kenneth Burke. Examining specifically SF as "equipment for living" (literature) as a genre of "satire by *entelechy*."		Literary criticism	Works of Kenneth Burke, selection of primary fiction texts—*1984*, *Brave New World*, *Fahrenheit 451*, TV and Film	Qualitative	Rhetorical analysis of SF narratives "offers possibilities to reflect critically on our contemporary attitude towards literacy, literacy culture, and art in general . . . perspectives of the future dramatised in SF reveal much about the context in which these narratives are told and therefore can teach us something about cultural practices and social values."

Author(s)	Date	Title			Publication
Schwartz, M.	2013	"How Nauchnaia Fantastika Was Made: The Debates About the Genre of Science Fiction From NEP to High Stalinism"			*Slavic Review*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Genre definition and role of Soviet Science Fantasy. Relation between cultural demands and literary content and form—especially anxieties and stress		Science and technology studies	Literature, contemporary accounts	Qualitative	The efforts of the Soviet state to control science fantasy were inconsistent and had strong influences on direction at certain times, even subduing the genre almost entirely during the mid-1950s.

Author(s)	Date	Title			Publication
Shaddox, K.	2013	"Generic Considerations in Ishiguro's 'Never Let Me Go'"			*Human Rights Quarterly*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
How sentiment and the rights of the human are expressed in *Never Let Me Go* similarly to abolitionist literature, and other emotionally charged cultural critique		Literary criticism/connections between SF and human culture	Primary texts and subsequent literary criticism	Qualitative	That *Never Let Me Go* has stronger links to sentimental literature than to SF and that the issue it discusses deserves broader treatment outside of fantastical fiction

Author(s)	Date	Title			Publication
Sielke, S.	2015	"Science Studies and Literature"			Anglia-Zeitschrift Fur Englische Philologie
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The link between science studies and the cultural work of literary texts that probe the history of knowledge production		Science and technology studies	Science studies research, historical two and more cultures debates and the work of Richard Powers	Qualitative	Defines and positions science studies within the current discussions on science, culture, and literature

Author(s)	Date	Title			Publication
Slaughter, A.	2014	"Ray Guns and Radium: Radiation in the Public Imagination as Reflected in Early American Science Fiction"			*Science & Education*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
The representation of radiation in early American SF as a corollary to existing history and philosophy of science treatments of the subject		Science and technology studies	*Amazing Stories*, 1929 and *Astounding Science Fiction*, 1934	Qualitative	Early SF reflects the popular interest in science but does not contain proper or realistic scientific method.

Author(s)	Date	Title			Publication
Steinmuller, K.	2003	"The Uses and Abuses of Science Fiction"			*Interdisciplinary Science Reviews*
Focus of research		**Theme**	**Data sources**	**Methods**	**Summary**
Influence of SF on science, pseudoscience, and the realism of		Relationship between SF and science culture	SF literary criticism,	Qualitative	SF is strongly linked to pseudoscience and has

science and scientists portrayed in literature		history, and philosophy of science		reflected social and cultural historical interests in science. The relationship and focus between science and SF reflects contemporary issues of the time.

Author(s)	Date	Title		Publication
Strauss, K.	2015	"These Overheating Worlds"		*Annals of the Association of American Geographers*

Focus of research	Theme	Data sources	Methods	Summary
Ecological issues: Opportunities to explore climate change in human geography are opened up by utopian and dystopian representations in SF	Relationship between SF and science culture	"Cli-fi" and historical geography texts	Qualitative	Utopias and dystopias are fundamentally spatial, stories of a better present and archaeology of the present, enabling exploration of alternative political futures and other socioeconomic systems

Author(s)	Date	Title		Publication
Toscano, A. A.	2011	"Using I, Robot in the Technical Writing Classroom: Developing a Critical Technological Awareness"		*Computers and Composition*

Focus of research	Theme	Data sources	Methods	Summary
How technical writing and comprehension can be enhanced beyond the practical elements by considering SF representations of technology in a broader cultural context	Pedagogy/science communication	*I, Robot* by Isaac Asimov, contemporary theory on technical writing, close reading of student essays in response to topic questions	Qualitative	Students must understand that technologies are not merely tools but products of culture and society before they can acquire critical technological literacy

Author(s)	Date	Title		Publication
Van Dijck, J.	1999	"Cloning Humans, Cloning Literature: Genetics and the Imagination Deficit"		New Genetics and Society

Focus of research	Theme	Data sources	Methods	Summary
SF as a tool for comprehending and evaluating the scientific "imagination deficit" and associated oversimplification of science	Pedagogy	Historic and current fiction regarding cloning, media reporting of cloning	Qualitative	Cloning is represented in a variety of positive, negative, and neutral ways in fiction, and literary narratives are important intermediaries (between nature and science, science and culture) and rhetorical tools in the construction of public meanings and the public understanding of science.

Author(s)	Date	Title		Publication
Van Gorp, B; Rommes, E; Emons, P.	2014	"From the Wizard to the Doubter: Prototypes of Scientists and Engineers in Fiction and Non-Fiction Media Aimed at Dutch Children and Teenagers"		Public Understanding of Science

Focus of research	Theme	Data sources	Methods	Summary
Identifying prototypes of scientists in juvenile media and how that may affect the image of science in society	Pedagogy	Media consumed by schoolchildren—written and broadcast	Mixed	Creates seven prototypes of fictional scientists and contrasts with prototypes of real scientists—the fictional prototypes provide misinformation that is unrepresentative and often negative

Author(s)	Date	Title		Publication
Wilsing, M; Akpinar-Wilsing, N.	2004	"Integrating 'Outer Space Design' Into Design Curriculum"		*International Journal of Art & Design Education*

Focus of research	Theme	Data sources	Methods	Summary
Using SF concepts to stimulate the creative imagination of design students	Pedagogy	Research on classroom experiences, SF literary criticism	Qualitative	SF is a very effective pedagogical tool for teaching design students and the use of it is to be encouraged as an aid to conventional curricular teaching.

The selected articles come from 34 journals across 15 disciplines, and include results published in English arising from analysis of primary sources from eight

countries, including material from Brazil, Russia, and Holland. Only four papers were published before 2000: two in the 1990s and two in the 1980s (Jameson, 1987, McIntire, 1982, Nerlich, Clarke and Dingwall, 1999, Van Dijck, 1999). The prevalence of more recent works was due to the search methodology, which excluded hand searching, investigating works cited in the selected papers, or grey literature, rather than a reflection on the proportional volume of publications in this field over the period. The increasing visibility of relevant papers in major academic databases indicated clearly, however, that the employment of science fiction was becoming steadily more general and "mainstream" in academic literature rather than being restricted to specialist publications that were not commonly indexed.

Table 2.   **Thematic Classification by Number in Category.**

Theme	Number
Connections between SF and human culture	12
Influence of human culture on SF content	3
Literary criticism	10
Pedagogy	9
Relationship between SF and science culture	7
Science and technology studies	7
Science communication	5
Two cultures	5
Total	58

The thematic classification of texts is shown in Table 2. The total is greater than the number of publications as 15 papers were classified as having two balanced themes.

Thematic Analysis

Cultural themes dominated the content of the publications (Table. 2). The "two cultures" debate initiated by Snow (Snow, 1961), regarding the perceived cultural gap between the natural sciences and humanities, was explicitly addressed in five papers (Brandau, 2012, Erren and Falaturi, 2009, Fendt, 2015, Hull, 2005, Miller, 2011) but was implicit in a majority of the works examined. Among cultural themes, there were clear distinctions between research examining the relationship between science culture and SF, which examined the influence of human culture on SF content, and the research that focused on connections between SF and human culture. The first two of these themes are bi-directional—SF can influence science and scientists (Dunnett, 2012, Hansen, 2004, Steinmuller, 2003), science can influence SF (Guerra, 2009, Kohlmann, 2014), and this relationship can be reciprocal (Coyer, 2014, Jonsson, 2013, Strauss, 2015). The theme of "connections between SF and science culture" indicated a less directive association. Observations of congruence rather than influence were specifically noted in nine papers (Banerjee, 2003, Geraci, 2007, Hull, 2005, Jameson, 1987, Jonsson, 2013, Kohlmann, 2014, Kotasek, 2015, Parrinder, 2009, Shaddox, 2013).

      The primary discipline-specific themes were literary criticism and pedagogy, appearing in 10 and nine publications, respectively (Table 2.). Two of the literature

papers were focused on traditional close reading of specific texts (Lin, 2013, Piper, 2013). Literary criticism is an expected theme in a review of publications on fiction; pedagogy, however, was not a search term and consequently the prevalence of the use of SF in education and for educational purposes was a significant finding. This varied from classroom education employing SF texts and media as aids to learning (Larsen, 2011, Toscano, 2011, Wilsing and Akpinar-Wilsing, 2004), to observations on how SF has served as popular, informal, education on a range of topics; leading to both positive (Coyer, 2014, Hansen, 2004, Jonsson, 2013, Strauss, 2015) and negative outcomes (Banerjee, 2003, Geraci, 2007, Hull, 2005, Jameson, 1987, Jonsson, 2013, Kohlmann, 2014, Kotasek, 2015, Parrinder, 2009, Shaddox, 2013, Van Gorp, Rommes, & Emons, 2014), and to recommendations on the use of SF as an effective educational medium or resource (Erren & Falaturi, 2009, McIntire, 1982, Milner, 2009, Van Dijck, 1999).

The majority of the remaining papers were classified under the closely related, but distinct, themes of science and technology studies (Bainbridge, 2004, Brandau, 2012, Fendt, 2015, Maguire, 2013, Schwartz, 2013, Sielke, 2015, Slaughter, 2014) and science communication (Carpenter, 2016, Nerlich, Clarke and Dingwall, 1999), which were also connected to pedagogy in three papers (Hansen, 2004; McIntire, 1982; Toscano, 2011). The two explicitly communications-themed papers were concerned with the melodramatic and negative effect of use of SF tropes in media representations of science. The two papers approached this from different methodologies and came to differing conclusions. Carpenter concluded from participant observation within nongovernment organizations focused on campaigning against "Killer Robots" that tropes used from SF (e.g. *Terminator*, *RoboCop*) were effective as inducements to draw people into more fruitful debate about politically sensitive research policy, whereas Nerlich, Clarke and Dingwall found media associations of cloning with stories such as *Frankenstein* and *Brave New World* had a very negative and damaging effect on public perceptions of research. Their findings could be interpreted as illustrating that negative "diegetic prototypes" (Kirby, 2010) can be employed for sensationalist purposes. Carpenter's participant observation confirmed positive outcomes arising from the appropriation of fearful film tropes for the purpose of attracting interest in open debate of their subject matter. Nerlich et al. examined literary and media examples, more than

film, and these tended to be darker and more negative – promoting fears about emerging science. The "directedness" of the authorship of these narratives is manifest: positive from expert research advocates, negative from less well informed, and sensationally invested, news media. Carpenter's paper illustrates what Jan Schwarz styles as "storylistening" (Schwarz, 2015: 512). The Campaign Against Killer Robots employs popular narratives to embody the fictional in the factual debate on robotic futures, and creates a compelling hybrid for the engagement of the public. This builds an "alternative mode of knowing" (512), in which the public will discuss the factual science due to their interest in the fictional narrative, and the organization can learn more from the public. The alternative mode retains the human significance of the fictional versions, enabling future research design to include measures to address these human concerns. Science and technology studies-themed papers tended to be more abstract; all the authors except Bainbridge examined specific aspects of science appearing in historic literature that can be related to theory. Bainbridge's paper, being a forward-looking description of the potential to employ advances in technology to aid the convergence of natural sciences and humanities, was focused on applied science. Bainbridge advocated using systematic semantic systems to integrate research cultures that are currently isolated. He demonstrated the practicality and effectiveness of this systems-based approach by applying it in his paper, employing quantitative analysis to support qualitative evaluation of the theory across multidisciplinary frameworks. Two other papers also utilised quantitative methodology, to apply SF to the interpretation of cultural change (Rabkin, 2004), and to drive innovation policy (Bina et al., 2017). The remaining papers employed qualitative or mixed methods.

The six publications that have not yet been mentioned (Ginway, 2005, Hills, 2003, Hrotic, 2014, Idema, 2015, Newell and Lamont, 2005, Rutten, Soetaert and Vandermeersche, 2011) exhibited foci or approaches that were either very specific or not readily classifiable. Ginway discussed SF from the developing world, specifically Brazil, making observations on the specificity of SF themes and mythology to cultural values, which are valuable in demonstrating this entanglement from a perspective outside of the English-speaking tradition. Hills and Hrotic both examined modern developments in SF writing that reuse historic literary and cultural traditions: Hrotic suggested current disappointment in science explains the success of Steampunk

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literature, which hearkens back to the scientific optimism of the Victorian era, and Hills discussed Kim Newman's reuse and exploration of classic SF and horror literature (*Dr. Jekyll and Mr. Hyde*, *Dracula*) as a means of exploring modern culture in historic literary environments already very familiar to readers. The only paper with gender as a critical subject was Newell and Lamont's discussion of pre-1970s SF by female writers from a feminist perspective, although Hills also discussed gender concepts in regard to Newman's "queering" of *Dr. Jekyll and Mr. Hyde*. Idema concluded that futuristic, "hard" SF could be read as a mode of thinking with science about the future of human life. Rutten, Soetart, and Vandermeersche employed rhetorical models of analysis to describe SF as a "satire for living" – particularly with regard to fictional dystopias: Theirs is the only paper that applied this approach.

Discussion

There were two prominent applications of SF that became evident in the close examination of the publications reviewed. The first was the supposed power of SF as a tool for scientific and social advocacy and cultural insight: Erren and Falaturi said that SF might be used "to smuggle scientific facts into the consciousness of a scientifically illiterate public" – a potentially noble intent concealed behind what could easily be criticised as a patronising deficiency model – and Kotasek concluded that as society depends upon the influence of our models of reality, so SF has a role in "constructing such cultural and social systems also to implicate the genre as a cultural, social, and political institution."(p. 76). Nerlich, Clarke, and Dingwall agreed, "the general public uses metaphors to talk about human dignity and autonomy, and they reach back not to philosophy books but to sci-fi novels and films to underpin their arguments" (para. 1.13). Bina used SF for "a form of forward-looking technique" that might have a significant role in influencing real-world policy. The clearest statement of this position was made by Van Dijck:

> Science Fiction, throughout the centuries, has been a significant cultural tool for comprehending and evaluating the scientific, moral and social consequences of new technologies . . . besides projecting a possible future, SF often entails criticism of present technological or social arrangements. (9).

The second major application was in the enhancement of learning and teaching. Research undertaken in this field demonstrated a broad range of applications and was predominantly positive when the use of SF as a pedagogic tool was integrated purposefully into the curriculum. Toscano notably employed SF to educate students about good technical scientific writing – the most efficient combination of pedagogy and communication that was found in this review. The exception was Van Gorp's study, which was focused on passive, observational, learning absorbed by the subjects from the representations of science through fictional representations of science and scientists across a range of media. This was found to lead to negative or inaccurate views of science and scientists. In contrast, however, Hansen's analysis of comic book portrayals of science in the 1940s suggested that media representations could have positive impacts. In a formal, directional, context the pedagogical applications are varied and have a measurable beneficial impact. Therefore, classroom use of SF provides valuable tools to both encourage interest in science and to inspire scientists, but passive absorption of SF concepts that cross over into real science is more problematic.

Methodological approaches found in the literature
In SF analysis, I discovered that out of 55 papers and chapters that were selected for in-depth examination only three included an approach that clearly filtered specific genre examples, to varying degrees of scale. Of these, only two applied quantitative methods. Aimee Slaughter examined a very small number of early pulp fiction magazines (from *Amazing* for 1939 and *Astounding* for 1934) to draw conclusions about cultural interests in the "new world" of radiation in the early twentieth century (Slaughter, 2014). This study applied close reading to the texts. The two studies that applied quantitative methods to a number of sources were the paper by Bina et. al. that examined 64 novels and movies from the period 1815-2016 to examine how they might provide insight into human interests and fears about science and innovation that could be used to inform government policy (Bina et. al., 2016). Perhaps the first work to describe a method of analysing larger volumes of text in some depth, however, was Eric Rabkin's paper demonstrating the work of the Genre Evolution Project (GEP) between 1998 and 2004, which has carried out analysis on 1,959 short stories (Rabkin, 2004) to discover relationships between genre and thematic elements. He mentions in his paper the

potential for including material that situated the stories in context (advertising, editorials et.al.) but the GEP database only records the content of stories.

Considering the demonstrable impact of research applications of SF content and concepts, the small number of quantitative methodologies found in the review is significant, as is the variable quality of their implementation. William Bainbridge (2004) provides a cogent and well-structured methodological example of the potential for SF to be an insightful and meaningful tool, and employs quantitative methodologies to analyse chaotic and granular data of the sort that is found in cultural studies. The strength of Bainbridge's multidisciplinary research in semantics is evident in the consistent quality of his methodology. Bainbridge argues that technological progress in development of quantitative tools for analysis enables a convergence between the Arts and Sciences, which was previously not possible. Rabkin's study included the intent to remove qualitative selection bias by engaging a pool of researchers from the field of literature to apply content categories to stories so that they could then be analysed quantitatively. Yet, predefinition of coding categories appears to have constrained the freedom of analysis, and this may have resulted from not collaborating with academics from other disciplines more familiar with statistical sampling and coding methods. For example, a strong correlation between the categories of genre form "alien contact" and genre content "alien" was one of the "provocative results" (466) described in Rabkin's findings, but such a correlation is naturally predicated at a one-to-one ratio in SF narratives. The study findings would arguably have been strengthened by the identification of the statistical insignificance of this correlation by members of a multidisciplinary research team. Bina et al. applied iterations of subjective criteria to identify films and novels that were analysed mathematically to create new suppositions, but the methodology is not described in replicable detail, and would have been subject to confirmation bias arising from the use of pre-selected online databases to validate the choices made (as I will discuss further in "Defining the Genre," below, as it adds to the argument for a clear definition of SF).

Employing quantitative tools to analyse research findings in fields that have traditionally been dominated by qualitative methods is constrained by access to expertise. During the design and execution of the project, engaging experts from outside

of the author's own specialism may improve the application of quantitative methodology to humanities research. The application of techniques such as data and text mining, robust statistical and structured methodological analysis, to studies that are traditionally located in the humanities would support the convergence between the arts and sciences, and the breaking down of the perceived gap between them that was highlighted by Snow in 1961. For analysis of literary content to become a credible tool in broader research contexts, a stronger focus on the use of quantitative, replicable, methodologies is to be recommended. The focus and mechanism of the current study is a direct response to this recommendation, which led to the inclusion of multidisciplinary collaborations and techniques in my subsequent research.

DEFINING THE GENRE

Menadue, C. B., Giselsson, K., & Guez, D. (2018). An Empirical Revision of the Definition of SF: It's All in the Techne. [In Review: *SAGE Open*].

To examine the public perspective on SF, and how it resonates with them, it is necessary to determine exactly what the public are imagining when they use the term "science fiction." The responses to the survey data gathered from two online surveys (Menadue, 2016b, 2017a) made it apparent that the popular definition of SF does not correspond well with existing academic definitions of the genre. For the purpose of academic research this might be considered a curiosity, as we know that the popular view is rarely the critical view. However in the case of research that relies upon popular perspectives, values and beliefs to generate insights that are intended to be relevant to public interests, and even drive public policy, it is essential to consider how, exactly, this most popular of genres is viewed by the public and to contrast this with the academic interpretations. Otherwise there is the risk of coming to conclusions that are intended to speak for the majority of the public, but are in reality extrapolated from the differing perspective of an academic minority, and of correspondingly limited general relevance.

The need for a popular definition

I found in the literature review *Human culture and SF: a review of the literature, 1980-2016* (Menadue and Cheer, 2017), that researchers increasingly employ SF and fantasy in public engagement, advocacy and education, and imply popular understanding. Existing definitions of SF, however, and especially postmodern definitions, risk obliterating the very concept of genre. The use of SF as an effective research tool is undermined if the genre no longer contains meaning. Responses to a survey that asked for definitions of SF and fantasy indicate the popular definition of SF is based on a few, very clearly defined, story features, unlike the complexity and fluidity of academic approaches. Analysis suggests SF contains a categorical core within a mutable family of associated features. The empirical survey data is highly consistent, and demonstrates a clear demarcation between the popular and academic definitions of SF and fantasy. Theoretical analysis indicates historic academic definitions may be artefacts of examining secondary characteristics as if these were the primary genre features. Wittgenstein's *family resemblances*, often presented out of context as definitive, are more authentically interpreted as surface features once we return to Wittgenstein's original writing and identify the concepts underlying them. Identification and exploration of the primary features exposed by the survey and the basis of the common themes within the raw material itself, suggest the Classical concept of *techne* better describes the empirical essence of SF in the public consciousness.

The literature review was published in a multidisciplinary open journal. To respect the wide-ranging audience, an all-inclusive definition of SF was used to include the contexts of all 43 works reviewed – a definition that started with the cloning motif found in the Sumerian *Epic of Gilgamesh*. This generalised definition was not queried by the editor or peer-reviewers, and the majority of papers identified in the literature review, across multiple disciplines, did not provide any definitions of SF. The implication is that the researchers reviewed believe "science fiction" is universally comprehended, and does not require definition. This contrasts with analytical, formal academic approaches, which approach genre definition from a theoretical research tradition, and omit the phenomenological experience of the audience. I designed the

survey *Science Fiction & Fantasy – Your Opinions* (Menadue, 2017a) to address this phenomenological gap – to discover popular opinions on the nature, structure and definitions of SF and fantasy. The findings from that survey are analysed here following an assessment of the theoretical arguments.

The relevance of research that incorporates SF requires the researcher and their audience to share the same comprehension of the genre. To assume that the researcher's definition is commonly shared might be problematic. If, for example, a research group extrapolated public interests and concerns about science from a subjective selection of SF works, which did not accurately reflect the public view, and used the results to direct public science funding priorities. This may seem an unlikely example, but Olivia Bina, Sandra Mateus, Lavinia Pereira and Annalisa Caffa did exactly this in a paper that was identified in the literature review, and written to influence EU policy on science funding priorities (Bina et al., 2016). The works that the researchers included as indications of public attitudes are a found on lists of the finest critical examples of the SF canon, including: Verne's *Paris in the Twentieth Century*, Forster's *The Machine Stops*, Zemyatin's *We*, Godard's *Alphaville*, LeGuin's *The Lathe of Heaven* and the Tarkovsky film of Lem's *Solaris*. Much as SF academics might weep over the fact, contemporary SF consumers are largely unaware of these works. Responses to my first survey (Menadue, 2016b) indicate that Terry Pratchett, Isaac Asimov, Ursula LeGuin, J.R.R. Tolkein, Robert Heinlein, Neil Gaiman, Philip K. Dick and J.K. Rowling are the most popular authors of SF and fantasy today, and in that order. Only LeGuin features in Bina's catalogue.

Methods

There are two perspectives from which I approach the problem of definition – an evaluation of SF genre theory, and analysis of the responses to an audience survey, these are synthesised here to build the argument for a new perspective on the definition of this popular literature.

Theoretical Approaches to Science Fiction

science fictional concepts are visible in work that significantly pre-dates the twentieth-century origins of the name, but Hugo Gernsback's employment of "scientifiction" in *Electrical Experimenter* (Gernsback, 1916) was the first attempt to define this emerging genre. The easier-to-enunciate "science fiction" was to become the dominant genre name within a decade. The inclusion of "science fiction" in the titles of magazines containing fantasy, horror, thriller and detective stories might have been expected to dilute the clarity of the public understanding of the genre from the outset, rather than maintaining a clear concept of what SF entailed. This diverse content is demonstrated in research that samples content from SF magazines (Menadue, 2017b, 2018a, 2018c), and identifies sources that genre theorists and industry professionals have attempted to dismiss from the SF canon. I discovered in the survey responses, however, that SF is an extremely well-defined genre in the minds of the SF audience. This calls for an investigation of the SF genre as it has been defined by specialists and theorists, and to attempt to explain differences between public and private definitions.

The Shock of the New

SF emerged when science was "the new," a wide range of exciting possibilities across a broader range of human interests (Cheng, 2012). John W. Campbell, editor of *Astounding Science Fiction* (*ASF*) between 1937 and 1971, called for technological SF, and included articles on scientific topics in *ASF*. Robert Heinlein, an independently minded writer who was successful enough to not be intimidated by Campbell's edicts (Heinlein, 1989), described the genre differently as "speculative fiction" in his 1947 essay on writing:

> There is another type of honest-to-goodness SF story that is not usually regarded as SF: the story of people dealing with contemporary science or technology. We do not ordinarily mean this sort of story when we say, 'SF'; what we do mean is the speculative story, the story embodying the notion 'just suppose…' or 'What would happen if...' In the speculative SF story accepted science and established fiefs are extrapolated to produce a new situation, a new framework for human action. As a result of this new situation, new human problems are created – and our story is about how human beings cope with those new problems. (Heinlein, 1991: 5)

Heinlein described the human experience of "science as new possibilities" of the earlier part of the twentieth century. This accords with the findings of the *Science Fiction & Fantasy – Your Experiences* survey (Menadue and Jacups, 2018), discussed in the next chapter, which discovered a statistically significant correlation between readers' experiences of science, scientists and SF, and "newness" of thought and action. This classification of a form of literature by its association with "newness" is much older, however. Aristotle's definition of *poeisis* (as "creative production" – not to be confused with the more narrowly defined modern use of "poetry") could be describing SF:

> the poet's function is to describe, not the thing that has happened, but a kind of thing that might happen, i.e. what is possible as being probable or necessary… you might put the work of Herodotus into verse, and it would still be a species of history; it consists really in this, that the one describes the thing that has been, and the other a kind of thing that might be. Hence poetry is something more philosophic and of graver import than history, since its statements are of the nature rather of universals, whereas those of history are singulars. By a universal statement I mean one as to what such or such a kind of man will probably or necessarily say or do. (Aristotle, trans. 1920, 9)

Samuel Delany's description in *The Jewel Hinged Jaw* of content distinction on the basis of "subjunctivity" echoes Aristotle; defining content elements as the "could have happened," "could not have happened" and "have not happened," he also adds the historical category "this happened" of journalism – analogous to written history (Delany, 2009: 31-36). Aristotle's description of "a kind of thing that might be" is similar to Heinlein's description of speculative fiction, and I argue that this is not coincidental, but that they both reflect the human experience of creativity − both mental and physical.

Aristotle's emphasis on the "universals" of poetry, a speculative form of literature, compared to the "singulars" of history implies these are naturalistic distinctions. Our poetic, science fictional, visions of the future are thought-experiments about what might be real, or possible. This contrasts with history, and contemporary applied science, some of which – for example, the pervasive electronic surveillance of Orwell's *1984*, mobile phones, spaceflight, cloning, and killer robots – has become realised after originating in the (unreal) thought experiments of SF. When content

becomes physically, or culturally actualised, it passes out of fiction and becomes reality: Aristotle's "history," falling away from the core of SF. As Jean Baudrillard observed of the Apollo missions, once we have observed men sent to the moon in a small metal box with a bathroom, this is no longer SF (Baudrillard, 1991).

There have been other definitions of SF of varying degrees of utility; Roger Luckhurst noted in 2006 that Bruno Latour had appropriated Gernsback's "scientifiction" as his own neologism (Luckhurst, 2006). This indicates, ironically, that the failure of this term in the early twentieth century enables it to be rediscovered as an alternative to the value-laden labels of "SF" or "speculative fiction" – the first term coloured by Campbell's technology focus, the latter by association with the British New Wave writers of the 60s and 70s. In *The Jewel Hinged Jaw* Samuel Delaney dismissed "speculative fiction" however, consigning Heinlein and the New Wave to a merely "historical reference" (Delany, 2009). Resurrecting Gernsback's awkward term is unrealistic, but the enduring difficulties of rule-based classification of the genre include the seemingly insoluble problem of value-laden terminology. Finding a popular definition of SF, and using that as a basis for discussion, is a way of clarifying the substance of the genre.

Writers vs. Readers

Professional authors tend to focus on content specifics. Stanislaw Lem stated: "it is the premise of SF that anything shown shall in principle be interpreted empirically and rationally. In SF there can be no inexplicable marvels, no transcendences, no devils or demons—and the pattern of occurrences must be verisimilar " (Lem et al., 1973: 28). The author Philip K. Dick also talked about the explicable:

> Take psionics; take mutants such as we find in Ted Sturgeon's wonderful MORE THAN HUMAN (sic.). If the reader believes that such mutants could exist, then he will view Sturgeon's novel as science fiction. If, however, he believes that such mutants are, like wizards and dragons, not possible, nor will ever be possible, then he is reading a fantasy novel. Fantasy involves that which general opinion regards as impossible; science fiction involves that which general opinion regards as possible under the right circumstances. (Dick, 1999: xiii - xiv)

Editor and writer Frederik Pohl lamented a perceived fuzziness to the public perception of boundaries between SF and fantasy:

> …science fiction is not, is positively not, fantasy…there is a tendency… to lump the two genres together. Bookstore proprietors, librarians, and casual readers have long blurred the differences in their own minds. What is worse is that in recent years the distinction has been made fuzzier still, even by some of the very institutions that were originally set up to defend SF against all other kinds of writing. For example –
> 1. The trade union of the people who write the stuff, the Science Fiction Writers of America, has changed its name to the Science Fiction and Fantasy Writers of America [SFFWA]…. the academic wing of the field…routinely gives to works of fantasy the same attention once given only to science fiction…Science-fiction [conventions]…habitually give comparably equal time to the other genre. (Pohl, 1997: np)

Pohl's definition, however, is subjective, and symptomatic of the "ghetto effect" described by Wolfe and Weil in their consideration of the genre placement of Harlan Ellison, a diverse writer most well known for SF, whose works they observed exclusively appearing on the SF shelves of book shops regardless of their actual content (Wolfe and Weil, 1990).

Other writers also express strong opinions on permissible definitions. Margaret Atwood declared – countering Ursula Le Guin – that she does not write SF at all (Atwood, 2011). SF consumers are quick to identify such "shy-fi" authors as dissembling. All 24 public comments below Atwood's article define her work, like Orwell's *1984*, or Huxley's *Brave New World*, as SF. Reader Mmmrrrggglll (sic.) observes in one comment: "It's the community and its reaction to – and from – the wider world that gives it its names/ tags/ colloquialisms not the oddly narrow stereotypes of a single member of that community – albeit a relatively powerful one" (np).

Tautological assertions, such as Pohl's affirmation that SF is categorically not fantasy, or Atwood's claim that her work is not SF (because she says so) call for a more objective classification, shared by a statistically significant number of people. Ironically, my findings suggest that SFFWA members have a very clear concept of the difference between SF and fantasy regardless of Pohl's objections, and are in close accord with both him and Lem: that SF is "positively not fantasy," and is an expression of scientific and technological rationalism rather than the inexplicable.

The Significance of Style

The editor of *Galaxy*, Horace Gold, provided the following manifesto on the back cover
of the first issue:

> Jets blasting, Bat Durston came screeching down through the atmosphere of
> Bbllzznaj. He cut out his super-hyper-drive for the landing…and at that
> point, a tall, lean spaceman stepped out of the tail assembly, proton gun-
> blaster in a spacetanned hand.
> Hoofs drumming, Bat Durston came galloping down through the narrow
> pass at Eagle Gulch. He spurred hard for a low overhang of rimrock… and
> at that point, a tall, lean wrangler stepped out from behind a high boulder,
> six-shooter in a sun-tanned hand.
> 'Sound alike? They should-one is merely a western transplanted to some
> alien and impossible planet. If this is your idea of SF, you're welcome to it!
> YOU'LL NEVER FIND IT IN GALAXY!' (Gold, 1950).

Gold implied that the content of competing magazines was ersatz, impersonating
genuine SF by word-substitution, and promised that *Galaxy* would provide something
new. I found, however, that vocabulary is genuinely a strongly defining characteristic of
SF and fantasy, as I will illustrate from my survey findings below.

Le Guin argued the significance of style in her essay "From Elfland to
Poughkeepsie" (Le Guin, 1973: 146). Le Guin's examples of poor writing are more
recent than Gold's, and trace modern SF borrowing to corporate and political
melodrama – a fact excruciatingly familiar to anyone sitting through the interminable
council meetings and trade delegation plotting of the *Star Wars* prequels. Le Guin
emphasises the importance of written style, which might be expected to be significant in
genre differentiation, but I found that responses to the survey indicated clearly that the
perceived literary value of a story is independent of genre, and the quality of
characterization is paramount. If the quality measure is general across a range of literary
forms, the implication is that categorisation of SF is independent of style considerations.
It may be that the use of standard science fictional terms or concepts is sufficient to
define SF, independent of the rich experimental narratives of writers such as Samuel R.
Delany (Alterman, 1977).

The Fiction of Estrangement

Academic definitions of SF are distributed into three general categories: concept,
context and content. Conceptual approaches are dominated by Darko Suvin's statement

in 1977 that "SF is distinguished by the narrative dominance of a fictional novelty (novum / innovation) validated both by being continuous with a body of already existing cognitions and by being a 'mental experiment' based on 'cognitive logic'" (Suvin, 2010: 67). Suvin proposed "cognitive estrangement" as a quality which categorically defines SF (Suvin, 1979). Suvin borrowed openly from Bertolt Brecht and the Russian Formalists, particularly Viktor Shklovsky (Suvin and Tatsumi, 1985), sharing their focus on estrangement, and Suvin's usage approximates the *ostraniene* of Shklovsky. Suvin's definition might also be considered a sub-classification of Tzvetan Todorov's all-inclusive description of fantasy (Todorov, 1975), but the responses to my surveys indicate that SF and fantasy are commonly used independently and are specifically employed terms – so it seems sensible to respect Suvin's assumption of difference.

The meaningfulness of Suvin's definition to a general audience has been questioned by other researchers in the field. Carl Freedman observed that Suvin includes Brecht, but excludes *Star Wars* and *Star Trek* from the SF canon. This distinction makes little sense to the non-academic (Freedman, 2000: 16-19). There are alternative and complementary critical definitions, and genre descriptions, for SF – and each has their own strengths and weaknesses. For example, Adam Roberts suggested the qualities of SF reflect Protestant pragmatism, in contrast to fantasy, which resonates with Catholic mystery and ceremony (Roberts, 2005a: 59-60). While Roberts' definition seems sensible for some stories, and not only those with an overt Christian theme such as *A Case of Conscience* by James Blish, or *A Canticle for Leibowitz* by Walter M. Miller (Blish, 1963, Miller, 1960), it excludes both pre-schismatic and non-Christian writing.

Science Fiction in Postmodern Genre Theory
SF has attracted increasing academic attention as it has become more culturally pervasive. John Rieder in "On Defining SF, or not: Genre Theory, SF, and History"provides a detailed academic analysis of SF as a popular genre from the postmodern perspective (Rieder, 2010), describing Wittgenstein's *family resemblances*, and Lofti Zadeh's notion of the *fuzzy set* (uncited) as existing ways of describing genre

(195). Rieder draws on Kincaid's interpretation of Wittgenstein to claim that SF has "no essence; no single unifying characteristic and no point of origin,"asserting that SF is merely a "mutable" (193) cultural construction, "whatever we are looking for when we look for SF" (201, 203). Rieder claims that the genre does not derive "from the qualities of the object itself" (203), but is the "rhetorical act" of "labelling" (200). SF is not a "set of texts" but a matter of "using texts" (197). Paraphrasing Damon Knight (193), he states, "we can simply point to a story and say it is SF" (201). In a painstaking effort to avoid saying anything that might be remotely construed as "essentialist," Rieder implies that no identifying features exist in the texts themselves. Combined with the insistence that the "rhetorical act" of "labelling" is decisive, the act of definition becomes meaningless. Rieder refers to Wittgenstein's supposed "anti-essentialism" (95), which is equated with the relativistic view that there is no "referent": no common world, truth or experience to which language refers. However, philosophers have presented convincing evidence that Wittgenstein was not a relativist (Barrett, 1991, Coliva, 2010, O'Grady, 2004, Putnam, 1995), particularly in the terms conceived by postmodern theorists. O'Grady argues that Wittgenstein may have been a conceptual relativist, but although we may conceive the world through concepts, and different language groups may have different concepts, this does not deny that the *world-in itself* exists – nor, most importantly, that truth exists (O'Grady, 2004: 332). Similarly, Kate Soper observes that, although inevitably conceived through our cultural understanding, the natural world still exists. As she drily comments, "it is not language that has a hole in its ozone layer" (Soper, 1995: 151).

O'Grady (2004), Barrett (1991) and Coliva (2010) affirm that Wittgenstein insisted on a common humanity, that our language structures – which produce our language games – spring from our common *form of life* (Wittgenstein, 1986: PI 241). That we can understand foreign languages provides evidence of this: "The common behaviour of mankind is the system of reference by means of which we interpret an unknown language" (PI 206). Wittgenstein held that it is our common human condition, our "basic physical, emotional and intellectual features which we share with all humans" (O'Grady, 2004: 328), which forms our language structures. Wittgenstein's famous remark that "if a lion could speak, we could not understand him" (PI, II: 190) illustrates this commonality: we do not share this human form of life with animals

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(O'Grady, 2004: 328). Human beings, however, do share "one picture of the world" which is universal (Coliva, 2010: 21-22).

When Wittgenstein discusses the mechanics of definition, he uses the example of how we define *game*, he refers to subsets or categories of game that can be defined as having one thing in common: for example, ball games and board games; played with either a ball or a board, respectively. A category, concept or definition does not necessarily preclude the possibility of singular, defining features. Our everyday understanding of a board game or a ball game is not undermined because these may not have things in common with each other, or even other games, nor is it tautological to suggest that the definition is contained in the name itself. We call it a board game because of the action of playing a game on a board. It is a helpful description of something that exists, rather than an arbitrary classification. SF and fantasy fiction genres are also popularly defined by specific features, as my survey findings will demonstrate.

Rieder refers to similarities, themes, and repetition within SF, but is shy of saying what these might be (unsurprisingly, having insisted that the genre cannot be defined "from the qualities of the object itself" (203)). He concludes: "Definition and classification may be useful points of departure for critical and rhetorical analysis, but […] the project of comprehending what SF has meant and currently means is one to be accomplished through historical and comparative narrative rather than formal description" (206). I suggest, however, that the historical narrative is a secondary feature of what SF has meant and currently means – and is simply a reflection of changes in culture and society of the type I examine in my case studies, seen through the lens of SF. The primary feature is drawn from an enduring feature of human experience.

For the genre of SF to remain meaningful, I propose that similarities and family resemblances must apply to the defining features of the text. Family resemblances and fuzzy sets are useful for exploring genre definition, but require a more thoroughly contextualised understanding of Wittgenstein to be put in their proper perspective. In contrast to Rieder, I suggest that the concept of family resemblances, and the fact that these concepts spring from our common form of life, can usefully inform a more

empirically based approach to SF genre theory. The problem with postmodern approaches to genre definitions is that they risk obliterating the very object of their study altogether, along with any value that it can add to real-world circumstances. Genres risk becoming arbitrary when they are divorced from the objects they are describing – affirming the need for a more practical, empirically based theory. For example, Mark Bould and Sherryl Vint argue in "There is no such thing as SF" that:

> genres are never, as frequently perceived, objects which already exist in the world and which are subsequently studied by genre critics, but fluid and tenuous constructions made by the interaction of various claims and practices by writers, producers, distributors, marketers, readers, fans, critics and other discursive agents (Bould and Vint, 2009: 48).

Rieder suggests that a comparative, mutable, genre definition located in factors and influences is not a definition at all, supporting the opinion of Bould and Vint (Rieder, 2010).

My investigation indicates that the Classical origins of science and technology – embodied as *techne* – provide the fundamental, and enduring, characteristic of human experience that enables us as individuals to readily identify SF. Richard Parry states: "Aristotle refers to techne or craft as itself also epistêmê or knowledge because it is a practice grounded in an 'account' —something involving theoretical understanding" (Parry, 2014: np). Parry describes how these ideas became separated in Western philosophical and scientific traditions, into the applied, and the theoretical aspects of the human world, and clarifies that "some of the features of this contemporary distinction between theory and practice are not found in the relation between epistêmê and techne"(np). For the Greeks epistêmê and techne had common characteristics. Techne describes a way of doing, and being, which incorporates knowledge and skill, actual and theoretical, experiential and potential.

The Greek philosopher and surgeon Galen (130-c.201AD) saw the human hand, the experiential human mechanism of physical creation, as invaluable, not only for making physical objects, but for making tools that could be used to extend the artistic, creative and imaginative capacity of humans beyond their physical limitations, including writing about such things:

> With these hands of his, a man weaves himself a cloak and fashions hunting-nets, fish-nets and traps, and fine-meshed bird-nets, so that he is

> lord not only of animals upon the earth, but of those in the sea and the air
> also… being also a peaceful and social animal, with his hands he writes
> laws for himself, raises altars and statues to the gods, builds ships, makes
> flutes, lyres, knives, fire-tongs, and all the other instruments of the arts, and
> in his writings leaves behind him commentaries on the theories of them.
> (Galen, 2003: 18)

Galen's description encapsulates the human physicality of techne as an integration of applied knowledge and imagination. More recently, Bernard Stiegler has described "technics" in *Technics and Time* as "the horizon of all possibility to come and of all possibility of a future" (Stiegler, 1998: ix). He calls it: "a process of concretization" (22), and says that we should admit "the technical dynamic precedes the social dynamic and imposes itself thereupon" (67).

The core of SF is the human embodiment of techne, and this drives an intuitive understanding of the subject. Readers are not simply pointing at texts and making arbitrary decisions about genre. SF, as creative writing about scientific, technology-focused and plausible worlds, may be a socio-cultural manifestation of the human concept of techne, which has been part of our experience of the world since, and before, the philosophers of ancient Greece added it to the lexicon. I use techne to describe the core of the categorisation of SF, not only because it can be justified by philosophical debate, but because it also mirrors empirical analysis of survey findings (below). The essence of physical tool-making and the mental thought experiments that accompany the concept of physical creation is the core of SF, and the visible historical narratives of SF genre are merely the material through which this essential core, this "star" of essence, sweeps: collecting and discarding new family members as it proceeds.

The World Outside Text: The Survey

Subjective opinions of authors, and established academic theories, appear not to have been previously subjected to independent evaluation based on the expectations and opinions of the general public – who are the beneficiaries of applied research that employs SF concepts and content. I suggest this lack of a common baseline fuels increasingly complex academic work towards the uncertainty of being able to create a definition that is meaningful to a general population. It was with a view to investigating

this complexity that I designed the *Science Fiction & Fantasy – Your Opinions* survey (Menadue, 2017a), the aim being to assess the genre definitions of SF and fantasy from an original, empirical perspective, rather than relying on theory alone.

Sample Characteristics

Email and Facebook promotion of the survey generated what proved to be a statistically significant sample of 232 unique, globally distributed, responses[6]. Most respondents were English speaking North Americans, Western Europeans, Australians and New Zealanders. The North American responses showed a spike in returns during promotion of the survey on the Facebook page of the SFFWA, indicating writers and fans participated. The demographics of the respondents showed a broad spread of ages, no gender bias, and a dominance of tertiary educated respondents. These demographics mirrored those reported in the *Science Fiction & Fantasy – Your Experiences* survey (Menadue, 2016b, Menadue and Jacups, 2018). Details of both surveys are provided in Appendix E. The complete survey dataset and questionnaire is stored in a permanent online repository (Menadue, 2017a), and archived online in its original format (Menadue, 2016a).

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[6] The statistical significance of the number of responses received as a sample of a larger population is more strongly affected by consistency between responses than by population size. The survey findings are statistically significant because of this lack of variation in responses. For example, a finding that "magic" is considered to be a defining (and exclusive) feature of fantasy by 94% of survey respondents gives a 95% confidence in the results with a confidence interval of +/- 3% (i.e. between 92% and 98% reliability that this would be affirmed by any other member of the population from which the sample is derived), even if we compared the sample size to the world population of English speakers. The association of "plausibility" with SF by 90% of respondents offers a reliability of between 91.5% and 97.5%. There are specific limitations of online surveys, which I describe more fully in Appendix E. In terms of standard statistical measures of reliability, however, the results indicate that the distinguishing features of SF and fantasy are not a matter of serious debate to the populations from which survey responses were received.

Survey Results and Discussion

Only two survey respondents out of 218 employed "Fiction of Estrangement" (FoE) terms and concepts[7]. Two further respondents referred to Samuel Delany's classification of SF on the basis of "subjunctivity" (Delany, 2009: 31-36), and three referred to Clarke's Third Law(Clarke, 1968: 255) that "any sufficiently advanced technology is indistinguishable from magic" to justify apparently fantastical elements appearing in some SF stories. Qualitative examination of the remaining 97% of responses found definitions based on presence or absence of specific content (Table 3.), which suggested statistical evaluation by word frequency and category would be a suitable analytical method to generate meaningful results. The manner in which the story employed content to build a functional narrative was frequently described by respondents in terms of plausibility or lack of plausibility, the presence of explanations or lack of explicable content. The remarkable lack of equivocation, and absence of qualification of answers, were the first clear indicators that the genre definitions of the respondents were markedly and categorically polarised.

Table 3.   Examples of responses to genre definition questions.

Time stamp of response	What is it about a book that makes you think of it as fantasy?	What is it about a book that makes you think of it as SF?
11/11/2016 15:58:11	Incorporating creatures such as dragons or orcs; the story contains magical elements.	Within the realms of possibility using scientific elements or scenarios.
11/12/2016 6:59:45	Fantasy is when elements of the novel are not realistic or possible. I.e. include mythical creatures, super powers...	Evolution of science-based inventions or themes.
11/19/2016 14:48:20	A story with fictional elements that could never happen.	A story with fictional elements that could happen, usually based around advanced technology.
11/20/2016 0:23:38	Magic of some sort; something that reminds you it is not real	Generally speaking I do not read SF although I do watch SF movies; so, my

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[7] Total count of survey responses was 232, but it was not compulsory to answer all of the questions in the survey. Throughout the analysis I give the precise number of answers received to each question.

		answer might be cliche: other planets, science and technology that is far more advanced than ours which makes the story implausible.
11/20/2016 14:29:24	Fantasy tends to rely on magic for its world building rather than science, engineering, or economics.	SF to me tends to focus on the future and present a vision, somehow rooted in science or engineering or real history, of how the future might work out.
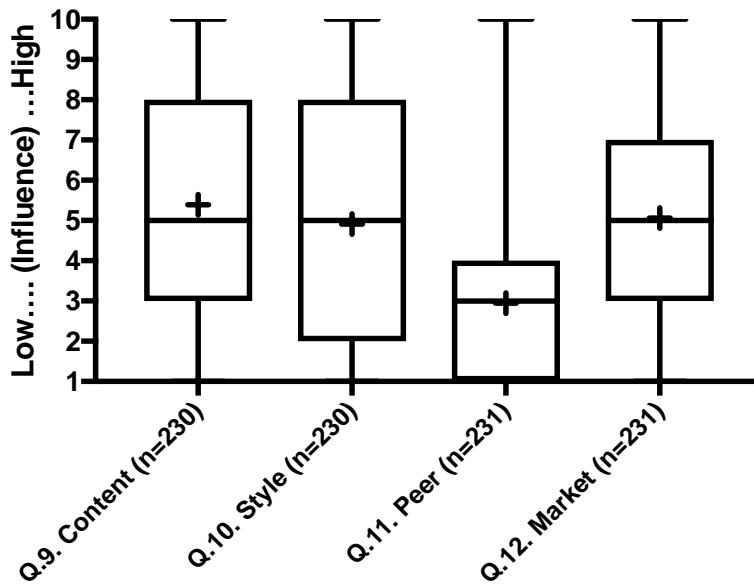
Fig. 2.   Perceived content, style, peer and marketing influences
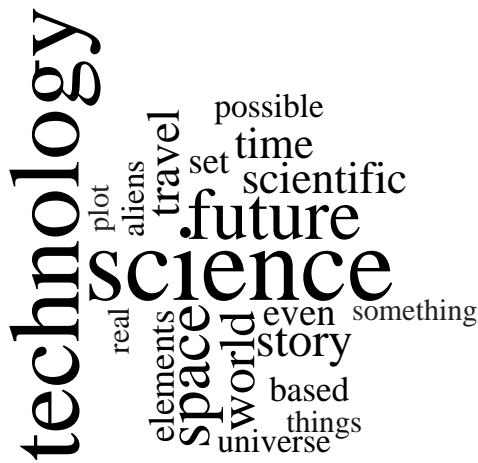
Fig. 3.   What makes a story SF?

Fig. 4.   What makes a story fantasy

I asked general questions about the influence of content types, style and structure, peer influence and marketing on genre definitions (Fig. 2), but the responses to these questions were largely ambivalent except for the assertion that peer influence has little effect. More exact questions regarding personal assessments of the quality of fiction provided unequivocal opinions (Fig. 8), but no SF or fantasy terms. These responses imply that generic factors do not clearly affect definitions of SF or fantasy. This is interesting, as responses to more direct questions on what makes a story fantasy or SF were focused on exclusive differences in content and structure, which may support the suggestion that the comprehension of genre is intuitive – that respondents do not consciously believe these factors are important to genre definition, but identification of a specific genre is nonetheless founded in specific content and structure categorisation.
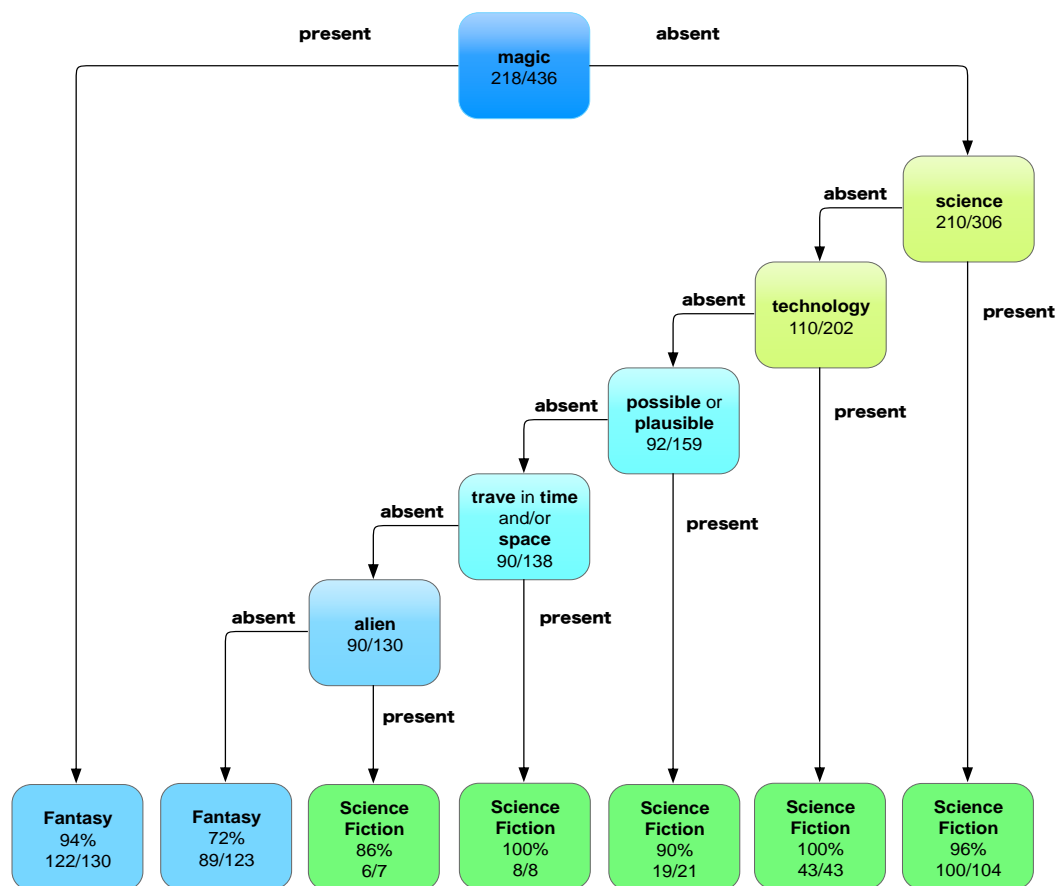
Fig. 5.   Classification tree of SF or fantasy

Free-text responses to the questions "What makes a story SF?" and "What makes a story fantasy?"used distinctive vocabulary (Fig. 3, Fig. 4, Tables 3-5). "Science" and "technology" are categorical indicators for SF (Fig. 3, Table 4), and the word "magic" dominates descriptions of fantasy literature (Fig. 4, Table 5.). To avoid skewed results caused by self-referencing, the terms "SF," "fantasy" and cognates were not counted when employed as genre names, but only when used to describe story content. Statistical classification of the terms used to distinguish SF and fantasy demonstrate overwhelming consistency, with the presence of magic associated with fantasy, and the combination of science and technology being a universal indicator for the SF category (Fig. 5). Word clouds of the 20 most frequent terms in the free text responses (Fig. 3, Fig. 4) illustrate the strength of discrimination between fantasy and SF content. In generating these word clouds, antithetical and general phrases such as "no magic" or "no science content" were amalgamated into single words (e.g. "unmagical" and

"unscientific") to enable them to be visible in context. For categorisation analysis, all responses were qualitatively assessed to identify the presence and context of the 30 most frequent words found occurring in responses to each definition and the results tabulated by stemming (e.g. "magical," "magic," "magic-based," would all be categorised as "magic").

In Figure 5, classification tree branches are at presence or absence (including negative statements) of terms found in any of 464 responses, 232 "what makes it fantasy," and 232 "what makes it SF," 17 non-responses were received to both questions. The tree demonstrates confidence levels of categorisation based on descriptors. Sixteen of the most frequent words were shared between SF and fantasy definitions, generally in a positive or negative affirmation (e.g. "SF does not contain magic" or "fantasy is based on magic"). This classification tree potentially had 44 nodes based on the 30 most frequent words in response to each question.
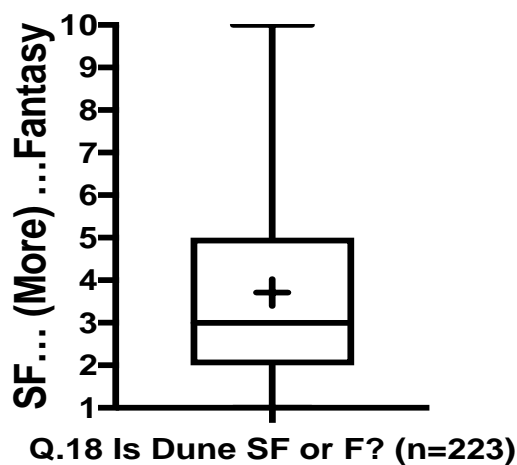
Fig. 6.   Likert scale classification of Dune as SF or fantasy
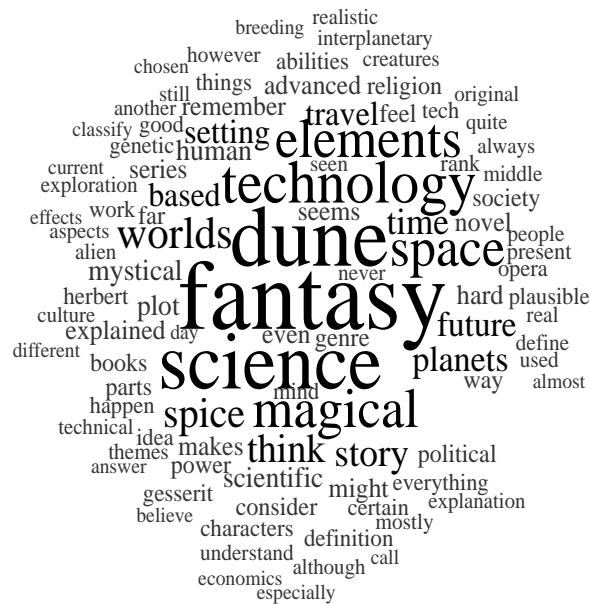
Fig. 7.   Defining Dune (100 most frequent words shown)

The Hybridisation Control Test: Dune

To test if the distinction between SF and fantasy was polarised or on a continuum, respondents were asked to classify a well-known SF work that contains a wide range of content that could be expected to defy a simple definition and explain their reasoning. The work chosen for this was Frank Herbert's *Dune* (Herbert, 1965), which contains science and technology that is plausible or actual, such as atomic power and weaponry. It also describes the physically impossible, such as instantaneous space travel and powers of prophecy. *Dune* is not pure SF according to the Likert scale responses (Fig. 6), and word frequency analysis of the responses suggests that the classification into SF or fantasy is not clear for this novel (Fig. 7). Qualitative examination of the free text responses to this question provide a more nuanced perspective.

Some respondents employed Clarke's Third Law to integrate ostensibly fantastic elements into a science fictional narrative: they argued that plausible explanations converted impossible fantasy into possible SF. The genetic engineering of humans into organic computers seems plausible in a society that has banned thinking machines, for example. The powers of the messianic central character arise from special properties of the spice, combined with the sociological factors of the Fremen's fanatical devotion and

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the manipulations of the Bene Gesserit. Those who found these elements to be impossible or implausible rated *Dune* towards the fantasy end of the scale. However, when explaining where they had placed *Dune* on the Likert scale, respondents did not introduce new "science-fantasy" terminology. Instead, they classified the content of *Dune* as a set of individual SF or fantasy elements, meeting the same criteria they used to define these genres more globally. This seems to confirm that SF and fantasy have specific and distinct characteristics which do not overlap. *Dune* provides evidence that respondents apply the classification in Fig. 5. to individual elements of story narrative. The proportion of specific SF to specific fantasy elements, and not a blurry continuum of the sort despised by Frederik Pohl, determines Likert scale placement of *Dune*. Works such as *Dune* may intertwine the threads of family resemblances of SF and fantasy, but the core distinguishing features of SF are unchanged: science, technology and possibility – there is no evidence for a unique third genre of science fantasy.
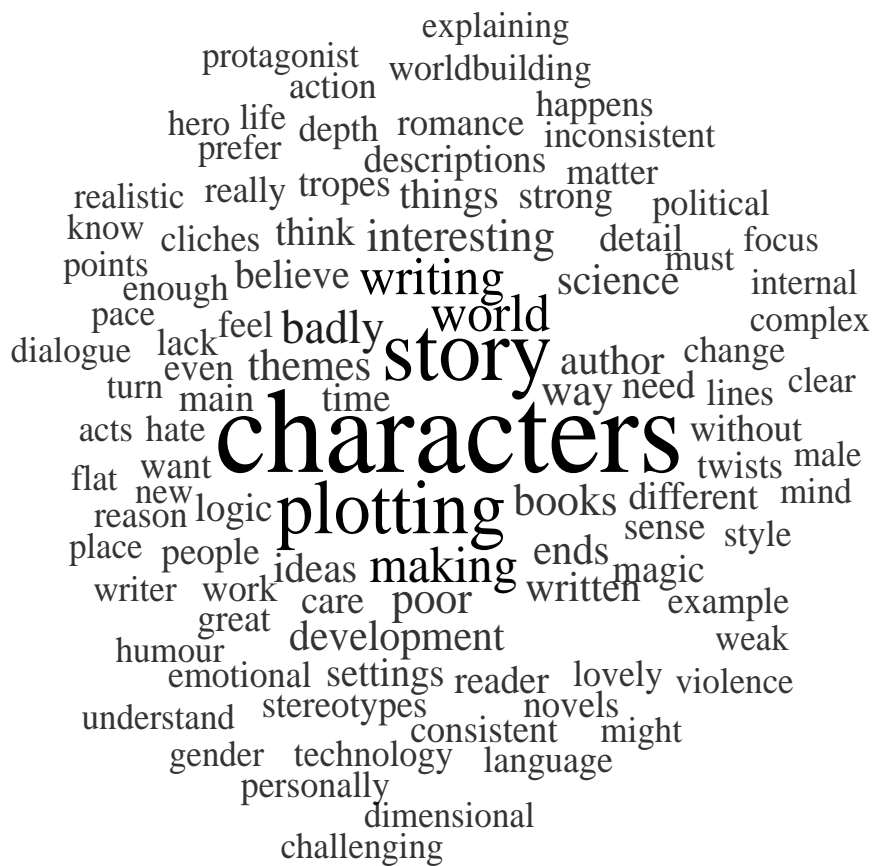
Fig. 8.   What makes a good / bad / favourite story?

Significance of style and aesthetics

Responses to Q.16 and Q.17 (Fig. 3, Fig. 4) defining fantasy and SF were not connected to story quality (Fig. 8). Answers to three closely related questions: "What makes a good story?", "What makes a bad story?", and "What do your favourite books have in common?" all affirmed that characterization is the most significant influence on story quality. The aggregates of responses[8] to these questions are shown in Fig. 8. Terms

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[8] These responses are analysed on the frequency with which the same words appear. They can be aggregated as they address the same fundamental theme of how a narrative is regarded based on particular characteristics. The control question of what makes a story "bad" compared to "good" demonstrated a significant negative correlation between the same terms e.g. "poor characterisation" is almost universally

used to define SF and fantasy are notably absent. This indicates that the categorisation of SF and fantasy is not quality dependent, but is a distinction arising elsewhere. Style is an indicator for quality, but not for genre, which is determined by content.

Word Frequencies

Table 4.   **Ten most commonly occurring words used to define SF**

Word	Count	Weighted %	Similar Words
science	125	4.25%	science, sciences
technology	90	3.06%	technological, technologically, technologies, technology
future	58	1.97%	future, futures, futurism
fiction	55	1.87%	fiction, fictional
space	47	1.60%	space
world	40	1.36%	world, worlds
story	38	1.29%	stories, story
travel	33	1.12%	travel, traveler, travelling
scientific	32	1.09%	scientific, scientifically
possible	30	1.02%	possibilities, possibility, possible, possibly

equated with bad stories, and "good characterisation" with good stories. Expertise in the portrayal of protagonists is important to both evaluations.

Table 5.   Ten most commonly occurring words used to define fantasy

Word	Count	Weighted %	Similar Words
magical	169	4.60%	magic
fantasy	163	4.43%	fantasies
science	80	2.18%	science
worlds	77	2.09%	world
elements	40	1.09%	element
story	34	0.92%	stories
dragons	34	0.92%	dragon
technology	34	0.92%	technological, technologically, technologies
fiction	34	0.92%	fictional
like	33	0.90%	likely

Word frequency analysis of responses was carried out by word counts of the raw data, discounting SF and fantasy when used solely as genre labels by the respondents (Tables 4 & 5). Word frequencies and classification tree analysis (Fig. 5) demonstrate very specific discrimination between SF and fantasy through content filters of magic, science, technology and plausibility. In Table 5, technology and science appeared in the responses in negative contexts, used by the respondents to describe what fantasy is not. These were included as negatives in the categorisation tree analysis.

The overwhelming lack of complex, or theory-based arguments found in responses to qualitative questions suggests a quantitative and categorical analysis is appropriate, and implies respondents were providing personal, intuitive definitions rather than ones based on knowledge of academic theory. This was found to be the case regardless of whether the respondents gave their occupation as a "genre-professional" (e.g. writer, editor) or not, again adding substance to the argument that these responses are not sourced from definitions found in the academic literature.

Evidence of Fuzzy Sets
A fuzzy set is composed of items that are not defined by purely binary conditions, but exhibit degrees of membership (Zadeh, 1965). These, alongside family resemblances,

appear to augment my core categorisation of SF and fantasy. I have employed a combination of methods to illustrate and support the rigour of the analysis: word clouds of frequencies, classification analysis and Likert scales; to illustrate personal perspectives (Figs. 3-5), and external influences (Fig. 2). The frequency of specific words found in free-text responses is statistically significant in indicating an evidently binary categorisation. In apparent contrast, Likert scale indications of the influences of content, style, peer and market are not polarised. In some cases, the responses indicate almost complete ambivalence, with both means and medians close to the centre point of the response scale (Fig. 2, showing results from Q. 9, 10 and 12 of the survey). The fuzziness of these responses is indicated by the relative lack of extreme responses to the scaled questions. The control question that could falsify a strict demarcation of SF and fantasy by identifying non-binary categorisations was whether *Dune* is fantasy or SF. Out of 224 responses to this question there were 43 responses of (1): definitely SF, and four that it was (10): definitely fantasy. Research has been carried out at length into the factors affecting Likert scale responses, which can include avoidance of end-of-scale responses, gravitating towards the ends, and bias caused by the direction of positive, negative and neutral points on the scale (Coertjens et al., 2012, Croasmun and Ostrom, 2011, Hartley, 2014, Lantz, 2013, Thissen-Roe and Thissen, 2013). As I was looking for evidence of non-binary definition, scale biases are largely irrelevant to the interpretation of the results. The results indicate a fuzzy set of associations including vocabulary, style, marketing and peer pressure, outside the sharply defined core characteristics of SF and fantasy. Family resemblances are clearly relevant to the ability of respondents to classify a range of different works without difficulty. Other varieties of content and external phenomenological experiences are also present, and associated with SF and/or fantasy. These appear to form fuzzy sets around the core criteria. This explains the fact that respondents were able to provide a variable scaled response to some questions, without compromising the clearly categorical classification they offered in their free-text explanations.

Survey Conclusions

I discovered that SF and fantasy genre definitions are predominantly influenced by vocabulary and plausibility. This contrasts with FoE definitions. This distinction was so sharply defined that "magic" was a categorizing factor in 94% responses to the question "What makes [a work] fantasy?", and the presence of "science" (independent of labels for the genre) was a 96% indicator for SF. The word "technology" indicated an absolute categorisation as SF. The public recognise the categories without deep analysis, and independently to aesthetic considerations. They interpret the narrative as an assembly of terms and relationships combined with external influences, and the genre is known by how these resonate.

Whether a story is deemed good or bad has qualitative characteristics which are independent of genre (Fig. 8). Fewer than 3 % of respondents made a differentiation between SF and fantasy based on theoretical distinctions of any sort, even though many more respondents (those who are writers or editors of SF) might be considered experts according to online survey response theories. The presence of a plausible narrative structure, based in logic, influences the classification of a work as SF, and the formal narrative structure implied by this may be an indicator that influences categorisation. To analyse this feature in more depth is beyond the scope here, but may provide the basis for further studies.

When asked to explain classification into SF and fantasy, free text responses are variable in depth and complexity, but the key word content is remarkably similar, and the words magic, science and technology dominate the responses (Figs. 3-5, Tables 3-5). These are the substance of a core that is supported by a family of resemblances – aliens, space ships, dragons, quests – but not defined by them. The survey findings suggest there are core features of texts which enable their categorisation as SF or fantasy, and that for SF these are often closely associated with concepts and developments, both current and future, drawn from real science. This accords with the analysis of my earlier survey, discussed in the next chapter, which discovered a statistically significant correlation between readers' experiences of science, scientists and SF (Menadue and Jacups, 2018).

From analysis of survey data, it proves possible to create a popular categorization of SF and fantasy without lengthy discussion of the aesthetic value or sociological basis

of content. Content defines SF and fantasy empirically, and provides the clearest, least equivocal, and most verifiable, means of identifying popular comprehension of these genres.

Synthesis of Theory and Survey

Based on both theoretical and survey analysis, it appears that what readers find most significant in defining SF – science and technology – is the classical concept of *techne*; the acknowledgment of the existence of an empirically based world, upon which the thought experiments and theories of SF are based. The core of the popular categorisation of SF is sharply defined, rather than being subject to a fluid and mutable historiographic process of genre change that is particularly problematic if we employ genre for real-world research outcomes. I have suggested it is techne that is this historically continuous core of SF, around which other themes, motifs and tropes orbit, and my survey findings provide strong supporting evidence for this proposition.
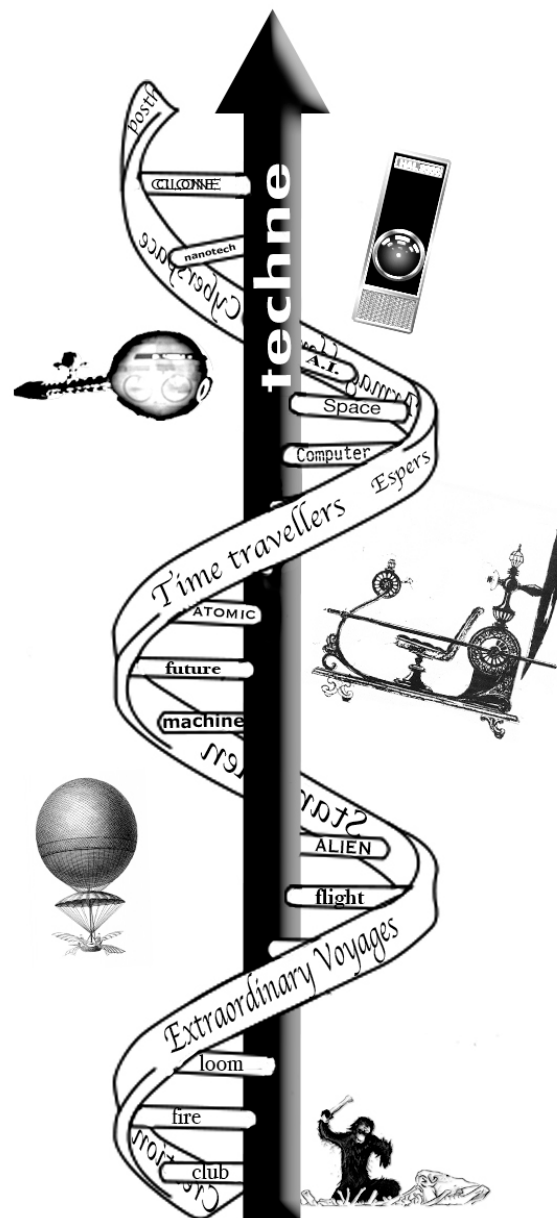
Fig. 9.   "techne-fiction"

Figure 9 illustrates how this core of techne is orbited by subject matter and concepts that may at any one time make up elements of the family of resemblances comprising the totality of SF, without dictating what may be included or excluded. The core of techne persists through time (the vertical arrow) even though fashions in SF, and real-world contexts of technology and science – from bone tools through to artificial intelligence – may change. Specific SF instances – such as Well's *The Time Machine*, or Kubrick's HAL – are linked to changing fashions, or even technology, and are among the fuzzy-set of associated items that are included in SF.

The academic definition of genres is the continuing subject of debate, and has inspired diverse FoE theories. I suggest that a reason for the multitude of academic theoretical approaches is because they tend to focus on transient surface features of the genre, and this obscures the empirical core of SF that general audiences find definitive. In contrast to pure research, applied research requires this more democratic definition. Wittgenstein's notion of family resemblances can explain the collection of "things" that surround the core category classification, as well as the unproblematic retroactive classification of literary or mythological works that pre-date the appearance of the label "science fiction," as the family provides a way of identifying related content −not merely a set of clearly defined rules. But, it appears that underlying the way of understanding, there is a continuous, historical, presence, which explains why these categories exist. The specific terms in the context of the literature correspond well to definitions of *techne* for what is commonly described as SF, and magic for fantasy. This practicality of popular definition is recognised by authors, who are often surprised by complex critical analysis of SF. Philip K. Dick remarked:

> One time I read in a distinguished book of criticism on SF that in my novel *The Man in the High Castle* the pin which the character Juliana used to hold her blouse together symbolized all that which held together the themes, ideas, and subplots of the novel itself − which I hadn't known when I wrote that section. But what if Juliana, also not knowing it, had removed the pin? Would the novel have fallen apart? Or at least come open in the middle and exposed a whole lot of cleavage (which was why her boyfriend insisted she put on the pin in the first place)? (Dick, 1980: np)

J.G. Ballard criticised the gap between academic and non-academic interpretation of SF, styling academic criticism as the "apotheosis of the hamburger," unrelated to the origin or intention of writing, or the perspective of the reader (Ballard, 1991: 11). The intention here is to provide a popular definition to fill that gap, one that can be used readily enough by interdisciplinary researchers, and reliable enough to reduce the likelihood of embarrassment.

The empirical data from my survey analysis seems to confirm that SF exists, in a real and permanent way, and is more than a fluid and mutable association of resemblances. Popular definition is not dependent upon the more abstract features of

FoE definitions. The public recognise the categories independently of analytical or aesthetic considerations. They interpret the genre of the narrative as an assembly of terms and relationships combined with external influences. This contrasts strongly with definitions based on qualitative standards or theoretical structures, including FoE examples. The empirical evidence suggests the survey respondents are defining genres from a core of essential features, which are orbited by family resemblances and fuzzy sets. The influences of marketing and peers are included in the fuzzy sets of associations, and marketing categorisation may even be influenced by shared distinctions understood by the marketers, based on the same conception of techne, rather than being an entirely arbitrary designation. The focus of the respondents on science and technology provides us with a characteristic of human experience that identifies SF.

Techne is empirical in the sense that SF refers to the experience of the existence of an empirically based world, and the survey of SF readers finds clear and practical categories that separate SF from fantasy literature. The difference between SF and fantasy is decided by mutually exclusive features, and SF is easily recognised.

To secure the significance and relevance of SF as a meaningful indicator of human cultural interests and experience it is not sufficient to demonstrate that it is commonly employed to illustrate and enhance research across a range of disciplines, or to demonstrate that it is sharply enough defined by its audience to be an effective instrument for analysis. It is also necessary to assess the relevance of SF to the broader public.

Science Fiction Readers

Menadue, C. B., & Jacups, S. (2018). Who Reads SF and Fantasy, and How do they Feel about Science? Preliminary Findings From an Online Survey. *SAGE Open, 8*(2), 2158244018780946. doi:10.1177/2158244018780946

I expected that SF may refer to a broad range of texts, but this cannot be assumed to reflect the popular perspective, and consequently I included both SF and fantasy in the survey title. Existing theoretical definitions do not reflect popular readership – unlike surveys, they lack the individual perspective. The findings of my survey (Menadue, 2017a) described above identified that the popular definitions of SF and fantasy are very sharply defined compared to the academic discussion, and demonstrate that in the imagination of readers, SF is not considered to be a subset of fantasy literature, but a companion by contrast (Menadue, Giselsson and Guez, 2018). Answers that refer to SF or fantasy in my surveys are founded on popular understanding of these genres. Respondents know SF, distinct from fantasy when answering questions about how SF is related to various topics .

 The Science Fiction & Fantasy – Your Experiences survey was designed to gather information on who the readers of SF and fantasy are today, their attitudes

towards science and scientists, and their reading preferences. To this purpose, the survey included questions on reading habits and genre preferences, attitudes towards science, and demographics. This survey was intended to augment and extend the results of prior commercial surveys and elicit a wider range of responses to assess the relationship between people's SF experiences and real-world science. As well as providing information of use to researchers who employ SF to assist in achieving their research aims, it adds to the body of survey work in the tradition of large-scale general, and non-commercial, genre-focused surveys such as the "Lord of the Rings International Audience Research Project" (Barker and Mathijs, 2006), and Berger's work on convention attendees (Berger, 1977).

Reader surveys have been conducted by SF magazines since at least 1948 (Adams and Wallace, 2011, Campbell, 1949a, 1958b, Carnell, 1955, 1964, Hamilton, 1954, Van Gelder, 2003). Magazine surveys often focus on demographics and market research data to sell advertising. Analysis has been made of some early surveys, including the comparative demographics of convention attendees (Bainbridge, 1980, Berger, 1977). The most recently cited magazine survey was by John Adams and Sean Wallace for *Lightspeed* in 2011; it focused on quantifying advertising market segments and technology purchasing habits. The historic surveys portray a demographic dominated by young male readers (93.3% male in 1949, average age 29 years) but trending towards more balanced gender and age ratios over time (92% male and 30.8 years in 1963, 67% and 40 years in 2003 and, 59% and 43.5 years in 2011: significant figures are given from original survey data). It should be noted that these surveys tend to favour subscribers or buyers of these magazines, and may not represent the demographics of a broader SF audience. As I have discussed, the relationship between SF and science in the popular imagination is a point of interest, relevant to the broader discussion of the relationship between SF and culture. For this reason, this survey included questions designed to explore that relationship.

The Survey

The combination of SF and fantasy in the survey title, and for some survey questions, is related to the fact that the peak writers body is the Science Fiction *and* Fantasy Writers

of America (SFFWA, italics added), which does not discriminate in the usage of the terms, bestows its Nebula Awards on writers who are considered to be in either category, and was expected to be the source of a significant number of survey respondents. I considered it prudent to not anticipate a clear separation between SF and fantasy in this or the subsequent survey (Menadue, 2017a), which explicitly addressed genre definitions – and found, as I have described above, that the public separation of these genres is absolute. At the time of preparation of the surveys, before discovering the empirical evidence, it was not known to what extent the public make a distinction between SF and fantasy, or what reasons they might give for doing so. This paper reports on the characteristics of a self-selecting audience and their attitudes to SF and science. The survey sought to address the research questions, and present findings alongside demographic characteristics to better identify and describe the attitudes and preferences of respondents.

Survey Aims

The aims of the survey were to gather information on the following topics:

1. The demographic characteristics of the SF and fantasy audience.
2. How respondents perceive that SF is influencing attitudes to real science, regarding:
    a. perspectives on the benefits SF generates for science;
    b. how SF might affect other people's attitudes to science; and
    c. if SF representations of scientists differ from the perception of real scientists.
3. Correlations between the characteristics of respondents, their answers regarding the SF genre, and attitudes towards science and scientists.

Design

The survey comprised 57 questions, in three successive sections: reading preferences; attitudes to science, SF and fantasy, and respondent demographics. The full questionnaire for the survey, and the survey data, are available in an online research data repository (Menadue, 2016).

Information was collected on: reading values; preferences and volume of reading; reading habits of other members of the household; general consumption of other SF media; self-perception of manual and mental agility; strength of personal opinions, and history of reading SF. Questions were also asked on attitudes to science, and demographic information was collected on: age; country of residence; first language spoken; gender; education; employment status; income satisfaction, and relationship status. The survey questions included closed ranges (for age-related questions), five-point Likert scales (for measuring strength of opinions), and open-ended questions prompting free text responses. This section reports the findings from closed and ranged questions. Further questions asked for respondent attitudes towards science, as well as how they imagined SF might influence the attitudes of other people. Survey questions were accompanied by an explanation for each question, and these were informally written to encourage respondents to complete the entire survey. The survey was written in English and no translations were provided.

One question asked if there was a difference between how "grounded" scientists in SF were, compared to real-world scientists. A deliberately neutral term was used for this question to reduce response bias, as an alternative to one of the value-laden terms such as "mad," "eccentric" or "absent-minded" that are sometimes applied to real or fictional scientists. This question was problematic, as attempts to make it general included several broadly related terms. The question in full was: "Do you think scientists in SF seem more grounded and understandable than scientists in real life?", and the ends of the Likert scales were labelled with "I think real scientists are more understandable" at one, and "Yes, I can relate to them more easily" at five. This question was intended to gain an impression on the part of the respondent rather than a very specific response to this question, but the clustering of responses around the centre might reflect an insufficiently clear phrasing of this question, even though data analysis indicated meaningful correlations between the variance present and other factors.

Procedure

The survey *Science Fiction & Fantasy – Your Experiences* was posted online on 16th November 2015, aimed at attracting a sample of SF readers. It was promoted via email, personal recommendations, and social media, including targeting Facebook pages

dedicated to SF and fantasy fans, readers and writers. These included direct posting in Facebook groups with membership in the hundreds, to the SFFWA closed group, for which a request to post was necessary. The SFFWA Facebook page has over 43,000 followers, and the timing and frequency of survey responses following posting with the SFFWA indicated that a significant proportion of respondents may have come to the survey via that link. Survey responses were collated on the 17th November 2016 after a year of continuous online availability.

Data Storage and Analysis

Survey Data was collected using Google Forms and exported as comma separated values for statistical analysis. The questionnaire and anonymised results of the survey are stored in a public research data repository (Menadue, 2016).

Spearman correlation tables were created using GraphPad Prism version 7.00 for Mac (Graphpad, 2017), and I report only correlation coefficients above 0.20 with a P-value <0.01. Anything lower is considered too weak to be unexplainable by chance. Significant relationships between questions on attitudes to science and all other questions, and significant correlations related to age and gender are presented separately. Correlations have been omitted for clarity where the logic of the relationship is obvious, and has no added significance (e.g. a strong correlation between geographical location and native language, a correlation between enjoying SF and reading large numbers of SF books).

Findings

Sample Characteristics

After the survey closed, a total of 909 survey responses were collected. As the questions were not mandatory there are variations in response numbers, as shown in the tables. Due to a significant number of respondents neglecting to answer one or more questions, the analysis includes all responses given to each question rather than filtering for those in which respondents answered all survey questions. The mean age of respondents is

42.3 years and the gender balance favours female respondents, who make up 54.5% of the total. Mean, median and mode ages were lower for females than males (Table 6).

Table 6.   Demographic characteristics of survey participants

Geographical area residing	n	%
North America (USA and Canada)	386	42.8
Australia or New Zealand	256	28.4
Western Europe	164	18.2
Eastern Europe	33	3.7
Southeast Asia	9	1.0
Other (15 Locations)	54	6.0
Native language (n=891)	**n**	**%**
English	728	81.7
Other (15 Languages)	163	18.3
In a relationship with someone(s) (n=898)	**n**	**%**
Yes	633	70.5
No	222	24.7
Rather not say	30	3.3
Maybe	13	1.5
Gender identification (n=901)	**n**	**%**
Female	491	54.5
Male	400	44.4
Other	10	1.1
Age (n=900)	**n**	**%**
<15	2	0.2
15-19	28	3.1
20-29	153	17.0
30-39	229	25.4
40-49	215	23.9
50-59	180	20.0
60-69	82	9.1
70-79	9	1.0
80+	2	0.2
mean age (all)	42.3	
median age (all)	45	
mode age (all)	35	
	female	male

	41.0	44.2
mean age	41.0	44.2
median age	35	45
mode age	35	45

Education (n=902)	n	%
University	391	43.3
Post-Graduate University	353	39.1
School	90	10.0
Technical / Professional	68	7.5
Employment status (n=894)	**n**	**%**
Employed	513	57.4
Self employed	132	14.8
Student	121	13.5
Retired	77	8.6
Unemployed	32	3.6
Parent / Carer	10	1.1
Disabled	9	1.0
Income satisfaction level (n=889)	**n**	**%**
I never have enough money	102	11.5
I do well enough	481	54.1
I'm happy with what I have	229	25.8
I have more than I need	55	6.2
I don't have to think about it	22	2.5

How important do you think your life experience and learned skills are compared to your formal education (n=902)	n	%
Not important (1)	4	0.4
(2)	15	1.7
(3)	123	13.6
(4)	323	35.8
Very important (5)	437	48.5

How good are you at working with your hands (n=902)	n	%
It all falls apart (1)	67	7.4
(2)	169	18.7
(3)	300	33.3
(4)	290	32.2
I could build a space-station (5)	76	8.4

How good are you at solving puzzles and working things out in your head (n=900)	n	%
I solve puzzles with a hammer (1)	13	1.4
(2)	66	7.3
(3)	254	28.2
(4)	512	56.9
I'm the world chess champion (5)	55	6.1
Do you learn new physical or manual skills easily (n=897)	**n**	**%**
Yes	672	74.9
No	225	25.1
Do you find it easy to understand new and unfamiliar ideas (n=898)	**n**	**%**
Yes	855	95.2
No	43	4.8
Do you think of yourself as happy to consider all sides of an argument, or do you have strong opinions of what you think is right and wrong (n=895)	**n**	**%**
I'm happy to consider all the options	759	84.8
I prefer my own opinions	136	15.2

Respondents are globally distributed, with 42.8% of responses coming from North America. Most respondents (81.7%) report their first language as English, the remainder are distributed between 15 different languages. The majority of respondents (82.4%) have a university level of education, and 72.2% of the sample are employed or self-employed. The measure of attitude towards personal income indicated that the majority (88.6%) are neutral about, or satisfied with, their financial circumstances. The majority of respondents (70.5%) also reported being in a relationship with someone. Other questions are separated into two groups: responses concerning reading habits (Table 7), and those regarding science and scientists (Table 8).

Table 7.   Background questions on reading and other activities

How much do you enjoy reading compared to doing other things (n=846)	n	%
I'd much rather be reading (1)	345	40.8
(2)	375	44.3
(3)	90	10.6
(4)	27	3.2
I don't read much (5)	9	1.0

Do you always have something around that you are reading (n=908)	n	%
Yes	867	95.5
No	41	4.5

About how many books have you read in the past month (n=898)		
average	5.06	
median	4	
mode	2	

How many magazines do you read in a month (n=880)		
average	1.69	
median	1	
mode	0	

How old were you when you first started reading SF (n=900)	n	%
Under 15	786	87.3
15-20	81	9.0
20-30	24	2.7
30-40	5	0.6
40-50	4	0.4

Do you read [SF] as much now as when you first started reading it (n=907)	n	%
I read more now (1)	250	27.6
(2)	215	23.7
(3)	229	25.2
(4)	151	16.7
I don't read much SF&F these days (5)	62	6.8

Do you generally prefer Science Fiction or Fantasy (n=901)	n	%
Mainly Fantasy (1)	112	12.4
(2)	187	20.8
(3)	235	26.1
(4)	194	21.5
Mainly Science Fiction (5)	173	19.2

Do other people in your family read a lot (n=905)	n	%
Yes	725	80.1
No	180	19.9

Do you also like SF and fantasy films and TV shows (n=901)	n	%
Yes	830	92.1

No	71	7.9

How much do you like SF and fantasy (n=890)	n	%
About the same as other things I read (1)	30	3.4
(2)	16	1.8
(3)	82	9.2
(4)	352	39.5
It's the best thing ever (5)	410	46.1

How special is good SF&F compared to other writing (n=891)	n	%
It's trashy (1)	5	0.6
(2)	12	1.3
(3)	111	12.5
(4)	284	31.9
It's as good, if not better (5)	479	53.8

Would you say you're a bit of a dreamer, or more of a realist (n=901)	n	%
Realist (1)	62	6.9
(2)	134	14.9
(3)	282	31.3
(4)	268	29.7
Dreamer (5)	155	17.2

Do you think reading SF&F opens you up to new ideas (n=902)	n	%
Not really (1)	12	1.3
(2)	12	1.3
(3)	42	4.7
(4)	187	20.7
Definitely (5)	649	72.0

Do you ever find yourself feeling a bit ashamed to be reading SF&F (n=901)	n	%
I should be reading something more worthwhile (1)	11	1.2
(2)	53	5.9
(3)	56	6.2
(4)	131	14.5
Not at all, I'm proud of what I read (5)	650	72.1

Table 8.　　Attitudes to Science

Does SF help you relate to science in general (n=897)	n	%
Not really (1)	69	7.7
(2)	72	8.0
(3)	141	15.7
(4)	302	33.7
Yes it does (5)	313	34.9

Do you think reading SF&F makes you more likely to believe in "real" science (n=893)	n	%
Not at all (1)	74	8.3
(2)	68	7.6
(3)	198	22.2
(4)	214	24.0
Yes, very much so (5)	339	38.0

Do you think that other people who have doubts about science might be more open to it if they read Science Fiction? (n=896)	n	%
Probably not (1)	84	9.4
(2)	100	11.2
(3)	236	26.3
(4)	263	29.4
It would definitely help (5)	213	23.8

Do you think scientists in SF seem more grounded and understandable than scientists in real life? (n=894)	n	%
I think real scientists are more understandable (1)	103	11.5
(2)	168	18.8
(3)	425	47.5
(4)	153	17.1
Yes, I can relate to them more easily (5)	45	5.0

Reading habits and self-identification

Respondents prefer reading to other activities, with 85.1% reporting a preference for reading. Almost all (95.5%) stated that they are always reading something, with the average respondent reading five books per month and between one and two magazines. Most readers (87.3%) had started reading SF before the age of 15, and 76.5% read as much or more now as when they started. Genre preferences between fantasy and SF are

generally spread evenly, with a small preference for SF among older and male respondents. Most (80.1%) come from families of readers, and 92.1% also watch SF and fantasy films and TV shows. SF and fantasy are the preferred form of literature for 85.6%, and the same proportion state that SF and fantasy are as good as or better than other forms of writing. Respondents describe themselves as "dreamers" more than "realists," 72.1% are proud to be seen reading SF and 84.3% believe that life experience and learned skills are more important than education. Respondents perceive themselves as having good manual skills and to be very good at puzzle-solving. Many believe that they are very good to excellent at learning new manual skills and learning new and unfamiliar ideas. Most respondents consider themselves to be open to all sides of an argument (84.8%) rather than relying primarily on their own opinions. There was a very strong positive response to the suggestion that SF opens readers up to new ideas in general. This is believed by 92.7% of respondents.

Table 9.   **Spearman's correlations: attitudes to science and scientists.**

Categories (P<0.0001)	How much enjoy SF&F	Helps relate science	Opens to new ideas	Increases belief in science	Readers doubt sci. less	Qual. vs other writing
SF&F helps relate to science	0.27					
SF&F opens to new ideas	0.31	0.49				
SFF makes science believable	0.30	0.56	0.45			
Other people may doubt science less if they read SFF	0.22	0.43	0.37	0.56		
SF scientists vs real scientists				0.28	0.26	
Not ashamed to read SFF	0.21	0.20	0.25			0.32
Quality of SFF compared to other writing	0.48	0.27	0.33	0.30	0.21	
Read SFF as much as ever	0.39	0.20	0.20	0.22		0.30

Attitudes to science and scientists

Responses to questions on science and scientists are presented in Table 8. Significant relationships discovered between questions on attitudes to science and all other questions, and significant correlations related to age and gender, are presented as Spearman's correlations in Tables 9 and 10. The number of respondents to each question in Tables 9 and 10 is identical to that for the corresponding entries in Tables 6-8.

Respondents agree that there is a positive relationship between science and SF: 68.6% believe that SF helps them relate to science in general; 62.0% believe that reading SF makes them more likely to believe in real science, and 53.2% that the people who doubt science would be more positive about it if they were to read SF.

Spearman's correlations between the positive responses to science and familiarity with SF are clustered together with moderate interactions. There are, however, only very weak correlations between scientists in SF and real scientists being comparatively

more or less "grounded" and other responses (Table 9.).

Other findings

Table 10.   Spearman's correlations: consumption habits

Categories (P<0.0001)	Gender	Age	Pref. SF or F	How much enjoy SFF
No. Books read last month		0.22		
No. magazines last month		0.22		
Number of SFF books last month				0.36
Like SFF TV/Film also				0.23
Prefer SF or F	0.34	0.24		
Dreamer or realist				0.20
SFF helps relate to science			0.31	

There is a moderate correlation between both age and gender and preferences for SF or fantasy, with older males more likely to prefer SF rather than fantasy (Table 10.), and older respondents generally read more than younger ones.

Discussion

The survey generated a significant response, with 909 forms completed between November 2015 and November 2016. The survey was far-reaching, with responses given from 21 geographical locations, and 18.3% of participants do not speak English as a first language, suggesting a diverse range of respondents. The survey responses indicate that the SF audience has a more balanced gender and age profile today than is indicated by previous surveys. The average reader is in their forties, employed and in a relationship, with female respondents tending to be younger than males. A significant majority of respondents report being educated to university level or above. This reinforces previous audience data that found "astonishing" high levels of education among fans (Berger, 1977: 236).[9] A similar proportion of respondents, however, also

[9] This can be ascribed to sampling bias (see limitations in Appendix E), but the fact that it holds true across face-to-face surveys (at conventions), paper surveys (by magazines) and my online survey suggests that it may indeed reflect a general characteristic of SF consumers.

believe that life experience and learned skills are more important than education, suggesting a more balanced perspective than one focused on academic attainment. Furthermore, respondents watch SF films and TV shows as well as reading SF literature, self-assess as more likely to be good at puzzles than physical skills, and are interested in and positive about real science. More strongly than this, however, they think that reading SF makes them receptive to new ideas in general.

Although there are correlations between support of real science and the benefits of SF as a form of pursuit there are only very weak correlations with scientists in SF and real scientists being comparatively more or less "grounded." This contrasts with the findings of a previous study, focused on children's literature, that indicated representations of SF scientists are negative and unrealistic (Van Gorp, Rommes and Emons, 2014). The findings of this survey may suggest that negative representations of fictional scientists have a limited impact on the attitudes towards scientists expressed by the adult SF reader. The use of the term "grounded" rather than a more clearly prejudicial term may have influenced a less radical response to this question than might otherwise be expected, and could explain why the correlation is weak.

The response to the question about whether SF opens the reader to new ideas is more positive than responses to questions regarding the relationship between SF and science. This suggests that readers absorb more from SF than ideas about science, and SF content is expected to discuss a wider range of new subjects. This is consistent with SF theories that are not constrained by a science focus – such as Darko Suvin's definition of the genre.

Respondents report strong preferences for reading compared to other forms of activity, with 40.8% reporting an absolute preference for reading. This is combined with a high average monthly volume of books (5.06). Almost all (96.3%) respondents started reading SF before age 20, and 76.5% report reading the same or more as when they started. This pattern of consistent high-volume lifetime reading contrasts with general reading surveys in Australia, America and the UK, the geographical locations from which the majority of responses to the survey originated. American readers report reading nine books per year in the 18-29 year-old age category, and thirteen for older readers (Scardilli, 2014). Jacqueline Manuel and Don Carter, in their comprehensive

review of current and historical reading practices of a population of native English speaking teenagers in Australia (Manuel and Carter, 2015), found that since 1952, year 7 to year 12 teenager reading averaged between 1.6 and 2.0 books per month, and in their own 2006-2010 survey that reading volume is remarkably consistent between the 1950s and the present. Numbers of books read monthly by respondents to the SF experience survey are more than twice these values. Manuel and Carter also found that SF was not especially popular with teens, ranking six out of twelve for boys (42%), and eight out of twelve for girls (12%). Fantasy was the first preference for girls and second preference for boys (123). They further describe a body of research that discovered a positive link between reading volume and academic success. Both reading volume and the presence of self-selected, or selection-guided reading options influence this effect. Consequently, the above average reading volume reported in the SF and fantasy experience survey may be related to the high levels of educational attainment of the sample population, with 82.4% reporting a university education. This compares to 46% of the United States population, 50% of Australians, and 46% of the UK population (OECD, 2017). The survey analysis ignores non-SF and fantasy reading habits, and total reading volume may be even higher than reported here. Research carried out in the UK on childhood literacy also indicate that reading levels are low compared to those found in my survey (Clarke, 2014).

In the survey, reading was in addition to interest in SF in TV and film, and this suggests that the reading of SF is complementary to other forms of genre consumption, rather than competitive. These findings indicate a population that is not following a more recent trend of declining reading that is particularly concerning to some educationists, as Sandra Stotsky has described in "What American kids are reading now" (Stotsky, 2016), and the significant impact of literacy upon quality of life has been discussed elsewhere (Dugdale and Clarke, 2008). I was surprised to find no strong Spearman correlations between family reading and the reading habits of respondents. There were extremely weak correlations between family reading, geographical location (0.13), native language (0.12), and gender (0.1) but no other categories. A previous review of the literature on home and family influence on reading has indicated that socio-economic status (SES) has a significant influence on reading habits, but also that home literacy levels have a limited impact on childhood reading motivation regardless

of SES, a result that intrigued Linda Baker, Deborah Scher and Kirsten Mackler who have called for further research into these effects (Baker, Scher and Mackler, 1997: 73). In their exhaustive examination of the relevant literature, Baker, Scher and Mackler state "we cannot determine whether certain factors were more important than others in contributing to leisure reading." (Baker, Scher and Mackler, 1997: 74). It is suggested that influences on reading practices are not easily disentangled. In this instance, however, strong statistical evidence supports the possibly controversial finding that respondent's perception of the volume of reading exhibited by other family members has little influence on their own reading habits and experiences.

A method for increasing literacy among young people might be simply to encourage them to read SF and fantasy, perhaps as an alternative to employing more complex and time-consuming behavioural interventions to the same ends (Cockroft and Atkinson, 2017). One approach to addressing declines in reading has been to recommend a more popular, public investigation of reading characteristics to identify the issues that exist (Albalawi, 2015). As a contribution to this effort, this survey seems to identify one reading group that is not in decline.

The Readers

The audience identified in this survey is characterised by openness to and belief in science, consistently high-volume reading, and a high level of education. Respondents are sympathetic towards science and scientists, believe reading SF inspires scientific comprehension and positive attitudes to science, and reading SF also has the potential to positively change new readers' attitudes towards science. Respondents watch TV and film SF and fantasy as well as reading, and the number of books read by respondents is larger than the findings of general reading surveys, and appears to be independent of family reading habits. Reading is complementary to other forms of participation with genre rather than competitive. It has been found elsewhere that SF and fantasy are popular among younger readers, and that self-, or guided-selection of reading creates the most educational benefits from reading. Open acceptance, and encouragement, of SF and fantasy reading at a young age might therefore improve the adoption of

persistent and high-volume reading habits that are of benefit to cognitive development and academic success.

Investigations suggest this is the first methodical attempt to describe the findings of a general on-line SF and fantasy audience survey that was not distributed by a SF publisher, and adds to the literature by providing a more neutral and broad reaching account of the interests and attitudes of this audience than might be found in surveys with a more commercial intent. My literature review indicated how the role of SF in the fields of education and advocacy has become increasingly important, and how it responds to the evolution of cultural change. The gathering of popular opinions and attitudes based on empirical data adds to the resources available to researchers who intend to integrate SF into their research. Researchers may also be able to use a more accurate knowledge of what SF and fantasy audiences think about science to increase the effectiveness of the applications of SF in research contexts. It is, however, clear that the SF audience includes a wide range of people, and this seems to reasonably suggest SF is a genre that has a common appeal, and may be confirmed as a reliable source of information on broader cultural values and experiences than might have been expected previously.

SUMMARY OF PART I: SCIENCE FICTION

The literature review, and demographic and attitudinal responses to the two surveys, provide strong support for the relevance and reliability of SF as a source of cultural information. To make a meaningful evaluation of contemporary cultural values from the content of SF magazines, it is necessary to understand what SF is, as a cultural artefact in its own right, and to establish if any insights that are gained from analysing SF can be relevant outside of a very narrow focus of interests. The literature review established that from an academic perspective SF is being increasingly used as a generic tool, especially for education and advocacy, and in this role is considered to be a valuable indicator of popular interests. The ease and clarity with which SF audiences recognise and categorise SF demonstrate it is recognised by commonly held and consistent characteristics, without which it would be a random, rather than a precise, instrument

for inspecting cultural values. The persistence of techne as the core of SF immediately positions the genre within a practical domain of human experience and understanding. The consistency and clarity of this definition clearly runs counter to postmodern theories which suggest that whatever the content of SF is, its relationship to human culture is transient and unknowable, which would deny the validity of cultural indicators drawn from genre content. Finally, we find that the SF audience does not reflect a merely minority interest. The demographic data finds an audience who are evenly distributed by age and gender, and who come from a wide range of backgrounds, with a variety of interests that are not exclusively focused on SF.

Having established the relevance of SF, the question is what method might best be applied to illuminating and interpreting the cultural impressions that have been imprinted on it.

METHODOLOGY

The development process of the research methodology was influenced by a common feature of the two main quantifiable studies of speculative fiction I discovered in the literature review. These were those of Rabkin, and Bina et. al. Both employed a coding system for selection of content according to a pre-established schema before analysing the content in more detail. Eric Rabkin (Rabkin, 2004), co-founder of the Genre Evolution Project (GEP), established a coding schema by which volunteers and research assistants might code texts as they are read, with secondary reading to validate the classifications of the first reader. The resulting database may be cross-referenced to count frequencies of occurrence of coded items and identify relationships between them, using statistical methods to validate the results. An issue with this approach is that it generates results that are limited by the structure of the original coding – this (comparatively) early work in this field was not able to take advantage of the tools that are available today for corpus text analysis, and the use of database storage of pre-classified codes was the only realistic way to approach the analysis undertaken. Today, the increased computing power available makes it feasible to use computerised sorting and filtering comprehensively across a very much larger body of work and to do so sufficiently rapidly and conveniently that coding can be revised, and the results reiterated without the vast overhead required to make changes to an established structural "top-down" coding system such as that employed by the GEP. Bina et. al. in their approach to using thematic analysis of prominent SF works to inform strategic funding initiatives around scientific innovation (Bina et al., 2016) only made use of a small number of SF examples – 149 cases from the nineteenth century to the present day, and their methods for selecting these were questionable in terms of their objective rigor, as I have described previously. Unfortunately, both these approaches depend upon human elements of preference and bias both in the development of the coding schema and also in the application of the schema to select and examine the subject material. This is especially problematic when we are looking for material that identifies cultural change across a long historical period, as the human interests and cultural values that are to be explored may not have been included in the coding schema for that topic precisely because they are not currently considered relevant.

It seemed to me that some pre-selection bias could be minimised if the initial

selection criteria were as "mindless" as possible: based on criteria that were too simple to require expert, creative processes to devise them; searches for individual words, rather than concepts or phrases; and not allowing any close reading in the selection phase. Qualitative coding would all be made entirely after the selection of data sources. This allows the qualitative analysis – the thematic reading of the output – to occur at the end of the sequence, after a selection process that has not been subjected to strong bias, and has employed replicable, objective terms. Where this approach is most rigorous is in the analysis of text using terms that are the least equivocal. An example of a "single issue" that can be readily analysed using these tools is Dianetics (Hubbard, 1950a), as I will demonstrate in the first case study in Part II. A keyword search on"Dianetics" and "Scientology" cannot be misconstrued. There are also words in English that have very limited applications that can be linked to specific subjects – here a number of words may have an evident thematic link. An example would be the combination of the words "robot," "android," "cyborg," "clone," and their derivatives. These are words that are very strongly associated with posthumanism. It is inevitable that the initial selection of words for a simple search is going to be decided by the researcher, and will include words that seem most pertinent to them. This is an example of how the "expert" characteristics of a specialist provides input to the process that has potential for both positive and negative outcomes. I suggest, however, that initially identifying sources by the presence of a small number of key words is less subject to selection bias than qualitative selections based on reading titles, or summaries. Moreover, the technical ease with which an initial search can be made once a corpus has been digitised means a researcher can readily repeat the search with additional terms if these emerge from the closer reading of the initial texts. Additional sources identified can then be appended to the study.

PROXIMAL READING

Menadue, C. B. (2019). @rts of D@rlcne55: A Pilgrim's Progress Towards a Humane Digital Methodology. [Manuscript in preparation for invited resubmission to *Digital Humanities Quarterly*].

Menadue, Christopher B. (2017) *Proximal Reading: a Network-Scaled Approach to Digital Literature Analysis.* Presented at: CASE HDR Conference 2017: Intersecting Fields, 30-31 October 2017, James Cook University, Townsville, QLD, Australia. doi: 10.4225/28/57634A978EC88

The process of creating a methodology suitable for analysing an extensive and substantial digital literary corpus was arduous. Despite the difficulties, the journey led to the satisfactory realisation that more traditional or eclectic approaches can be enhanced through the application of digital tools, but not supplanted. Furthermore, the multitude and flexibility of digital approaches, although daunting at first, can provide "fit-for-purpose" solutions that enable previously unthinkable research (primarily simply on account of scale, but also coding and statistical considerations). It has become apparent to me that a methodology need not be locked into a rigid structure, which would not respect the variety and richness of human culture, but could take advantage of this variety to be scaled by degrees of digital intervention to answer a specific research question, or to suit the aims and abilities of any specific researcher or collaborative group. I have been pleased to be able to retain traditional, qualitative, non-digital approaches alongside more quantifiable techniques. In my view, this can create a satisfactory synthesis that may be appealing to researchers who currently work with literature but are apprehensive about the potential of the digital humanities to transform their work, or even have fears that digital approaches will make their work redundant. If there is only one thing that I have learned from this voyage of discovery on the seas of data, it is that there is no real likelihood that digital tools will eliminate the requirement for humans to consider, discuss and imagine whatever it is they might find using those tools – meaning can only be derived from human participation in the process.

My description and explanation of my methodology is by necessity closely bound up in my own interests, skills, and experience – and the process of trial and error (often the latter), which has led me to a workable solution. The following is an attempt to describe that process and put this digital investigation into a very human perspective, rather than simply describe techniques. The formal application of the methodology to each case study is presented in my elaboration of these in Part II.

'Wonder if the computer's finished its run. It was due about now.' [George said].
'Look,' whispered Chuck, and George lifted his eyes to heaven... Overhead, without
any fuss, the stars were going out.
– Isaac Asimov, The Nine Billion Names of God.

It is four in the morning. I have been investigating what Nigel Fielding and Raymond Lee describe as *Computer Assisted Qualitative Data AnalysiS* (CAQDAS) (Fielding and Lee, 1991), and I am unhappy. The requirements of my research in English literature might have been met by reading a few delightful books, or perhaps a couple of moving poems, and creating some carefully nuanced and polished text. Instead, I am empathising with Wilbur Mercer in Philip K. Dick's *Do Androids Dream of Electric Sheep* (Dick, 1968): I feel I too am struggling up a barren mountainside towards an uncertain goal, all the while being pelted with sharp rocks by unknown assailants. In this case the rocks are application crashes and installation errors – but they still hurt, if only my pride. I have spent many of these hours struggling to install RQDA (Huang, 2016) on my MacBook in the face of a frustrating cascade of dependent-library errors, and, like Chuck and George, I fear that the stars will, indeed, go out before I have finished. Finally, exasperated, I give up on the Mac. It takes a mere fifteen minutes to install RQDA on a PC instead, and it works just fine, without quibble or error. Just like every other implementation of CAQDAS, it actually does do everything I need, as my requirements are primarily focused on text-mining, but it turns out to be a bit harder to use than NVivo (QSR International, 2016), and not significantly quicker. I am embarrassed by these experiences as I am not entirely lacking in technical skills – I have even taught digital literacies to students, but my past performance is clearly no guarantee of future success.

My quest has been to find a CAQDAS implementation that can quickly process queries on my four thousand texts – motivated by my experience that NVivo takes all night (literally) to run queries on my extensive corpus – but I am thwarted by my technical deficiencies, and the vagaries of technology. RQDA is not much speedier than anything else I have tried: ATLAS.ti (Scientific Software Development, 2018), HyperRESEARCH (Researchware, 2016), MAXQDA (Verbi, 2017), AQUAD (Huber,

2018), QDA Miner (Provalis Research, nd), KH Coder (Higuchi, 2018), Rapidminer (Rapidminer, 2017), and GATE (GATE, 2017). I am discovering that all these have similar functionality to NVivo, but are harder to work with. Except GATE, which seems to be entirely admirable. GATE is faster than NVivo, but appears difficult to learn and master, and I am under pressure to complete my PhD. I find I must allocate all my system memory to GATE to make it load all my text without crashing; a minor inconvenience compared to some of the other options. I am coming to accept that there is a reason why it is termed Computer *Assisted* Qualitative Data AnalysiS (my italics). I have confirmed this through a process of desolate, sleep-deprived, empirical experimentation: you have to do the hard work yourself, and not expect the tools to work their magic by themselves. Self-driving data-analysis remains at present a mere twinkle in Elon Musk's eye. For me, it will come down to a choice between using R extensions (R Core Team, 2018) for language processing, and scripting all my requests manually, or sticking with NVivo. I had started off my PhD wrestling with R. It will take me little reflection to decide to stick with NVivo – my university has licences for it because the social scientists use it for survey coding. Buying a licence for an alternative commercial application is beyond my means in any case, so not only has my quest been futile, it has been fuelled by wishful thinking, and my native stubbornness. My funding is too meagre for me to justify paying for software, and also effectively bars me from attending conferences full of people who might tell me the answers. This is because I live in the remote tropical paradise of Far North Queensland, Australia, and I cannot expect to have everything.

When I envisaged my PhD, I knew I would investigate how SF had something to do with its contemporary cultural and social change. If this included science, so much the better (Liedl, 2015, Longo, 2016, Luokkala, 2014, Macdonald and Macdonald, 1982, McFadden, 2015, Menadue and Cheer, 2017). Considering how strong the social, cultural and historical focus would be, I found approaching this in an ostensibly English literature PhD was intimidating. I was unsure how my PhD subject fitted into English Literature, apart from the fact that my sources were written in English.

My university is small, and the faculties are correspondingly tiny. Consequently, I put the case for my proposal to a Byron scholar, who was candid about being in territory that he knew little about, and warned me to rely on his supervisory support for writing advice and encouragement, rather than corpus knowledge. When I had planned my PhD, I had, naturally, spared a thought for methods – I chose SF magazines due to my special attachment to them, derived from discovering my father's modest collection in the attic when I was eight years old: editions of *Astounding Science Fiction* from the early nineteen-fifties, with fantastical covers. They smelled strongly of decaying newsprint, and were filled with delightfully apocalyptic stories, mysterious adverts for trusses and body-building (Fig. 10), and bizarrely archaic editorials.

Fig. 10.   Charles Atlas: A new man in 15 minutes a day (Atlas, 1941).

If only my CAQDAS might be so swift…

The richness of content associated with the stories would later attract me to the outward reading method described by Robert Scholes, Sean Latham and Clifford Wulfman (Scholes and Latham, 2006, Scholes and Wulfman, 2010), as an excuse for rifling through this exotic content, as well as a way of exploring the cultural environment of the period more fully. I am not an expert on English literature, but I like to read – and this, along with a fascination with adverts for anti-dandruff shampoo and editorial features on perpetual motion machines, had attracted me to the technique of outward reading. This creates the happy opportunity for reading a whole magazine when looking for contextual information, rather than only the isolated context of the terms being investigated.

The Backstory

As an undergraduate, I had built a modest collection of SF magazines, and was pleased when I went to my university library and discovered theirs was less impressive – it did not occur to me that this was because the university considered this "literature" to be entirely inconsequential. I studied social and political science as an undergraduate, along with some anthropology and psychology, and recognised how SF magazines of the fifties were full of apocalyptic, post-nuclear themes, which seemed related to the society and culture of their time.

I had come of age in the UK of the 1980s, when global thermonuclear war was always four minutes away (Fig. 11), and anxious people built shelters in their back gardens. Two decades after I graduated, I was working in the research directorate of a regional Australian university when my role was deleted in a restructure. As I considered what to do next, a colleague suggested I do a PhD, if only because the opportunity was there. After a long talk with my wife – who

Fig. 11. We're all going to die: post-nuclear SF (Pattee, 1950)

agreed, conditional on a scholarship – I submitted my application on the deadline two weeks later (experience of working in a research office makes such things possible). I proposed to discover significant links between magazine SF and its contemporary culture. I was guided by intuition, and at this point I knew nothing about methodologies used in the digital humanities, or even that there was such a thing. If I had done more background research, and discovered such useful material as David Hoover's *Textual Analysis*. I would have been encouraged by his statement that "it would seem perverse not to use an available digital text of a work for searching for a vaguely remembered passage that is important for an argument or for locating every significant example of a word or phrase" (Hoover, 2013: 1). I would also have benefited from his advice that

"'Planning' may take a very loose form at first for an exploratory project based on a hunch… more explicit planning will eventually become necessary to avoid the wasted effort of a poorly conceived study" (Hoover, 2013: 4). This might have made me more careful to control the impulses that would lead me in relentless pursuit of the "perfect" CAQDAS. In my defence, when I had last been a student, digital libraries were unknown, and I was beginning this endeavour with great enthusiasm, but completely blindly. I exuded confidence of inevitable success that must have been a wonder to my puzzled supervisors, especially since they freely acknowledged they were not quite sure what I was trying to do. The resulting exploratory process has been an intriguing aspect of undertaking literary analysis using digital tools at a regional university: especially one that does not have a record of work in the digital humanities.

I was blissfully unaware that over the horizon a bleak and lonely wasteland was waiting to be explored. My proposal was approved, I was awarded a scholarship – much to my surprise – and I was off. I then began to wonder where I was off to, exactly. Examining how the content of SF magazines compared to the culture of the day suggested some form of thematic analysis (Braun and Clarke, 2006, Clarke and Braun, 2017). Thematic analysis had already been used for analysis of fiction, even of weird fiction (McMahon-Coleman and Weaver, 2012, Zamani and Abbasi, 2015). Initially the focus of my application was more on science communication, and I had included surveying and interviewing in my PhD outline as I thought they might be ways of teasing this information out from famous writers. This was entirely aspirational, as I had no likelihood of meeting anyone face-to-face – being bound to a campus one thousand six hundred kilometres from the nearest major city. But I was inspired, and full of insane hope. As I wound down my redundant job, and geared up to my PhD, I indulged in a frenzy of magazine buying; my collection increasing from a couple of hundred copies to over a thousand copies in a matter of months, and nearly two thousand by the time I commenced the project. One day, as I was sitting in my office, in a fort I had built out of boxes full of SF magazines, it occurred to me that the task I had set myself might be impossible. If I were to rely on what I knew already about the genre, my research would be hopelessly biased. If I was to retain objectivity I would have to read this huge quantity of work I was collecting. I was very happy with my wonderful

library, but I could not comprehend it.

Surrounded by piles of magazines, each the size of a small paperback book, I realised that to have the time to discuss what I had found by the end of my PhD (allowing me two years of preparation), I would have to read and annotate the text equivalent of the weighty SF classic *Dune* (Herbert, 1965: Fig. 12), every day, without fail, for two years. Much as I like to read, this task was impossible.

In my research role, which continued for a few more months, I assisted academics with grant applications. I would fret about my PhD issues, while they waited patiently for me to stop complaining and help them with theirs. One of my customers was a linguist, who suggested: "Why don't you analyse this, uh, 'corpus,' using the R Natural Language Toolkit, AntConc, Wordle and tools like that." I had no idea what he was talking about, but I did not want to appear to be entirely ignorant, and relied on Google to fill in the blanks after he had left. I was delighted to discover there were computer programs that could help me with my problem. I marvelled at the fresh vista that had opened up. I brought the subject up with my primary supervisor, and it turned out he was more aware of digital approaches than I had realised – he lent me his copy of John Burrow's landmark work *Computation into Criticism* (Burrows, 1987). The message I took from it was that someone had spent years in the eighties (while I hid under a desk in the expectation of impending Armageddon) using the modern computational equivalent of a string of beads to find out how many times Jane Austen had used certain words in a handful of books. I was comfortable with computers, and I was confident I could do much better than Mr. Burrows – I had, after all, done a bit of BASIC programming when I was eleven years old.

Fig. 12. **A modest daily read of 518 pages: Frank Herbert's *Dune*.**

Corpus Assembly

I realised I had a significant problem: I would need to have digital copies of all my magazines to be able to analyse them. I asked a librarian if they knew about turning

books into files, and they did. I was introduced to the concept of "digitizing," and the field of "digital humanities." This seemed highly promising, until I was told the university did not actually have a book digitizer, or they might have one, but it was on another campus five hundred kilometres away. Some online investigation revealed that digitising was not a matter of putting a book in a machine and letting it get on with it – especially for a crumbling, ancient, SF magazine printed on pulp paper. Some manual work would be required. I pondered cutting the spines off my magazines and feeding them through a university copier, which would send the digitised pages to me by email. This would mean destroying my collection, which was a painful thought, but a simple calculation revealed it would take a long time to scan three-hundred and fifty-thousand double-sided pages, regardless of what I did with them next. I was not able to identify anyone at my university who had any conception about the complexity of my project, until I talked to the linguists. I am in such a remote location that linguists flock to it from all over the world to learn unique and endangered languages, spoken by a handful of people who are sometimes outnumbered by the people who study them. For want of a better alternative, the university had allocated me a cubicle in the midst of this strange tribe of academics, who appeared as alien to me as any characters in SF. They are all fluent in a minimum of three languages, and manipulate word forms and sentence structures from exotic dialects into abstruse formulas. I can never discover if they mock me behind my back for my simplistic methods, because they could be doing it in a language no-one else speaks. A benefit, however, was the realisation that what I was attempting was indeed possible.[10]

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[10] My standing improved when I discovered my collection included a couple of very obscure SF short stories from the 1960s, written (under a pseudonym) by a senior member of the department. I then experienced the surreal and unexpected pleasure of discussing the character and interests of the famous SF editor and author Frederik Pohl (1919-2013) with someone who had known him when he was editor of *IF* and *Galaxy*. All without having to move from my desk.

Fig. 13. Exotic SF from Project Gutenberg

In those early days of developing my project, I made the chilling discovery that other people had done, and were very active in, what appeared to be the sort of thing I was doing (Forlini, Hinrichs and Moynihan, 2016). I was relieved to find that nobody seemed to have done *exactly* what I was doing with a SF corpus, but our library could not afford to access all the academic publishers, so I couldn't be entirely sure. There were clearly academics working with digitized texts, so I searched for digitized SF magazines. As a logical starting point, I searched Project Gutenberg (Hart, 1992), and found someone had digitized twenty very early copies of *Astounding*, and sixty-three individual stories, as well as a few exotic titles (Fig. 13). A welcome find, but sadly not nearly enough for meaningful analysis. Plenty if I was going to do a traditional English Literature PhD, and write a monograph on a very few things I had read, but not for my ambitious project.

There are, however, a great many SF fans. As well as the ones who dress up as Spock, Imperial Stormtroopers, and Black Widow, there are those who collect SF magazines. Early issues are expensive – I have been unable to afford much before nineteen-fifty – and I was sure others would have been similarly frustrated. We may imagine SF fans are somewhat nerdy – although I subsequently found in my (digitally distributed and analysed) surveys that this is not necessarily the case (Menadue, 2016, 2017a, Menadue and Jacups, 2018). Some fans could be expected to have computer skills, and obsessive-compulsive traits. If anyone was likely to have spent ten hours a day digitizing SF magazines for sustained periods of time, they would likely be an SF fan. Meticulous online hunting for fan groups followed, and the discovery that there was indeed a semi-clandestine network of mysteriously named people, presumably

obsessive compulsive – possibly living in their mother's basement (but I later discovered this is not so certain) – who had been scanning magazines furiously for decades.

My collection – which I thought was massive – was less than ten percent of the total SF magazine issues of the twentieth century, according to the authoritative *Science Fiction, Fantasy, & Weird Fiction Magazine Index* (Miller, Contento and Stephensen-Payne, 2017), and was hard copy only. It was modest compared to what fans had digitized. After finding the right newsgroups and download sites, I collected over four thousand digital copies of unique magazines, including all the early editions of major titles such as *Amazing Stories* and *Astounding Science Fiction*. This was excellent. Unfortunately they had all been compiled in comic book format (cbz) for easy reading.

The text was not searchable by computer – each page was a photographic image (jpg). I did not think this was a serious problem, I could carry out optical character recognition (OCR) on every page and all would be fine. My faith in the utility of computers is almost absolute – a product of my early childhood experiences writing games in BASIC. I believed that if you could imagine it, a computer could be persuaded to do it. The most suitable software for the task seemed to be Adobe Acrobat Pro (Adobe Systems, 2018a). All that was required to create a digitised text copy of each magazine was to extract the image files from cbz files, collate them sequentially into a single portable document format (pdf) edition, perform OCR to extract the text from the pdf, and save this in a suitably named text file. I would then repeat this four thousand times, and my library would be ready for analysis. On the first day, I was very excited.

By the end of the week I was less enthused: I could not carry out the conversion fast enough manually. Some sort of automation was required. I looked to the Automator application bundled with the Mac operating system, which runs macros to carry out a range of programmable functions, for answers. Automator has specific in-built tools for manipulating and processing pdf files (See Appendix G for more details). These were initially unfamiliar, so I searched online for friendly advice. My favoured source of solutions became macosxautomation.com – the unofficial Mac OS developer site
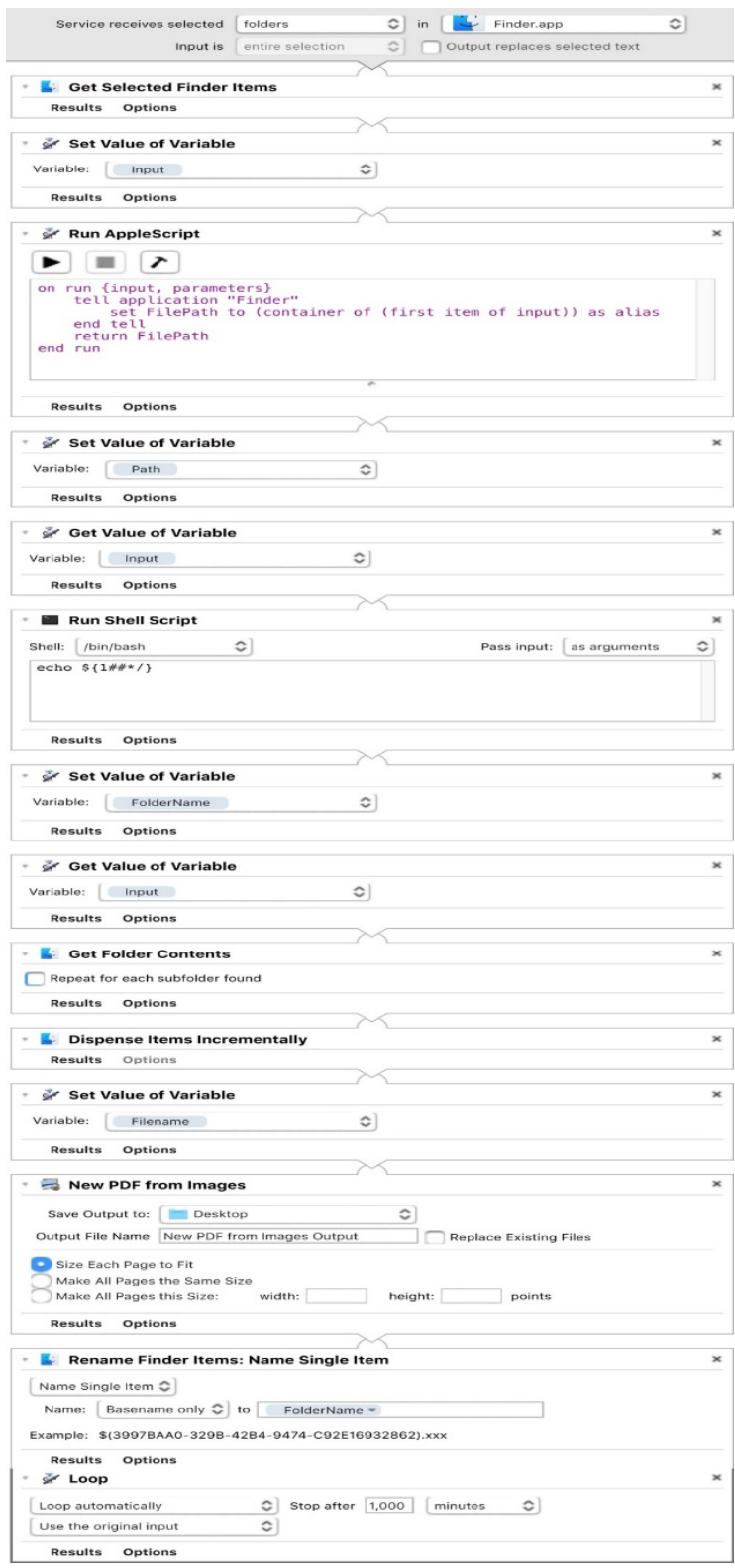
Fig. 14. Automator Script that combines images into pdf files

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My faith in the inevitability of success also led me to Stack Overflow (stackoverflow.com), probably the best online source of informal programming expertise. Within a matter of hours, I was running an Automator script (Fig.14) that would collate all the pictures from a folder, assemble them into a pdf, and save the pdf with an appropriate name. I could then use OCR to find the text in the pdf (there is a standard Automator script that performs this function), and save this as a text file somewhere else, with the same name. That was the vision. This actually took me about a fortnight, but to make a fair assessment of the practicality of my methods I felt I had to do everything for myself, with the trial-and-error inefficiencies this entails. This process created four thousand four hundred and thirty-one digitized texts. I was now ready to explore this body of works, and test my emerging hypotheses.

My first attempt consisted of a word frequency analysis, frequency by decade, to benchmark changes over time in magazine vocabulary to changes in the general, and huge, English literature database that had been compiled in *Google Ngram Viewer* (Michel et al., 2011) – I thought perhaps if I knew when and how frequently people talked about "Armageddon" and "Apocalypse" in SF I could map changes in frequency over time against Ngrams results to identify any SF-specific bias, and find correlations, or the lack of them, with historical events of the period. I painstakingly copied a suitable script from a post on Stack Overflow into the R package on my Mac and let it work its magic. The result was spectacular. I had created a huge data file of word frequencies for the entire collection, from nineteen twenty-six to the end of the millennium. I was very excited to have the first digital output for my PhD, and only eighteen months had passed. I was clearly on track to finishing in four, maybe five years.

Text Laundering

For the sake of somewhere better to put the output so I could read it more easily, I opened it with Microsoft Excel. Excel refused to load four million unique items, so I checked Stack Overflow, updated my Excel and used the newer xml format (that saves as .xlsx files). I then discovered that there were all sorts of words present that did not exist in the English language, not even the SF dialect version. Words like "A1l," or "an0tlner," or even "!!—111.. p." This explained why, rather than the few hundred thousand words I was expecting, I had four million words. Three million or more of them were not real words at all. I cursed the feeble OCR of Adobe, and wept over the futility of my efforts. I then pulled myself together, having found that the student in the cubicle next to me had not noticed – their attention was intently focused on dissecting the structure of a minority dialect spoken in Highland New Guinea. I went back to the original works, and discovered the reason why the OCR included such gibberish. Eighty years of slow decay smudges the ink printed on porous, uncoated, pulp paper (Fig. 15).

Fig. 15. A smudgy page, ripe for OCR…

In my naiveté I tried changing contrast, sharpness and other characteristics of the images, doing this painstakingly and manually in Adobe Photoshop (Adobe Systems, 2018b), and tried again with the "improved" version of the images. The results were no better – naturally the people at Adobe had already integrated "smudgy text" processing into the application. As an alternative, I wondered if the wizardry of Mac Automator could be used to clean up the text post-processing. A return to Stack Overflow led me to "regular expressions" (regex) – simple commands for manipulating text, and some ideas

about script-based programming in python (van Rossum, 2018). After more searching and Stack Overflow queries, I found many ways of achieving my goal with regex. I suspected the process might require significant computing power to process all my texts, so I asked to use the university supercomputer. After listening to the person in charge for half an hour, and nodding sagely, I looked out of the window and decided not to follow this pathway after all. It seemed to lead into a potentially bottomless abyss, with a warning sign at the top stating: "Here be dragons." After a week of experimentation, I had created a regex script that ran within Automator, which would speedily remove all the non-alphanumeric characters from the files. Due to a glitch in my implementation, it destroyed the hard drive in my Mac by thrashing it to death over four days of continuous running time. I had managed, however, to make the text in the files look much less threatening by removing all the "111!!!!!lllllooooh1" entries, and replacing them with "lllllooooh." It was progress. I replaced my hard drive with a faster solid-state one. I wrote ever more complex regex to do things such as deleting additional sequential occurrences of any letter more than twice. This was satisfying work, and turned "lllllooooh" into "llooh." It didn't make more sense, but it did look more like English, and as a benefit I had learned much about how programming today was very different to what I had been expecting based on my childhood experience. It was unfortunate that the results were not what I wanted. Learning from my mistakes, I approached a fresh PhD student who I had not yet burdened with my problems. He suggested I ask one of the computer programming students at the university for help. I smiled, baring my canines, but it really wasn't his fault that this obvious resource had not occurred to me. I emailed a programmer he had recommended – I didn't see them face to face, of course – they lived far, far away in an office decorated with *Star Trek* posters – and received a remarkably short python script by return of email. I tried it out, and with minor tweaking (consulting Stack Overflow) it worked perfectly. In half an hour I had a better, quicker, happier version of my text – cleaner than the one I had spent a fortnight over on my own. I let it run on one of my early editions of *Astounding Stories* and I was impressed by the results. Using the scan of Fig. 15 as the source material, the OCR had converted:

```
' .. / .
-there she was WAITING AT THE CHURCH
\\"/,- c· 1.: I I
-: .r r·Clr·cI;JII,·,.: \\'
Annsq>tier"I.I,. .. by l'wI.. .
., . . '·' r "'"' lt-rnrenr· . . . -rstenne . '"·'.f"l" l':rtL\L" ..,- h,-.. I I .rtrun "'
riJ,.nwllc/,
l.:nu\1'd <.rtI "'"'" Tl ' l:rt j'o11r /.n-:ul ·. It'll you will
 F:"ri I' ' " Ml·r·r·r,.r. purer (Astounding Stories, 1938)
```

into:

> there she was WAITING THE CHURCH I Clr JII Annsq tier I by wI lt
> rnrenr rstenne rtL I rtrun riJ nwllc nu rtI rt o11r It you will ri purer.

I carried out a word frequency analysis of the cleaned up versions against the original ones, but found to my surprise, and subsequent chagrin, that both versions provided output that was virtually identical. I had not changed the frequency of occurrence of "real" words, just removed some of the non-words. Since I was only interested in words that occurred above a certain frequency this made no difference. In my thematic searches I would be looking for occurrences of very specific words– such as "cyborg" or "volcano," and these were either there, or they were not, regardless of the surrounding junk text. I still had faith, however, and I reasoned that there must be ways of improving accuracy by performing an "autocorrect" of faulty versions of words: "D@rlcne55," for instance, should be readily convertible to "Darkness." I had already noted that lc for k and ri for n, not to mention li for h, were common

errors found in OCR of my aged pages, so this type of error could presumably be fixed with the right script. I found another programmer, and he offered to look into it. He came back to me a few days later with Peter Norvig. Not the *actual* Peter Norvig (Fig. 16), but an implementation of his dictionary-matching script for comparing faulty text against a reference dictionary to find possible errors (Norvig, 2016). This was wonderful, except that it proved impractical for my research – in my text there were many non-standard words, and gibberish, and there was a danger that I would lose words that were important (like "Scientology," for instance) unless they were in the text-matching dictionary file, which would have to be huge – possibly almost as

Fig. 16. Peter Norvig (Norvig, n.d.)

large as the original texts. This would take a very long time to process, and a dictionary-matching system might "correct" nonsense characters into words that did not occur in the original. So "111!!!!!lllllooooh1" might become "oh," when it was really an OCR misreading of the border around an advert. I parked Norvig in a virtual garage, with the regex and python scripts, and surreptitiously dropped the USB stick in the river. An interesting excursion that had added precisely nothing to my PhD, but had been part of my process of evolving into a "proper" digital humanities researcher. Unsurprisingly, in retrospect, these issues have been identified in the analysis of similarly-smudgy newspaper text, and researchers have come to similar conclusions regarding a substantial corpus: that for some research aims (e.g. my own) this is a "desirable but not essential" process (Strange et al., 2014: 51). A happy result of this toil, however, was that I gave an in-house conference presentation on text processing which was attended by at least a dozen people – four percent of those invited – so, it was a tremendous success, despite being irrelevant to my actual study (If my mother had come it would have been five percent, but fifteen thousand kilometres is a long way to go and observe your son's moment of glory). This was when I realised that even though I may care how

aesthetically pleasing my text looks, the computer is unimpressed. Pretty text does not improve statistical results, or add significant words to a search. The positive outcome of this process was that I now had a large volume of digitised text, from many books, and due to my foresight, the files all had identifiable names like: *Amazing (v1n1) 1926*. This gave me a feeling of quiet satisfaction that outweighed the difficulties I had experienced.

Analytical Beginnings

As an example of my methodological process, something I had planned to do from the outset was to find out how Dianetics (the "Bible" of Scientology) had appeared, been received, and mutated since it first emerged in the May nineteen-fifty edition of *Astounding Science Fiction* (Fig. 17). I looked in the .xlsx file of my word frequency search created by using the R statistical package, and found three hundred and eighty-nine occurrences of Dianetics and Scientology. I now needed to know the context of
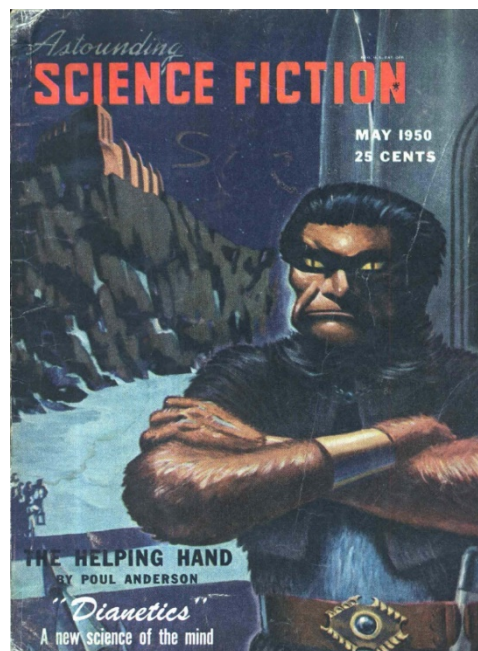
Fig. 17. It's Astounding

these was significant, or my major exposé would be merely an embarrassing wardrobe malfunction. I experimented using the built-in Spotlight search engine on my Mac to find files that contained these words. This works, but I had to open up the files in a text editor and search again to find the words in their original context. For proper analysis it would be necessary to go to the hard copy (if I had it) or find the photographs of the digital copy to see it in the original form. Possible, but laborious. I explained my struggle to the colleague who had originally suggested I do a PhD. She was analysing survey transcripts and suggested I use Nvivo. I concealed my ignorance by nodding sagely, and googled it afterwards, as had become my customary practice. It seems in retrospect that I was, even if more often by accident than design, "allowing the theory to emerge as necessary" in a structured framework, as described by Debbie Richards

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(Richards, 2009: 2:2). I was learning something from my isolated attempts to build a coherent and effective solution to my research problem.

In common with other CAQDAS applications, NVivo stores files in a database and provides various ways of searching, coding and linking the content of these files. It includes some tools, of varying degrees of complexity and comprehensibility, for visualising the results. NVivo can create word clouds without having to put text into an online system such as Wordle, even if the results are not as pretty. But "pretty" is not often associated with "respectable" in academia, as I had already discovered (Billig, 2013, Sand-Jensen, 2007), and my work might seem more rigorous now that I was not cleaning up my text before analysis. It was about this time that I started using Gephi (Bastian, Heymann and Jacomy, 2009). I stopped using it shortly afterwards, along with all the other CAQDAS I had been experimenting with, for two reasons: one was that I had run out of friends to help me get them working properly, the second was that previous experience suggested I might spend three weeks getting something to work in Gephi that was either completely unnecessary, or could be done in five minutes using a different tool. I was also running out of time, and the university had a licence for NVivo. After downloading try-before-you-buy versions of the alternatives in my search for the perfect CAQDAS, and others which are freeware, I decided I might as well use what was routinely available, and moreover had a modicum of technical support and local knowledge.

I discovered that, although NVivo does a good job of managing a library of resources, and coding them, and enables text-in-context searches and word frequency analysis, it is very slow when you ask it to work with more than a hundred files at once. I used to think it had crashed when I asked it to find, for instance, all the occurrences of the word "robot" in my collection. I recognised that NVivo suffers from the problems of software that falls into the "bloatware" category – including lots of features, at the expense performance. For example, NVivo opens another program (Libre Office) on a Mac each time it opens a text file, and closes it again afterwards. This is like going to the shops to buy a toothbrush and toothpaste every single time you brush your teeth. I became accustomed to setting up a search and letting it run overnight. To someone who grew up with computers in the eighties this should not seem troublesome, but I am now,

just like everyone else, impatient and have unreasonable expectations.

enlightenment
entrepreneur director entertainer
corporation community astrophysicist existence
blockbuster tenured bookshop
experimental traveler photographer fencing
degree paid full screenwriter daleks
president colonist
fictional musician editor education filmmaker
event books professor blower
teaching scientist lord world developer
financial aboard teacher author art science comic
botanist write artist • time designer data
academic
doctor marine writer novelist
amazon novel collector
beach fantasy librarian researcher course
everything biologist ceo camel
better college plus curator day
change astronaut now journalist
enough engineer publishing none comber
archivist professional game architect
administrator geologist museum coach
counsellor america archaeologist
editing anthropology crewmember
exploration business charity difficult
conservationist farmer

Fig. 18.   What do you want to be when you grow up?

I explored the features of NVivo – word trees, webs that show links between tagged words and other words, codes and other codes – but realised that these were not necessary. I only needed to identify issues that contained relevant text, although I did create some word clouds with NVivo that seemed meaningful (Fig. 18 – the results of a question on preferred profession included as part of my first survey, and perhaps influenced by the number of responses from the Science Fiction and Fantasy Writers of America group). When I asked myself whether my approach was "fit for purpose," I realised that what I had started out wanting to do – examining the evidence for cultural links between SF content and the real-world context – was strongly grounded in English literature and the social sciences. I had, after all, only been looking for a way to find the text I wanted to read and discuss – and the software wasn't going to do this for me. This was an epiphany. My obsession with software and the possibilities for the digital analysis of texts had blinded me to the fact that I only needed the technology to help me do what I had originally intended – a thematic analysis of objectively chosen sources. On the way to this realisation I had learned a great deal about my capacity for frustration, but the CAQDAS requirements were not as complex as I had tried to make them. I immediately employed this primitive understanding to write a simple (but a little

provocative) paper, published in a friendly (but somewhat obscure) journal, to demonstrate that I had achieved something (Menadue, 2017b).

Surveys and Statistics

The other use I made of digital tools was for the analysis of survey data. I carried out two audience surveys, if for no other reason than because ethics approval had been so hard to obtain it would be a crime against the humanities not to use it. The first received over nine hundred unique responses (Menadue, 2016), which my colleagues found impressive – they clearly did not recognise the implications of posting a link to a SF survey to the forty-three thousand followers of the Science Fiction and Fantasy Writers of America Facebook page. The survey was something else I could work that CAQDAS magic on – and this time I could do some statistics – something that is also digital, and I'm working in the humanities, so this is clearly within scope. This was an opportunity to create categorisation trees, numerical tables, and even Spearman correlations. This went much more smoothly as I had now become more pragmatic about my work. Rather than trying to do the survey analysis myself, I humbly asked a statistician, or two, for help. This saved me a lot of effort. I learned a great deal about statistics in the process, and co-authored several papers (Menadue and Cheer, 2017, Menadue, Giselsson and Guez, 2018, Menadue and Jacups, 2018), which was reassuring. I was discovering that in the digital humanities co-authors are a very good thing, even essential. I had learned that I did not know it all, could not know it all, and there was joy to be had in learning things that were not in my immediate field. If you wish to apply robust statistics to survey data on readers of English literature, however, be prepared for interesting comments from literature reviewers more used to inductive methods. E.g.: "Your findings have missed out the link that is obvious to anybody between [x] and [y]," and having to explain that this was indeed thoroughly investigated, has no statistical significance, and is misleading – which is why it was left out. I have discovered that the digital humanities can provide excellent opportunities to say, in the spirit of Galileo, "And yet it moves," even if some reviewers remain skeptical.

A Humane Methodology

In the furthering of my masochistic tendencies, and increasing devotion to the digital humanities, I felt I had not only to use digital tools, but I had to have suitable supervisors. I recruited from English literature, public health, epidemiology and philosophy as I tried to bridge the crevasses that appeared from time to time between my islands of expertise. My public health professor knew nothing about SF (but is a methodology expert), and challenged my assumptions and expectations about my readership. My English literature supervisor rolled his eyes at my terrible prose but painstakingly corrected my blundering style. The epidemiologist is good at mathematics and comes from a hard science background – and demanded I apply robust methodology to what she considers to otherwise be merely random thoughts – and the philosopher helped me discuss the implications of my findings from a human perspective, and always spoke kindly to me. Supervisions have, naturally, been highly entertaining, and contradictory – and I sometimes allowed myself a little therapeutic cry afterwards. Now, after four years, we seem to have come to an understanding of what I am doing most of the time, even if my papers appear a little schizoid – some having robustly scientific structures, others not so much. This process must be familiar to people working across multiple disciplinary fields in the digital humanities, and I like to think it contributes to breaking down silos – which makes the pain feel more noble. It has also had a welcome and dramatic effect on the quality of my work, which is now accepted more readily than not by journal editors and reviewers.

Towards the end of the third year, I realised that I had managed to survive what are perhaps the two biggest threats to the digital researcher who focuses on literature analysis – getting so involved with the digital that you lose sight of the original goal, and expecting the software to do everything for you. As noted earlier, what I had intended to do was thematic analysis, and not only analyse text but find out about who reads it and why (hence the surveys), so I could get an idea of the relevance in a broader context. Looking back, I realise that applying the digital to the humanities has proved to be remarkably successful. I had discovered that SF readers are not exclusively nerds in the basement, but come from all walks of life (Menadue and Jacups, 2018), and proposed a popular definition of SF and fantasy (Menadue, Giselsson and Guez, 2018)

– work that would have been inconceivably hard for a PhD student employing more traditional methods. It would also have been far less convincing without the digital analysis to back up my hypotheses. I found that I had managed to collapse a multitude of options and tools into a very small selection, and it was one that I could now explain to my English literature supervisor without his eyes glazing over. Also, my work was now becoming more accessible; I had given two conference presentations early in my process about what I was doing, to various demonstrations of boredom and indifference. I gave one recently on my simplified methods, and declared I was getting some interesting, and meaningful, results – which is, of course, what you should say at conferences. At the end of the presentation, people asked questions. There was even a smattering of polite applause.

In my methodology, I had wanted to integrate the spirit of the humanities with the structure of digital searches and analysis. As Julia Flanders suggests: "The human scholar of literary studies must be present in the inquiry at its end points – as the initiator of questions and consumer of answers – and also inside the process, inside the tools, as they mediate between us and the field we are seeking to grasp" (Flanders, 2013). To achieve this end, I combined the objective selection method with two less constrained concepts, which rely on discoveries or informed choice on the part of the researcher – the first is "degrees of separation," a concept first explained by Frigyes Karinthy in *The Chain* (Karinthy, 2011): that you can connect any person to any other by a maximum of six links. For my purposes I applied this to describe sequences of links between sources. The second is the "random walk" (Pearson, 1905):links between degrees of separation may be randomly discovered, but they must be sequentially connected. I can reintroduce my phenomenologically bracketed personal perspective and expertise by adding degrees of separation from the initial discovery to the end of the trail. For example, when I find Scientology mentioned in a magazine advertisement, I can follow a trail that is clearly visible to me (Menadue, 2018a), and leads to further material that appears interesting and relevant – e.g. the Church of Scientology threatening *Oz* magazine with legal action because of a book review that suggested Charles Manson was a fan of Scientology (Neville, 1971). The degree of separation is the count of direct steps taken to arrive at this finding. In the example given there are

three, connected by randomly discovered, but sequentially connected, links. Using this technique is purposeful, and explicable – it respects and makes use of the personal knowledge and experience of the researcher to discover material that might not otherwise be visible, and it can also be intriguing. Manson, Scientology and *Oz* magazine – an unexpected discovery. So, I have whittled down my method to an objective primary selection of material, adding more by degrees of separation, linked by a random walk, and outward reading of whatever turns up (Fig. 19). A valuable outcome of this approach is that it takes only a few minutes for me to explain it to potential collaborators – whether in the arts or sciences.
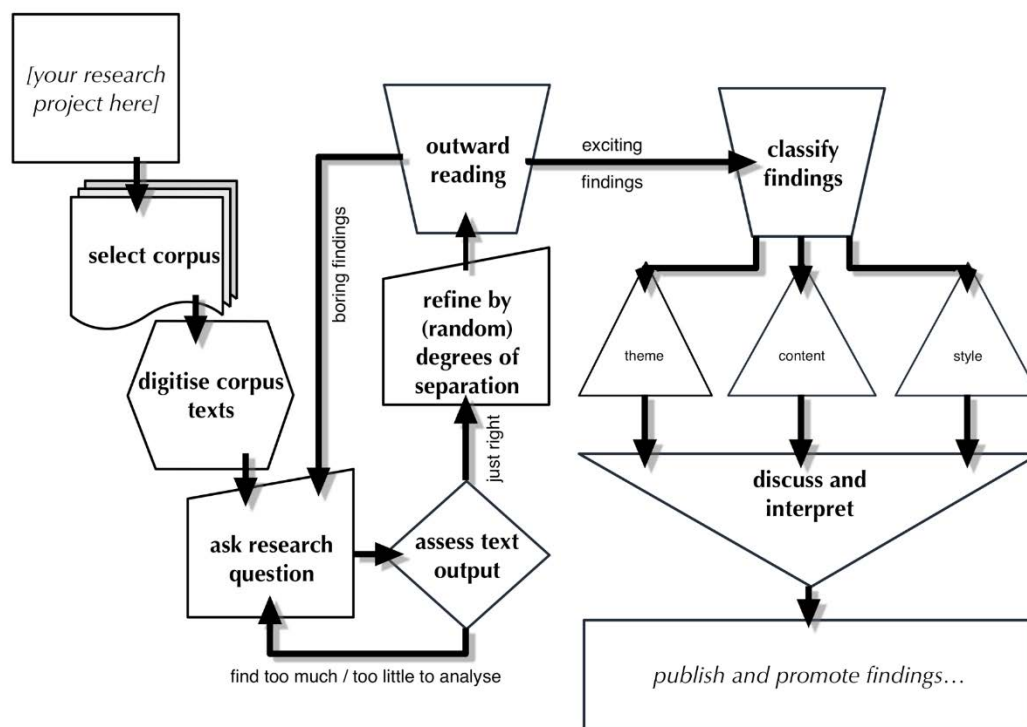
Fig. 19. A "proximal" methodology for corpus analysis

Is it true "digital" humanities? I think so – it fits my purpose, and adds a degree of objectivity that extracts more material and more reliable material for examination than I could find otherwise, using digital tools. It provides a starting point for me to say new and, ideally, interesting things about the material, and that cannot be bad. This flowing

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interaction between digital and non-digital methods fits well to the "differential reading" process described by Marjorie Perloff (Perloff, 2004). For the example of Scientology, I found I could map the fortunes of the cult (whose lawyers often sue people who describe it as such) against the size of their adverts, from full pages in the early days, to half pages, to columns, to small ads and then back up the chain. For a book project on posthumanism, I have found a one-degree of separation article by John W. Campbell, the editor of *Astounding Science Fiction*, that is prescient about the possibility of cyborgs (Campbell, 1953). This appeared in the word search in the same issue as a book review that used the word "posthuman." I did not use the book review, but I have used Campbell's article. I realised that it was not necessary, or appropriate to my requirements, for me to use an especially sophisticated digital tool for my work. Sometimes I was aware that CAQDAS was available but did not use it, as it might simply add to the labour of my outward reading, and make the results less accessible to a non-specialist audience. It was sometimes easier for me to make manual notes in an Excel spreadsheet while I was reading a magazine, refining thematic classifications as I went, than it would have been to code all the occurrences in NVivo towards the same ends.

I have omitted to mention Franco Moretti, yet his name appears in almost all research on the topic of digital analysis of text. Problems in the application of Moretti's approach on a smaller scale are recognised in the literature, and a criticism of holistic, world literature approaches is that they are too inclusive to provide meaningful results beyond a certain base level. This is a significant problem when analysing a specialised corpus such as my own field of SF. As Amir Khadem suggests:

> The distance that Moretti proposes is problematic, for it not only intends to generalize, but tries to render specialization as a minor issue. (Khadem, 2012: 420).

Problems arise with canonical and non-canonical content, and issues around the relative relevance and quality of individual works. Khadem indicates that the inequality between different literary work is not readily evaluated or categorised, and that we must not neglect it in favour of grand scale, generalised approaches, which may acknowledge difference, but still grind that difference away (Khadem, 2012: 419). To be fair, Moretti

described close-reading, with its very small canon of works, as "a theological exercise – very solemn treatment of very few texts taken very seriously" (Moretti, 2000: 57), and for the application of digital tools to literary analysis I also felt that close reading alone was not fit for my purposes. But my inner logic faltered at some of the claims made by Moretti's disciples:

> Unlike most of his critics, Moretti is therefore aware that a theory cannot be falsified by empirical facts, but by a stronger theory of these facts... Like any proper theory, Moretti's is the strongest where it seems the weakest, the most conservative. (Habjan, 2012: 92).

Although I could respect Moretti's use of statistics and digital searches, I was perhaps fortunate to have first drifted towards the principles of outward reading, and then to embed textual context, richness, and aspects of close reading that demand the researcher investigate the context of the work. Kate Trumpener suggests this type of mixed approach is the power behind digital approaches to literature:

> We can change our parameters and our questions simply by reading more: more widely, more deeply, more eclectically, more comparatively. Browsing in addition to quantification; incessant rather than distant reading: the unsystematic nature of our discipline is actually its salvation. (Trumpener, 2009: 171).

This sentiment is at the core of my objective selection, degrees of separation, and outward reading approach. This hybrid of digital searching and broader reading has served me best as I have examined what CAQDAS has assisted me to find, and cross-referenced this manually as necessary. The "finding" service performed by CAQDAS has been, and is, critical to my PhD research. The requirement for digital humanities tools to achieve certain outcomes is indeed absolute, but there is a danger of overcomplicating the method, or oversimplifying the analysis, and perhaps losing the human intervention that supplies meaning. As Alison Booth has said:

> Applying one's favorite method to all sizes and shapes of data is an obvious genre of error, and scholars and critics of all sorts studiously avoid it. In a maxim now popular among practitioners of digital humanities, when you have a hammer, everything looks like a nail. (Booth, 2017: 620).

It is not necessarily advisable to reject traditional, unsystematic, readings, and Tanya Clement points out that self-reflection is in itself a technology (Clement, 2013: 2), and I hope my frank discussion has made that evident here. In support of these concepts,

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objective selection reduces bias, and we know bias is bad for business in mixed methods research (Collier, 1995).

Feeling my way through using digital tools to improve my humanities research, even to make it possible, has led me to some interesting, and novel, findings. I like to imagine I have become one of the new breeds predicted by Wendell Piez, of "native plants and wildflowers… overtaking a tidy lawn" of English Literature (Piez, 2008: , 4), even if I am a late bloomer. Fortunately, my efforts led to my formulation of an effective method for my literature analysis – at the scale required, to the complexity required. I have termed this "proximal reading" – not close, not distant and a bit outward. The introduction of randomness around the centre allows "rabbit-hole" freedoms that are in keeping with more traditional literary custom and practice, but the digital approaches enable "hard science" collaborators to consider that this is more rigorous than the inconsequential faffing about they may perceive to be the main occupation of people in the humanities. In my readings of hundreds of objectively selected magazines to find, categorise and analyse the content and context of each of my subjects, I have read every single one in its entirety – experiencing the nostalgic look, feel, even the very odour of the original. The meaning added by my notes, classifications and excerpts from conversations, advertisements and stories, is influenced and enriched by my own phenomenological bracketing – which I freely accept, as for me it firmly embeds the human in the digital.

PART II.CASE STUDIES

I employed my proximal reading methodology to isolate and analyse specific themes and topics occurring in SF, for evaluation of cultural context. The utility of the proximal reading approach was tested for both specific subjects and the more general, and in the process some novel findings were generated. The most specialised use of the methodology was to investigate the origins and fortunes of Dianetics in the SF magazines (below). For this case, digital approaches were used to find all available references, to sort these into logical categories, and present the content with limited discussion. Two further papers examined portrayals of tropical culture. The first from analysis of text identified by text mining, the second from the evaluation of SF covers identified by image analysis. These demonstrated the flexibility of the methodology as well as the possibility of corroborating findings by using different modes of investigation. In these examples, there was a clear consistency in written and pictorial representations of tropical cultures. In an ongoing project, I am taking a looser, more interpretive approach in writing a book on posthumanism – for this work, I have identified a limited number of occurrences in text (fewer than fifty compared to nearly four hundred for Dianetics and Scientology), to reflect this, I employ the references made to posthumanism to illustrate alternative perspectives on existing theory, and as a starting point for investigating other relevant SF sources. All of these investigations discover new material that had not previously been considered, and provide potential novel perspectives to add to existing research.

HUBBARD BUBBLE: DIANETICS TROUBLE

"Dianetics" was unveiled to the public in the May 1950 edition of *Astounding Science Fiction*. It was the brainchild of SF author L. Ron Hubbard, and was rebranded as Scientology before the end of the decade. Dianetics was marketed as a scientific method for mental improvement – a robust alternative to conventional psychiatry – and was strongly debated in SF magazines. The trajectory of this cultural phenomenon from 1949 to 1999 as it appeared in this popular culture can be traced in the 389 references to "Dianetics" and "Scientology" found in the analytical corpus. Advertising, reader letters, stories, feature articles and editorials provide insights into whether Hubbard was considered a visionary, or charlatan, and whether his technique was quackery or revolutionary. Significant fluctuations in the prominence and perception of Dianetics are clearly visible in the source material across this broad spectrum of content. I found criticism present from the outset that was based on logical and scientific arguments, countered by obfuscation or attacks on the authors of these critiques. The followers and promotors of Dianetics did not provide scientifically rigorous proof of their claims and by the mid-1980s Dianetics and Scientology were no longer serious topics in the magazines, but were routinely conflated with other fads and fallacies of SF history. In this application of the proximal reading method, there is minimal subjective analysis – the source material is presented "as is" with descriptive statistics that illustrate changes in the fortunes of Hubbard's creation. The contemporary voices discovered in the corpus search speak for themselves without need for additional interpretation.

Introduction

In May 1950 a work by SF author L. Ron Hubbard, "Dianetics: a new science of the mind," was the feature article in *Astounding Science Fiction* (Hubbard, 1950a). Editor John. W. Campbell believed Dianetics was "revolutionary," and promoted it enthusiastically (Campbell, 1950l: 4). At the time, there was open public mistrust and concern regarding orthodox psychiatric therapies. Motives and merits of institutional practices around this time have been debated at great length, generally negatively, by a wide range of commentators (Fitzpatrick, 2004, Foucault, 2001, Halliwell, 2013, Rustin, 2015, Scull, 2015, Whitaker, 2015). Views on official practices have been

summarised by the psychiatrist Thomas Szasz, who used the term "the therapeutic state" to describe invasive treatment of citizens, often against their will, being justified by poorly supported theories (Szasz, 1960, 1994, 1999). Ken Kesey would later fictionalise the barbarity of psychiatric institutions around this period in *One Flew Over the Cuckoo's Nest* (Kesey, 1962), and it was into this paranoid environment (perhaps justifiable in some cases) that Campbell portrayed Hubbard's Dianetics as a viable alternative to conventional treatments.

Sheila Schwartz described Campbell as having "broadened the subjects of SF to include politics, business, war, religion, and philosophy" (Schwartz, 1971: 1044), and Dianetics fitted Campbell's interest in the potential for humans to exceed their physical limitations through mind powers. Dianetics promised that by a process of "auditing" it was possible to attain a superhuman state of the "clear." This was a sensible concept to a predominantly male readership, who were accustomed to reading about heroic figures who were "enhanced" versions of the "average male reader" (Menadue, 2017b: 136). Dianetics was debated widely in SF magazines, and reflects the enduring fascination of SF editors, authors and readers with more or less fantastical fads and movements.

SF is especially effective for investigating cultural phenomena which cross over between the factual and the fictional, and which are categorised by readers identification of plausible science and technology (Menadue, Giselsson and Guez, 2018). As the "cultural wallpaper" described by Brian Aldiss, SF is sufficiently influential to form a diegetic relationship between culture and fiction (Kirby, 2010). This supports Sheila Schwartz' conception of SF as a "bridge between all cultures," as I have discussed previously (Schwartz, 1971: 1044).

Not only did SF reflect interests in psychiatry and powers of the mind, but race and eugenics, which were associated in the magazines with Dianetics. We have discovered how SF is commonly used in research education, communication and advocacy (Menadue and Cheer, 2017), and can indicate changes in cultural values and beliefs (Menadue, 2017b). As Dianetics emerges in the medium of SF, this relationship becomes clear, and an analysis of the occurrence of L. Ron Hubbard's Dianetics in twentieth-century SF magazines provides an insight into the cultural currency of Hubbard's work during this period.

I employed the proximal reading methodology stringently in this study to identify

and explore how contemporary interests in – and concerns about – Dianetics can be found in SF culture. Analysis of the attitudes to Dianetics in the magazines provides a valuable critical perspective that is unfiltered by later commentary, and is untainted by the revisionist history of the Hubbard organisation and the Church of Scientology. Information provided by the scientologists on Hubbard's background, and the origins and foundations of Dianetics, tends towards vaguely defined hyperbole. Scientology is defined as "the study and handling of the spirit in relationship to itself, to universes and to other life:"

> Through the practice of Scientology one can increase his spiritual awareness and ability and realize his own immortality. Dianetics, though it might not have guessed it in its early publication, was dealing with the human spirit. Dianetics is a forerunner and substudy of Scientology. (Church of Scientology, 2018b).

The official Scientology page *Who Was L. Ron Hubbard?* does not mention Hubbard's SF background, or that "Dianetics: The Modern Science of Mental Health: the first comprehensive text ever written on the human mind and life" (Church of Scientology, 2018c) was first published in a SF magazine. Dianetics is still with us, under the aegis of the Church of Scientology, and the organisation claims that since 1983 it has "touched the lives of billions" (Church of Scientology, 2018a), which alone would naturally make it an essential subject for cultural studies, even though this dramatic claim has not been independently substantiated.

This paper adds informative context to the cultural environment and development of Hubbard's work by independently assessing the history of Dianetics and Scientology as perceived by contemporary commentators. Dianetic theory, the claims and activities of the Dianetics organisation, Scientology and scientologists are not being independently evaluated here, as the broader context of the history, practices and controversies surrounding Scientology have been discussed elsewhere (Urban, 2013). The focus of this article is on the content and context of references to Dianetics and Scientology in the SF magazines of the second half of the twentieth century, and the perspective this provides on the origins and growth of this significant cultural phenomenon.

The aim is to provide an independent review – from the origins of Dianetics to the

end of the twentieth century – of the discussions around, and reception of Dianetics and Scientology, and to present this from the perspective of the original primary audience for Dianetics – the readers, writers and editors of SF magazines. This approach is also intended to test the practicality of applying proximal reading methods to identify cultural interests embedded in a specific corpus text.

Methods

I carried out a text search of a corpus of twentieth-century SF magazines (Appendix F) to identify all occurrences of "Dianetic" and "Scientology" as well as derivations, finding the first mention of Dianetics in December 1949 (Campbell, 1949b). The search employed a PRISMA model (Liberati et al., 2009, Stevens et al., 2014) (Appendix A, Fig. 51). Any single advert, letter, editorial, feature article or story in which any of the target words occur was categorised as a single reference. The results were indexed and catalogued by author, date, magazine, issue, type, and attitude expressed towards Dianetics or Scientology. Specific types of reference found during the initial search were sorted into natural categories of letters, editorials, reviews, advertising (of various sizes and types), features on Dianetics or Scientology, fictional stories, articles which included direct or indirect references to Dianetics but did not focus on it, interviews, convention reports and cartoons.

Table 11.   Categorisation of Reference

Content / context of reference	Categorisation
Created by members of Dianetics or Scientology organisations, including advertising, or by others who portray Dianetics as effective and beneficial	Positive
Criticism of dianetic methods or claims, or deliberately comical	Negative
No prominent value judgement – sometimes as part of a list of activities or interests that had been grouped together	Neutral
Suggests the author intends to try Dianetics, is seeking more information, or wishes to meet people familiar with Dianetics	Interested
Suggestions that Dianetics is misplaced in SF magazines, or not of interest	Indifferent

Comparison and cross-referencing of references identified emerging themes, attitudinal changes and connections between and within discussions. Reading other content of the same issues provided additional information to add depth to the analysis by "outward reading" employing, but not limited to, the sampling, selective close reading, and "moving in and out" activities suggested by Robert Scholes and Clifford Wulfman (Scholes and Wulfman, 2010).

This combination of methods identified significant content from these primary sources. Illustrating the difference between "proximal reading" and close reading, which entails the subjective selection of a small number of primary sources by the researcher for detailed enquiry (Smith, 2016), and also from the distant reading of Moretti, which applies digital techniques to analyse text at a more global level (Moretti, 2000, 2011). As I highlighted in the Methodology section above, analysis is more detailed than distant-reading, and especially suited to thematic analysis (Braun and Clarke, 2016, Clarke and Braun, 2013). This may consequently provide more rigorous cultural analysis than broader, or more specific, approaches. In this case, the unequivocal terms "Dianetics" and "Scientology" in twentieth-century SF magazines enabled the most exact application of the methodology for maximising the likelihood of identifying all occurrences of a subject in the primary sources, subject to OCR errors.

Data and statistical comparisons

Occurences were tabulated by format and number for different publications and authors, using Excel. Statistical analysis was applied using R (R Core Team, 2018) to discover any correlation between advertising frequency of Dianetics / Scientology and the frequency of its appearance in other references, using the statistical model of *Kendall's tau*. The data outputs and catalogue have been published in a permanent online database for independent investigation and to allow the possibility of verifying the replicability of the research presented here (Menadue, 2018b).

Findings

Search Results

The search identified 389 occurrences in 258 issues of SF magazines between 1949 and 1999 (Fig. 20). Findings were categorised by type, attitude, publication, year and author. Outward reading identified articles by other organisations focused on mind-powers. Twelve full page advertisements were discovered for the Rosicrucian Order (AMORC), which describes itself as "a community of mystics who study and practice the metaphysical laws governing the universe" (The Roiscrucian Order, 2018). One full page advertisement was found for Psychiana, a spiritual, anti-theology, self-improvement programme created by Frank Robinson in the 1930s – at that time possibly "the world's largest mail order religion" (Psychiana, 2018). In addition, eight additional articles and letters which focus on powers of the mind were associated with references to Dianetics.

For this application, one degree of separation was permitted, and one external item from *Oz*, a counter-culture magazine with similarities to *New Worlds*, was correlated with an article in *Fantastic*. To compare the thoroughness of findings with that available from a specialist online database, a search of the Internet SF Database (ISFDB) for the word "Dianetics" identifies 37 references from 15 unique sources (Internet Speculative Fiction Database, 2019) including one cartoon. All were captured independently by the proximal methodology. The limited number found in the ISFDB reflects that only titles, illustrations and some editorials and letters are indexed. The text search undertaken for this article captured all recognisable word instances within the

corpus sample.
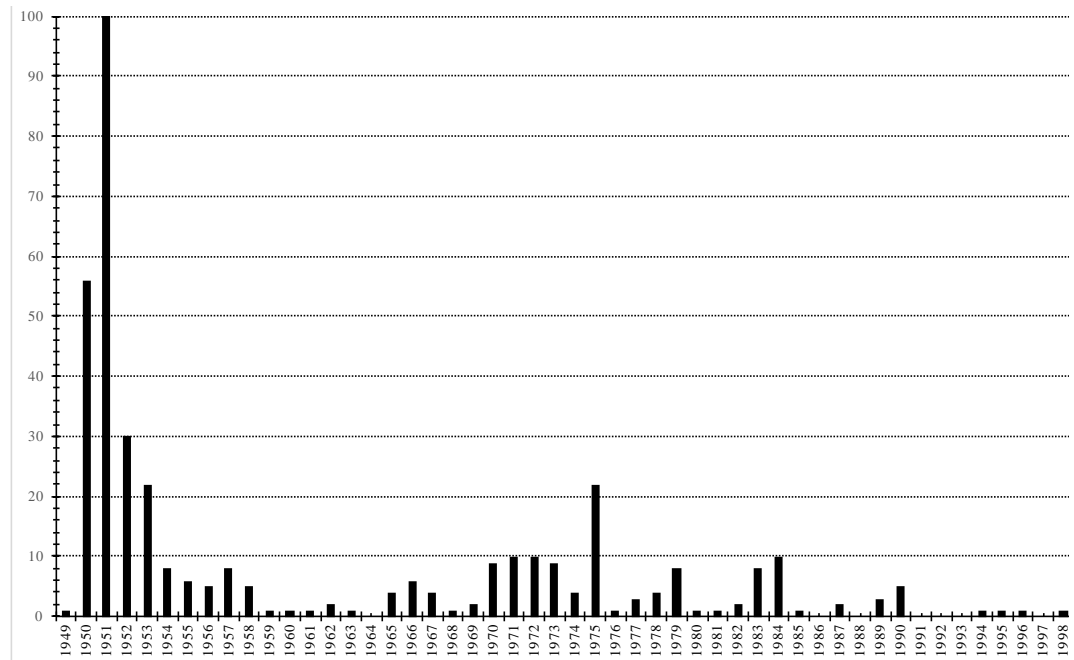
Fig. 20.   Dianetics / Scientology References by Year 1949 - 1999

Content Analysis

Hubbard had a historic relationship with editor John W. Campbell due to Hubbard's
history of writing SF stories for Campbell's magazine, and Cambpbell promoted
Hubbard's treatise on Dianetics within the pages of *ASF*. The May 1950 issue featured
articles supporting Dianetics by Campbell, who had written an editorial leader
celebrating this new "science of the mind" in December 1949 – the first time a mention
of Dianetics appears in the magazine texts searched in this study (Campbell, 1949b).
The first reference found to the "Church of Scientology" was an advert in *Galaxy* from
October 1956. Content analysis revealed advertising and promotion of Dianetics and
Scientology, fictional representations of Dianetics, advocacy, and controversy over
Dianetics in the early 1950s – including threats of litigation, letters from patients and
doctors at psychiatric and veteran's hospitals, and scientific or quasi-scientific articles.
References to Scientology after the 1970s were limited to advertising, retrospectives on

the history of the SF community, and satire. This may be explained in part by the changing demographic that my surveys revealed, indicating how SF now reflects a broader population, no longer dominated by the young males that have been identified previously as a historic audience (Berger, 1977). The contemporary SF reader is older, better educated and perhaps more skeptical (Menadue and Jacups, 2018).

Advertising

Advertising frequency and scale is necessarily an indicator of advertiser resources, and target market. As cost-dependent marketing, it may provide a benchmark for organizational success. As advertising is placed intentionally and systematically, its placement is not necessarily subject to specific reader or editorial influences. A reader criticised the moral probity of *Asimov's* in February 1984 for taking adverts from the scientologists, but editor Isaac Asimov dismissed this on the basis of free speech (Tabery, 1984). Censorship of advertising, and consequent loss of revenue, seems to be an unlikely action for a publisher to take without significant reason – and access to advertising opportunities afforded to the scientologists does not appear to have been limited by publishers over this period. Advertising varied in frequency and prominence, however. An initial "bubble" of activity following the

Fig. 21. Whatever happened to Dianetics?

May 1950 publication date burst in the mid-1950s, possibly connected to financial troubles later described by author and dianeticist A. E. van Vogt (Van Vogt, 1982: 11). Dianetics reappeared under the banner of Scientology in 1970 with an advertising campaign in *Galaxy*, *IF* and *Worlds of Tomorrow*, employing the tagline "Whatever happened to Dianetics?" (Fig. 21). Visibility returned to a new maximum in 1975 (Fig.

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22). Frequent advertisements for Dianetics were found in *ASF* in the early 1950s, alongside editorials and letters – adverts were found in every 1950 issue from March to December, and comprised 48 out of all 57 references in that year. In 1952, *ASF* contained 21 out of all 100 references in magazines, nine of which were adverts, and Dianetics appeared in every issue of *ASF* from January to July, and in November.
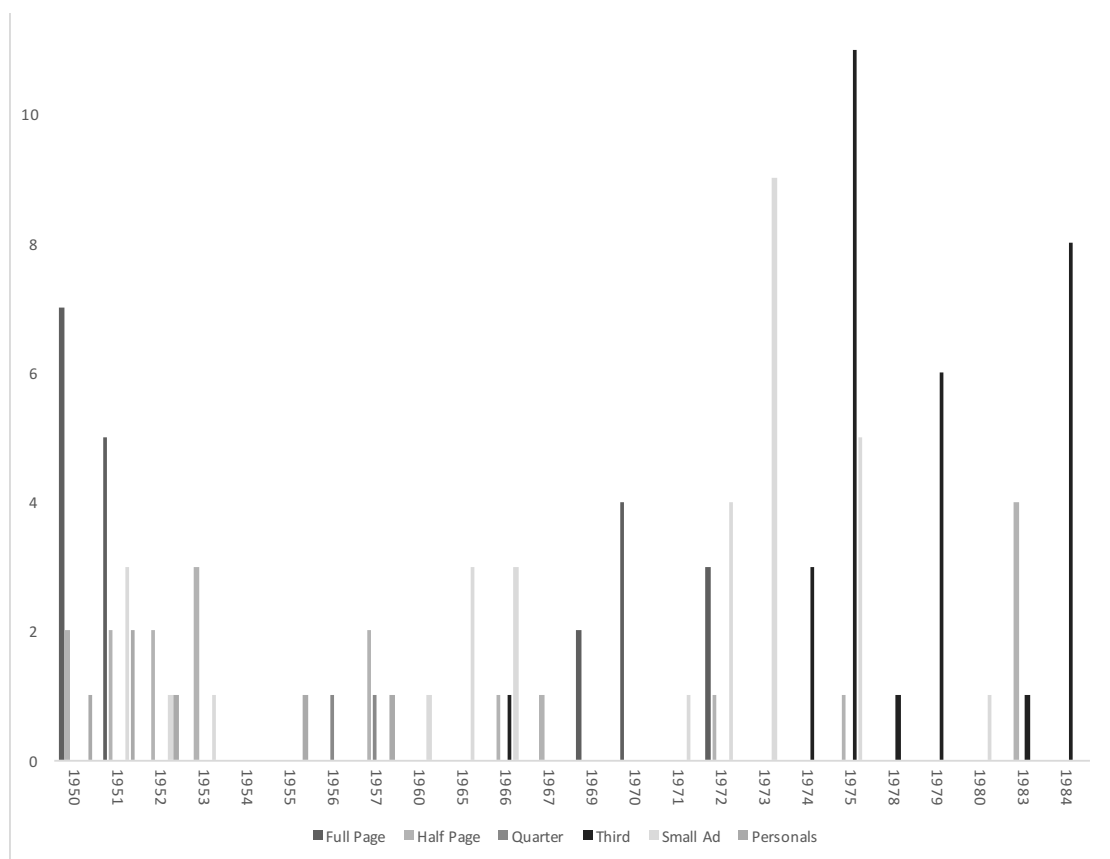
Fig. 22. Dianetics Advertising Frequency and Size 1950-1984
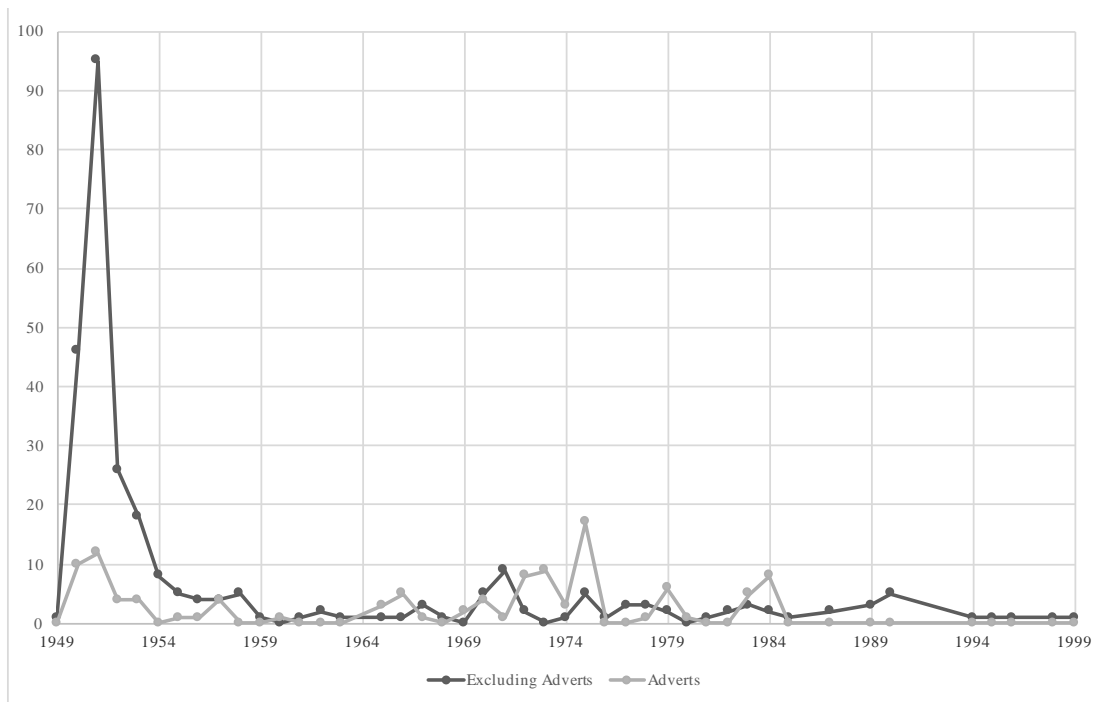
Fig. 23.   Comparison of advertising to non advertising frequency

Comparison of the frequency of advertising to other forms of occurrence between 1949 to 1999 (Fig. 23) discovered a significant, and perhaps unsurprising, correlation. (*Kendall's rank correlation tau* = 0.24, where 0 is no correlation, $p<0.05$ using R version 3.4.0). Whether this correlation is due to advertising encouraging debate is unclear, although we know from *Asimov's* that in at least one instance advertising policy was unaffected by opinion. The significance of the correlation between advertising and non-advertising mentions of Dianetics / Scientology may provide supporting evidence for the hypothesis that magazine content can be expected to become rapidly aligned with, and respond to, external features of contemporary culture.

Advertising by Competitors

Dianetics advertising was not exceptional among competitors in the market of mental self-improvement. From 1951 to 1973, outward reading discovered the Rosicrucians were often publishing full-page advertisements concurrent with small ads for Dianetics. An "alternative provider" (of mental enhancement) advertising "psychiana" – "Guideposts of decision!" was found alongside a reference to Dianetics in *Amazing* in 1952 (Psychiana, 1952: 3). There were adverts in 1953 (*Fantasy Fiction*, June) and

1975 (*Galaxy*, July) for books on extra-sensory or occult powers, indicating other approaches were available, and Dianetics was by no means a unique phenomenon. No advertisements were found after 1984.

Dianetics in Fiction

Hubbard wrote the first fictional appearance of Dianetics, and featured a heroic Dianetics practitioner (Hubbard, 1950c). This story was described by a reader in the February 1951 issue as "corny" (Carr, 1951), and criticised for its feebleness by L. Sprague de Camp in *El-Ron of the City of Brass* (Sprague de Camp, 1975). There was only one other story which apparently presented Dianetics seriously: in *New Worlds*, January 1953, where "reverse Dianetics" was employed as a method of torture (Duncan, 1953: 22). A cartoon likening Dianetics to the addictive
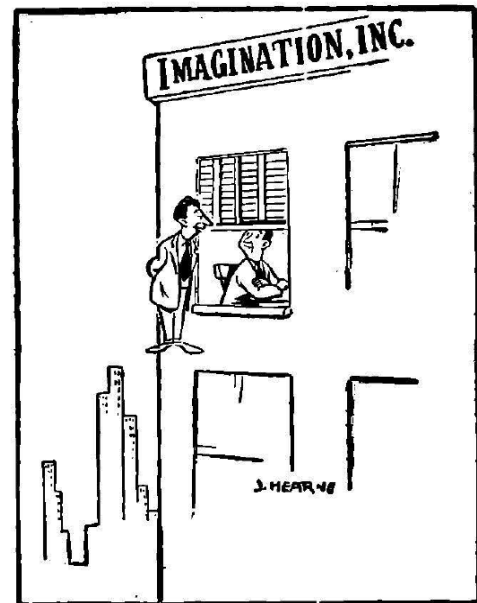
"Dianetics? Hell no, Hadacol!"

Fig. 24. Imagination, Inc.

"mother's helper" Hadacol appeared in *Imagination* in January 1952 (Hearne, 1952) (Fig. 24). Fourteen other stories published between 1952 and 1990 were satirical or derogatory. Robert Bloch suggested Dianetics was only for the gullible in the satirical *My struggle by Floyd Scrilch* (Bloch, 1951):

> Here I was, stuck in a rut, no Get Up and Go, no Aggressiveness, no
> Dynamic Personality… I went out and bought a copy of DIANETICS
> FOR EVERYBODY AT HOME IN YOUR SPARE TIME… if other people
> could be 'cleared' and find new success, so could I… I read the book down
> at the office and the boss heard about it and fired me. But I didn't care…
> The landlord said he'd throw us out if we didn't pay the rent, but I had to use
> the money for my [Dianetics] treatments. I didn't worry. Pretty soon we
> were going to be on Easy Street! After two months I was 'cleared'… I knew
> all the proper Psychological Approaches to Handling My Life. I took a lot of

> notes, but I had to burn them for fuel on account of we didn't have any coal.
> But my memory was perfect now and I knew everything. (p. 144).

Scrilch confidently approaches a potential new employer with predictable results: "he kicked me out on my face" (p. 145). Whether Bloch was intentionally referencing *Mein Kampf* in his title is not certain, but in March 1954, Robert W. Lowndes, editor of *Future*, openly associated Hubbard's style with that of Hitler:

> just before reading Dianetics, I had finally gotten around to a long-delayed
> perusal of *Mein Kampf*… the resemblance of Hubbard's rhetoric struck me
> so forcefully that his mesmerizing style had no effect. Or rather, not the
> affect intended by the author. (Lowndes, 1954: 84)

In the same year *The Turning Wheel*, by Philip K Dick, described how a society founded on Dianetics had brought about the collapse of technological civilisation:

> Sung-wu fingered his beads miserably. 'Elron be praised,' he muttered; 'you
> are too kind.'… Sung-wu… bypassed the rows of rusted, discarded
> machines, and entered the still-functioning wing. He located his brother-in-
> law… laboriously copying material by hand. 'Clearness be with you,' Sung-
> wu murmured. (Dick, 1954: 68)

In *The God Business*, protagonists read aloud to stun and capture animals for food: "Friend of mine says that the best book for the birds is Hubbard's *Dianetics*, but one ought to take pride in one's tools, you know. I've always caught my pheasants and geese with *Three Contributions to the Theory of Sex*." (Farmer, 1954: 21). Anthony Boucher wrote in *The Star Dummy*: "'That escapist Dianetics-spawning rubbish?' the analyst exclaimed, as if each word were spelled with four letters." (Boucher, 1952: 48). Hubbard had claimed that: "The creation of Dianetics is a milestone for Man comparable to his discovery of fire and superior to his inventions of the wheel and arch" (Hubbard, 1950b: 9), and this hyperbole may have inspired satirical and parodic works. Larry Niven later put a SF author who invented a religion into the inferno:

> The human face seemed quite mad. He founded a religion that masks as a
> form of lay psychiatry. Members try to recall… their own past lives ... and
> that adds an interesting blackmail angle, because those who hear confession
> are often more dedicated than honorable. (Niven, 1975: 80-81)

By 1990 there was no remaining respect shown for Dianetics, and Joe Haldeman described one of his characters as "a dope addict hip-deep into the Dianetics horseshit" (Haldeman, 1990: 187).

Editorials, Letters and Features

Discussions regarding Dianetics and Scientology occurred in features, letters pages, and editorials. Whereas *ASF* and John W. Campbell generally supported Dianetics, a *Marvel* feature in 1951 presented different perspectives on the subject and received a range of responses. *Other Worlds*, edited by Raymond Palmer – promulgator of the "Shaver Mystery"[11] – depicted Dianetics unfavourably. Letter writers expressed all attitudes, but over time, opposition to Dianetics became more prominent. Widespread criticism appeared shortly after first publication, focused on the lack of supporting scientific evidence. Fanzines – independent titles published by fans – were particularly scathing regarding Dianetics, with one exception: *Arc Light*, which Rog Phillips suspected was a mouthpiece for the Dianetics Organisation (1951a).

Campbell and Astounding Science Fiction

John W. Campbell was the strongest advocate of Dianetics in SF magazines. He published enthusiastic editorial features praising Dianetics and supporting Hubbard's claim that Dianetics was a revolutionary innovation that would bring a fundamental change to humanity. Campbell ridiculed critics:

> Sorry you find Dianetics of no interest, but it was my belief that knowledge of the human mind was of the utmost immediate and general interest because each of us possesses one. (Campbell, 1950d: 161).

Campbell printed nine positive editorial and feature articles on Dianetics, all appearing before the end of 1950 (Campbell, 1949b, 1950b, 1950l, 1950n, 1950o, 1950q, 1950r, 1950s, 1950t). He was skeptical regarding the science establishment, and championed the right of Dianetics to be taken as seriously as the existing sciences, which he suggested were self-interested and unwilling to accept new ideas – ideas which included Campbell's own concerning psionics and mind-powers (Campbell, 1950e, 1951b,

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[11] A deliberate, sensational, and provocative hoax about aliens and mythical pre-human beings living among us (albeit largely underground). This was fictionalised by Richard Shaver and disseminated by Raymond Palmer when he was the editor of *Amazing* in the 1940s, presumably to increase sales.

1958a, 1958c). Campbell's interest in mind powers is known from numerous retrospectives that appeared around and after his death in 1971 (Elliot, 1979, Flynn, 1990, Fraser, 1978, Gardner, 1983b, Gold, 1975, Malzberg, 1976, Morris, 1982, Panshin, 1971, Pohl, 1981, Schweitzer, 1998, Williamson, 1999). His support of Dianetics soon became less consistent, however, as was apparent in later comments on letters, and editorials (Campbell, 1950m, 1956a, 1956b, 1957). Campbell's close public association with Hubbard and Dianetics began to cool by the end of the year of first publication, when he clarified the separation of the Dianetics Foundation from his magazine, and stated a preference for readers to approach the Foundation directly with their queries (Campbell, 1950c, 1950p). Campbell was impressed by the boost in magazine sales that came from Dianetics, however (Campbell, 1950a), and co-advertised Dianetics and *ASF* subscriptions in the early months (Astounding Science Fiction, 1950a, 1950b). But even Campbell stated in November 1950 that his magazine was about SF, not Dianetics (Campbell, 1950u), in response to a letter by Robert Kelly:

> The Dianetic Foundation is publishing bulletins on new Dianetic techniques.
> That is not our province. We are publishing general articles on the mind;
> they are science articles of general interest. But this magazine's business is
> SF. (Campbell, 1950j: 156)

Other editors were less partial to mind powers, and from 1950 to 1952 there were robust debates about Dianetics in other magazines. Arguments against Dianetics tended towards evidence-based arguments focused on a lack of independent, replicable, substantiation of the extraordinary claims made about the benefits arising from Dianetics practices. C. Daly King wrote a dismissive book review, published in *F&SF* in December 1950:

> THIS volume is full of assertions and claims, and frequent reference… to
> scientific evidence, but your reviewer could find no item of such evidence in
> its 400-odd pages. Unsupported assertions are not evidence and, since the
> author presents every appearance of sincerity, one can conclude only that he
> is unfamiliar with the nature of scientific evidence. (King, 1950: 99).

James Blish explained evidential research in *Future* in 1951, when the Dianetics debate was "raging as loudly as ever" (Blish, 1951d: 78), and criticised examples of unsubstantiated claims: "a fact can be authenticated; it can be measured; it can be

substituted in a formula. A statement of fact which fails any one of these three tests may nevertheless be true enough – But it is not evidence" (p. 80).

Marvel Science Stories

Robert Erisman's *Marvel* editorial in May 1951 introduced three feature articles by prominent authors: negative – by Lester del Rey; neutral – by Theodore Sturgeon; and positive – by Hubbard himself. Erisman proclaimed: "For the first time in the short but epithet-scarred history of Dianetics a SF magazine presents all aspects of the controversy" (Erisman, 1951b: 2). He affirmed:

> CONTROVERSY is the life-blood of intellectual development, and all too often, publications take one side or the other, from bias, advertising pressure, or just plain fear. MARVEL dedicates itself to the honest presentation of those arguments which rage throughout the SF field. (Erisman, 1951a: 110)

Hubbard was afforded the unique opportunity of being provided advance copies of the critiques of the other authors, which gave him the opportunity to tailor his response – to del Rey's objections in particular.

Del Rey, in "Superman – C. O. D." (del Rey, 1951), considered Dianetics to be little more than a cynical money-making exercise. He was also disturbed by the eugenic implications of Dianetics: "Racism is based on the need to believe in superiority, and one of the basic factors underlying many neuroses is the doubt of even equality. L. Ron Hubbard has capitalized on this situation." (115).

Del Rey was unimpressed by the quality of argument demonstrated by Hubbard: "the first pages alone show the flimsiness of the 'scientific' knowledge behind it. After a brief opening eulogy to himself as greater than the inventor of fire, the wheel or the arch, Mr. Hubbard says: 'Dianetics is the science of the mind. Far simpler than physics or chemistry'" (115). Del Rey described the tautology inherent in the primary axiom of Dianetics: "The dynamic principle of existence is SURVIVE, according to him. Sheer gobbledegook. The principle of living is living!" (116). In *Homo Superior, Here we Come!* (Hubbard, 1951), Hubbard stated that the aim and result of Dianetics was to create a "better human being" (Fig. 25, p. 111).

Fig. 25. Portrait of L. Ron Hubbard: "Homo superior"

Hubbard denied the validity of scientific methods, but insisted that his own approach was a science – and employed familiar political rhetoric to undermine "so-called experts" who identified the flaws in his arguments:

> ...a large segment of the population has grown used to the idea that the opinion of an authority; that facts and statistics presented on large charts in red letters is evidence enough to outweigh the observations which they, themselves can make. Fortunately, thousands of others are still filled with the true spirit of scientific curiosity. It is to these open-minded people that Dianetics owes its first obligation. It is also these people who will be most able to carry the science of Dianetics forward. (112).

Hubbard rejected eugenic concerns: "Mr. del Rey begins by carefully trying to hang the label of racism and superiority complex on a science which proves for the first time that all human beings can be better human beings" (p. 111). This is not clear from Scientology materials, which refer to "dominance" in descriptions of the outcomes of Dianetics. *The Components of Understanding* states: "the race which first developed affinity to its highest degree would become the dominant race on any planet and this has been borne out." (The Church of Scientology International, 2015: 5). Hubbard employed a circular argument based on his own theories to discredit opposition: "The

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viciousness of Mr. del Rey's attack displays so clearly the aberrative force behind it, that no defense on this matter should be necessary" (112). Del Rey especially and expressly criticised the avarice of Hubbard's organisation. It is ironic, therefore, that in the second part of Hubbard's article, Hubbard's editor Forest J. Ackerman asked: "What are you doing about becoming a superman? The first step is to read the remarkable 180,000-word book by L. Ron Hubbard (Hermitage, $4)" (113). Ackerman affirmed the superhuman powers attainable through Dianetics: "A clear has an abundant store of energy, and needs but 4 hours sleep out of 24. A clear has a photographic memory, can return to any moment on his (or her) time-track and re-experience anything with full percepties (sight, sound, sensation, etc.)" (113).

Theodore Sturgeon, in "How to avoid a hole in the head" (Sturgeon, 1951) was more circumspect, presenting "a plea for general open-mindedness and progressive thought" (Sturgeon, 1951: 113). He described the debate as violent and polarised, and suggested readers make an impartial assessment: "If and when you get results from Dianetics, don't conclude therefore that everything Hubbard says must be true. Don't consider the unproven as false, either. If it's the science its adherents claim, it will bear investigation." (Sturgeon, 1951: 115).

Other Worlds

In 1950 Dianetics appeared briefly in *Other Worlds*: in a review; an editorial, and a classified advertisement (Ackerman, 1950, McDowell, 1950, Palmer, 1950). *Other Worlds* later provided a forum for Dianetics debate through 1951 and 1952. Dianetics appeared in Robert Bloch's satire, editor Raymond Palmer's response to criticisms of Bloch, and Palmer's later dismissal of relevance to SF. Dianetics also appeared in classified advertisements by people interested in knowing more (Paul, 1951, Smith, 1951, Stuart, 1952). Raymond Palmer was central to the correlation of Dianetics with The Shaver Mystery, and commented freely on Dianetics during this period. Bloch's relevance is discussed in further detail below.

Planet Stories

In *Planet*, we can follow author James Blish's journey from enthusiast to skeptic, in a debate moderated by the editor Jerome Bixby. Blish was a cautious enthusiast in November 1950:

> If Dianetics does work – and every check I've been able to run thus far indicates that it does – it may well be the most important discovery of this or any other century. It will bring the long-sought "rule of reason" to the problems of local and world politics, communication, law, and almost every other field of human endeavor. (Blish, 1950: 102)

By January 1951, Blish was less certain. Al Wickham said in a letter: "My own advice… is that you, Mr. Blish, and your readers take Dianetics with a large salt pill. So far, there is not a single shred of real evidence for it – and the layman is not the least bit obligated to prove Mr. Hubbard's claims for him" (Wickham, 1951: 106). Blish agreed: "Here I am with Mr. Wickham 100%... I have terminated my own experiments in this field, and I urge anyone else who has been tempted by Hubbard's claims to do the same," and affirmed that evidence was required to support the assertions of Dianetics, and the burden of proof was with Hubbard (Blish, 1951b: 107). Dianeticist Robert Sewell was unhappy with Blish's response:

> The assertion that Ron Hubbard has dim awareness of what constitutes science is your cross to carry, and certainly not his to disprove… I am truly sorry to hear James Blish say… that only experienced persons should experiment with Dianetics… Where is the evidence? I have evidence, for I have worked with DIANETICS… Do you have evidence? And if not, why not? You can get it the way I did. (Sewell, 1951: 104-105)

Blish became increasingly exasperated over the obfuscation regarding evidence: "I am already familiar with the claims… I wish some one person associated with DIANETICS would actually come forth with some of this evidence they all claim to have…" (Blish, 1951c: 105). The debate in *Planet* was otherwise mild and politely skeptical, lacking the vehemence found in other magazines (Gibson, 1951a, 1951b, Kyne, 1951, Sneary, 1951).

Letters

Campbell replied in *ASF* to early critical letters with legitimizing rhetoric (Campbell, 1950h, 1950i, 1950k), responding to one skeptical letter writer: "It is no hoax. It will be

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history" (Campbell, 1950f: 158). Shortly after C. Daly King's article appeared in *F&SF*, King was ridiculed in the letter pages of *ASF* alongside Erich Fromm, for their criticism of Dianetics (McLaughlin, 1951). J. S. Horan, a doctor working in a psychiatric hospital, queried the total lack of empirical evidence for the claims of Dianetics, as well as refuting the allegations that enormous numbers of people were being lobotomised or subjected to electro-shock treatments as mere scare-mongering (Horan, 1950). Campbell responded with unsubstantiated statistics and hearsay: "doctors have said that seventy percent of all physical ailments stem from psychosomatic causes," and "while prefrontal lobotomy is recognized, and certainly effective, it treats intractableness – something which bothers the psychiatrist, not the insanity which bothers the patient" (Campbell, 1950g: 153). A more open debate occurred in other magazines. One writer to *Amazing* reported: "Reliable scientific authorities are cautioning against the all-embracing claims made by the new science… Psychological analysis is not a toy and playing with the human faculties medically is dangerous. Whatever the merits of Dianetics, its practitioners should make this clear" (Morris, 1951: 35).

Medical practitioners responded, and patients wrote from psychiatric hospitals, including those for WWII veterans. Medical professionals such as Lew Cunningham of Stanford University – who had read Hubbard's book and reported being approached by Campbell to become a supporter – were scathing. Cunningham suggested: "it is a hoax deliberately perpetrated for the sake of money and acclaim" (Cunningham, 1951: 99). He reported finding "ludicrous blunders in [Hubbard's] writings… they are not the work of a man who knows how to improve memory or intelligence… the writings of Dianetics are not the writings of supermen or of people who know how to produce supermen" (99). Letters from patients demonstrated distrust of medical practices, and fear of lobotomy and electro-shock. Dianeticists fuelled these fears. Although Cunningham rejected Hubbard's advances, Dr. Joseph A. Winter was receptive, and became the professional "poster boy" for Dianetics in its early incarnation. Existing practices, even if not commonly used, were sensationalised as standard operating procedures of the psychiatric profession. In the preface to the original May 1950 Dianetics article in *ASF*, Winter wrote:

> Modern psychiatry holds that… there is no cure for several forms of insanity
> – they can only be treated by surgically excising a portion of the brain in a
> prefrontal lobotomy, or – this is an actual and literal description of the
> operation known as a transorbital leucotomy – by electro-shocking the
> patient unconscious and running an ice-pick-like instrument into the brain
> by thrusting it through the eye socket back of the eyeball and slashing the
> brain with it. (Winter, 1950: 159)

Letters, which often descended into antagonistic debates, described ongoing experiences of letter writers with Dianetics. Clarence McFarland wrote in May 1951 of his interest in learning more about Dianetics (McFarland, 1951b). William Hameling responded in September to warn McFarland about the spurious claims of Dianetics (Hamling, 1951a), but by November, McFarland's response to Hameling's *Dianetics Fraud?* article in Imagination (Hamling, 1951b), demonstrates McFarland had become a convert (McFarland, 1951a). Emory Mann was another reader who provided "follow-up" letters to describe his success. He said he was keen to "try Dianetics" on his wife and other members of his family (Mann, 1950), which he followed up in Marvel, reporting having spent "…two hundred hours on my wife… she is full of psychosomatic ills…" As a result a problem with her right hand appeared to have improved (Mann, 1951: 116). Critics tended to apply logic to scientific evaluation of Dianetics, and ascribed any effects to hypnotic suggestion. A doctor congratulated del Rey on his piece in Marvel:

> His criticism is completely logical and just, based as it is upon facts which
> are glaringly apparent to any scientifically trained mind. Hubbard, on the
> other hand, falls back on his old tried and true technique of playing with
> words which to the average person sound quite convincing. (Montgomery,
> 1951: 100)

In contrast to analytical approaches by detractors, a pro-Dianetics respondent, asserting that he had found no evidence himself against Dianetics, called del Rey a "milquetoast" (Feeney, 1951a: 100). A letter from the secretary of the China Lake Dianetics Society applied the circular "aberration" excuse to condescend to and undermine del Rey: "In some cases he is handicapped by lack of information, and in some cases his aberrations drive him to somewhat irrational conclusions. I don't blame him: the poor fellow can't help it. I know someone just like him" (Forbes, 1951: 105).

Dianetics followers also made ad hominem attacks on story writers – a response

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to Bloch's *My struggle, by Floyd Scrilch* described it as "a ridiculous bit of toilet tissue by Blochhead… It is obvious he knows nothing of Dianetics, probably being congenitally illiterate. Did he ever graduate from kindergarten?" (Anon, 1952: 153). Editor Raymond Palmer responded in-kind, defending Bloch (Palmer, 1952b: 153-154).

Letters to Future – the debate in microcosm

There was a detailed conversation in *Future* from May through September 1951 (Vol.2, issues 1-3). The fifteen references comprising this exchange reflect the trajectory and content of the general debate on Dianetics in microcosm: one editorial; eleven letters by nine writers – seven of whom are repeat writers to this and other magazines, and three editorial comments on letters. Six of the references were negative, five neutral, two indifferent, one positive, and one interested. In May, Jay Tyler commented: "One becomes suspicious… when questions are simply met with evasions, more repetitions of the original claims, or admonitions to 'try it, and see for yourself-it works!'" (Tyler, 1951: 95). Tyler would remain consistently skeptical, positively reviewing Gardner's *Fads and Fallacies Name of Science* in the April 1958 issue of *Future* (Tyler, 1958). In July, John Feeney, the same who would describe Lester del Rey as a "milquetoast" in the August edition of *Marvel*, responded to Blish's article *What is evidence?* Feeney said that demanding proof of Dianetics was unreasonable because we do not seek scientific proof of aerodynamics before getting in an airplane, as "everybody knows" it works (Feeney, 1951b). Blish observed that scientific evidence was available for the capability of flight, but not for proof of Dianetics, adding that Hubbard's suggesting the public try Dianetics for themselves was not dissimilar to being "shown an airplane and asked to fly it in order to prove that it was safe" (Blish, 1951a: 86). Alfred Bomar wrote similarly to Blish (Bomar, 1951), and Robert Lowndes added a caution that if Dianetics was so powerful it should not be recommended to "try it for yourself" in any case (Lowndes, 1951b). Alice Bullock praised Blish, suggesting that Hubbard made a giant leap in his pronouncements similar to the jumps made by any good SF writer when writing a story, and with a similar lack of realism (Bullock, 1951). In September, Frederick Hehr extended the Dianetics discussion to UFOs (Hehr, 1951), Louis Martello described Pavlovian conditioned reflexes (Martello, 1951), and McFarland

was being used as a "guinea-pig" by a local Dianetics organisation (McFarland, 1951c: 89). Calvin Beck suggested that without evidence either way Dianetics was a weak proposition (Beck, 1951), and Robert Lowndes called for an end to these letters on Dianetics to what was, in fact, a SF magazine, and not a Dianetics forum (Lowndes, 1951a).

Fanzines

Fanzines contained critical evaluations of Dianetics, as Rog Phillips described in a review of *Fantasy Times*: "There's an article discussing an article in Liberty magazine branding Dianetics as the number one fraud of the year, and lumping it with SF – to SF's detriment." (Phillips, 1951c: 146). Phillips' fanzine reviews indicated generally negative fan interest from July through December 1951, after which interest seem to have petered out. In September 1951, there were three fanzine reviews by Phillips that mentioned Dianetics and all of them were negative: from *Peon*: "'The Annals of Aardvark' discusses Dianetics, being somewhat agin the new mind fad. And somewhat pessimistic about any possible plans to squelch it" (Phillips, 1951d: 144). In *Censored*:

> J.W. Campbell Jr. has an article in defense of Dianetics. Some of his statements are quite remarkable. For example. Psychiatry is badly in need of a fresh approach; the present approach is over half a century old, and has produced no notable advances. He also states, "the continuing high population of our institutions is, in itself, an indictment of the present methods" … Could it be that Dianetics gives one the license to depart from reason? Or is logical thinking engrammatic... (Phillips, 1951d: 145)

In *Fantasy Times*: "There is also an article 'Fan Feeling Against Dianetics is Growing,' which surveys fan reaction to this latest 'mystery'" (Phillips, 1951b: 145). By December 1951, Phillips was exasperated by the perceived larceny of Dianetics courses, and joined the ranks of those frustrated by the continued lack of empirical evidence to support Dianetics:

> [Fanzine *Arc Light*] doesn't seem to be a fanzine at all, but a pamphlet on Dianetics. I don't know why I include it in the reviews this time unless it's because it's the only thing I've seen connected with that expensive subject that sells for only 20c and my guarantee of money's worth doesn't apply even to this. [Dianetics claims] can fool you… But what I and a good many quite sensible people I know would like to see done is for L. Ron Hubbard to pause in his training of auditors at twenty-five dollars or more per hour in

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group classes… and publish the results of concrete cases. If I were in possession of a cure-all that could return the hundreds of thousands of patients in mental hospitals to normalcy and a normal life I would force proof down the throats of the psychiatrists in charge of those hospitals. (Phillips, 1951a: 146)

In the same issue, Phillips relayed a comment he had heard in June that year at the Westercon SF convention in San Francisco: "somebody described Dianetics as push button psychology. Whereupon he chortled: You push the button here, The engrams go 'round and 'round, And you come out clear!" (Palmer, 1951: 150).

Relevancy to SF, and the magazines

From 1951 onwards, contributors said that Dianetics was not relevant to the magazines, or that it would be better to talk about more scientific, or SF matters – that Dianetics was a fad like other pseudoscience and cults, or simply tiresome, even incomprehensible. Robert Lowndes in his capacities as editor of *Dynamic* and *Future* stated firmly that Dianetics had no place in SF magazines (Corley, 1953, Fogal, 1952, Lowndes, 1953a, 1953b, 1953c, 1953d, Porter, 1952, Vick, 1951, Wheaton, 1952, Wiederhold, 1951). Campbell distanced himself from commenting on Dianetics methods in 1951 in response to a letter from the author Poul Anderson (Campbell, 1951a). Raymond Palmer was carefully neutral in a 1952 response to Boyd, an official spokesperson, but did not consider Dianetics relevant for his publication: "we don't disagree with Dianetics as a science, but it doesn't belong in a stf [scientifiction] mag!" (Palmer, 1952a: 148). Edwin Corley – who later became a best-selling author – expressed his interests clearly: "I like Bradbury. Dianetics bewilders me. I like dames on my covers" (Corley, 1953: 131). In the 1970s, editor Ted White expressed his irritation that writers continued to associate Scientology with SF, when there was no relevant connection. He quoted an article by Peter Prescott published in Newsweek on November 29th 1971 which did this, describing it as a "remarkable example of critical bigotry" (White, 1972: 4):

[Peter Prescott claims] 'Not very long ago *Astounding Science Fiction* presented Ron Hubbard's crackpot theory… saying that medical journals took too long to get the important news to the public. Since then, Hubbard has founded a religion, Scientology, the rest of us have landed on the moon,

> discovered DNA and made blueprints of the coming ecological catastrophe.'
> …Prescott has distorted the facts to his advantage, linking a 1950 Dianetics
> article with present-day SF, while pretending that SF ignored moon-
> landings, genetic manipulation and ecology. …There are probably more
> copies still around of the May 1950 *Astounding* (the one which came out
> 'not very long ago' with Hubbard's first piece on Dianetics) than there are
> of the issue of Newsweek which came out that same week… Perhaps we're
> better off remaining within our own ghetto, where at least we are among
> friends, and we are appreciated for our real values (124-126).

White's "real values" of SF include a vehement refutation of "crackpot theory," and identification of SF with discussion of real and potential human experience. This seems to reflect the categorisation criteria I identified in my analysis of the popular definition of SF. Ironically a full-page advertisement for Dianetics appeared on p. 5 of that same issue of *Amazing*. As noted previously, publishers cannot be expected consult with editors about advertising content.

Dianetics, The Shaver Mystery, and other fads.

Dianetics was compared to, or associated with, the "Shaver Mystery." In 1951, the fanzine *TMLA* connected "engrams" and the evil subterranean "deros" of the Shaver Mystery, which Rog Phillips said was "calculated to cause pro-dianeticists to rise in arms. Perhaps it will yet come down to a basic argument over whether an engram is a dero. Or maybe it will go even deeper and speculate on whether deros are that way because of engrams." (Phillips, 1951e: 148). In *Other Worlds*, Albert Lewis wrote: "I regard Shaver as the one thing lower than Dianetics" (Lewis, 1951: 153). A pro-Dianetics letter writer, Carla de Paula Lopes suggested that Palmer's support for Shaver and opposition to Dianetics was inconsistent: "I would be interested to know why as intelligent a man as you seems to be willing to swallow the Shaver myth and somebody's idea of the final answer to the Flying Saucer as TRUTH and yet absolutely refuse to be open-minded about as rational a thing as Dianetics?" (Lopes, 1952: 147). Palmer's critical response to Lopes was: "I would as soon trust my neuroses to the average Dianetics auditor as surgery to an ape" (Palmer, 1952c: 148). An official letter from dianeticist Walter Boyd sought to correct Palmer's errors, describing the utility of Dianetics in thwarting the brainwashing techniques of "the enemy across the water [Russia]," and providing "a ray of sunshine in a dank prison to know that through

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Dianetic techniques such vicious practice has met its counter-measure" (Boyd, 1952, p. 145). Boyd also stated he had proof of self-serving opposition to Dianetics by the American Medical Association, from practitioners who unfortunately had to remain anonymous for fear of losing their professional status (Boyd, 1952: 145-146). The discussions regarding Shaver and Hubbard were so similar that Robert Lowndes, as editor of *Future*, apologised to readers for not clarifying that he was referring to Dianetics in one comment, leading many to mistakenly connect it to the Shaver Mystery:

> Some readers seemed to think that the reference to "The Hoax," in our last issue, was aimed at the so-called "Shaver Mystery." My apologies; I thought it would be apparent to all that I was referring to the alleged "science" of "mental health," which has aroused so much comment. (Lowndes, 1951c: 68)

Fans frequently confabulated Dianetics and the Shaver Mystery. In 1955, letter writer Frank Kerr paralleled the Shaver Mystery and Dianetics in *Amazing*: "The letters were fair, will be better. Mr. Spalding [editor of *Amazing*] may be starting a new Shaver Mystery, or more likely, Dianetics" (Kerr, 1955: 124-125). In a personal advertisement in *Other Worlds*, May 1957, Seth Johnson said: "Welcome correspondence; interested in Shaver, Dianetics, psychology, Club organization, Esper and fantasy in general" (Johnson, 1957: 27). In 1957, Walter Willis looked back on Shaverism and Dianetics as the controversies of fan magazines, describing Hubbard as having voyaged from "pulp to pulpit" (Willis, 1957: 106). In Martin Gardner's authoritative book *Fads & Fallacies in the Name of Science* (Gardner, 1957), Gardner attacked many pseudo-sciences, including Dianetics. Shortly after this, Edward Wood stated:

> The fanaticism so characteristic of fandom during and before the second World War is gone… partially because of the hankering of the professional magazines for borderline topics such as flying saucers, Shaverism, Dianetics, etc. etc. (Wood, 1959: 127)

In October 1974, editor and author Isaac Asimov categorised Dianetics as a "crackpot" subject to be considered alongside the Shaver mysteries and various other fads:

> [John W. Campbell's] correspondence with me… dealt mainly with his own notions, many of which were bizarre indeed… he denounced scientific orthodoxy, and upheld various follies such as Dianetics, the Hieronymus

machine, and the Dean Drive. He pictured himself always as a persecuted rebel, hounded relentlessly by the great and powerful scientific priesthood. I finally broke down and wrote as follows: 'Why do you persist in considering yourself part of a persecuted minority, John? Look about you. Billions of idiots on Earth believe in magic, in ghosts, in omens and the evil eye, in astrology, in any and every variety of folly that you ever heard of or can invent… there are perhaps one or two tens of thousands who are rationalists and who accept only what their senses and their reason tell them. We few are friendless and alone and it's cold out here exposed to the winds of logic. Can't you leave us to our misery and spare us the wild accusations of evils we lack the power to commit even if we had the will?' (Asimov, 1974)

Author Charles Sheffield later expressed similar reservations, describing the many historic "fads for orgone theory, mesmerism, Dianetics, and pyramidology" (Sheffield, 1990: 228).

Van Vogt

Alfred Eaton Van Vogt was an author who featured mind powers in his writing and was an early adopter of Dianetics. As manager of the Los Angeles chapter of the embryonic organisation, he was described in a letter to *Planet* as "the Moses" of Dianetics in California (Barnett, 1951: 101). Meanwhile, Campbell bemoaned the fact that Van Vogt no longer had time to write SF for him on account of his Dianetics commitments (Campbell, 1950u). Van Vogt discussed Dianetics in several interviews, and his history with Dianetics was described in features on his life and works (Brennart, 1975, Drake, 1977, Elliot, 1978, Elliot and Flyn, 1979). Van Vogt was not taken seriously in some circles, and was described in *New Worlds* as the "Last of really charming SF loonies" (Partington, 1978: 48). As the former head of the California foundation, Van Vogt provided authoritative information on the difficulties in the early years of Dianetics, which is supported by the changes in advertising expenditure over time found here. In a 1982 interview he said:

Unfortunately, those early dianetic organizations lasted less than a year. I had the interesting experience of watching half a million dollars dwindle to nothing. All across the Hubbard dianetic foundations went into bankruptcy. (Van Vogt, 1982: 11)

Despite this, he added "I have never regretted my sudden feeling that this was probably my chance to study human behavior in a direct way" (p. 11). Van Vogt remained a defender of Dianetics, as Martin Gardner described:

> When I attacked Dianetics in my old Fads and Fallacies book van Vogt wrote to warn me that my hostilities would soon cause serious heart disease and crippling arthritis and that only Dianetic therapy could avert such disasters. Today thirty years later my heart and joints are in fine shape thank you but van Vogt's mind and career were seriously crippled by Hubbard nonsense. (Gardner, 1983b: 68)

Van Vogt responded to Gardner's comments in 1983 with unsubstantiated claims about the impact of Dianetics on the medical profession, its success in treating trauma, and added an ad hominem attack on Gardner as a "conformist" (Van Vogt, 1983: 11). Gardner believed Van Vogt to be delusional: "That Van Vogt… believes that this idiotic therapy has put psychiatrists in the United States out of private practice, passeth all comprehension. Was there ever a cult more authoritarian than Scientology, or anyone more conformist than a Scientologist? I rest my case" (Gardner, 1983a: 12).

Threats, Scorn and Litigation
Some commentary on Dianetics and Scientology provoked litigious responses – direct or implied. In August 1970, Ted White (editor of *Fantastic*) published an editorial on the murder of Sharon Tate in which he implied Charles Manson was a fan of Robert Heinlein's *Stranger in a Strange Land*, and a devotee of Scientology. White's comments were likely informed by an identical statement in *Satan's Slaves* by James Moffatt, published under the pseudonym of James Taylor (Taylor, 1970). White's editorial received an ad hominem attack from the well lettered "Rev. Dr. C. E. Deckard, B.S., D.D., Ph.D.," which White published, and responded to, in the December 1970 issue of *Fantastic* – adding a defence of Barry Malzberg, who had clashed with the scientologists in November. Deckard attacked White personally, adopting a disparaging tone of higher moral authority:

> Frankly, I was astounded by such frothings masquerading as responsible editorial comment. I suppose charitably charging your babbling to your, evident, extreme youth would be the Christian thing to do, and I would do so if it were not for the fact that your vituperation was given national

> circulation through your magazine. However, someone must call you to
> account for your irresponsibility. To take your mouthings in the order in
> which they appeared… (Deckard, 1970: 129)

Barry Malzberg's critical article *Dianetics: The evolution of a science* in the November 1970 issue of *Amazing* had included a fresh suggestion that eugenics was a natural consequence of Hubbard's statements about Dianetics: "Hubbard notes, that as the result of the introduction of Dianetic therapy, some one-fourth of the human race will shortly become dominant over the remaining three-fourths, and thus control the destiny of the globe" (Malzberg, 1970: 127). Fortunately, Malzberg noted, perhaps with some degree of skepticism: "the fact that this master race will show far more compassion than could be otherwise expected, will avoid the possibility of genocide of non-clears" (127). Following this, in March 1971, however, Malzberg wrote an apologetic letter saying: "It has come to my attention that an attorney claiming to represent the alleged interviewer in the introductory Scientology film mentioned in my November 1970 article…has stated that I have libelled his client" (Malzberg, 1971: 129). Malzberg's letter was printed with a lengthy rebuttal of his original article by the "Deputy Guardian for the U.S. Churches of Scientology," who stated: "In a field as retarded as human science, the emergence of a method to restore conclusively the tremendous power of true sanity is predictably subject to rejection before inspection" (Thomas, 1971: 104). A letter, from dianeticist J.E. Stewart, printed in the same issue managed to employ in one tract all the techniques commonly used to defend Dianetics – the conspiracy theory that the establishment was suppressing Dianetics: "The substance of the letter I received [from John. W. Campbell] was that Dianetics had been fairly successfully treating psychosomatic illnesses and that the AMA stepped in and stopped them, that Hubbard was infringing on the Medical Profession," and moreover, that A. E. Van Vogt was a practitioner "of overpowering integrity" (Stewart, 1971: 122). He also reversed the burden of scientific proof: "no outsiders have ever proved it not to be a science," as well as hinting at a media conspiracy: "Twenty years is a long time [for Van Vogt] to be interested in something in which (sic.) mass-media magazines have insisted is entirely without scientific basis" (123). Ted White, the editor, commented wryly on the response: "Apparently Barry's article angered the Scientologists considerably" (123). A review of *Satan's Slaves* in *Oz* magazine that year inspired a rebuttal from the Church

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of Scientology (Neville, 1971, Parselle, 1971), which referred to litigation against the publishers of *Satan's Slaves*. Later, in a 1976 article, Malzberg became more circumspect, reporting second-hand the doubts author Alfred Bester had expressed regarding John W. Campbell's enthusiastic embracing of Dianetics, rather than making another direct critique of his own (Malzberg, 1976). L. Sprague de Camp later warned of these widespread, aggressive and litigious practices of the scientologists in *El-Ron of the City of Brass*:

> More than one author has complained of harassment from outraged Scientologists by abusive letters and threatening telephone calls… While, so far as I know, none of these suits has ever come to trial they effectively discourage the publication of views unsympathetic to Hubbard and his followers. (Sprague de Camp, 1975: 64-65)

There was a pattern in the magazines of the followers of Dianetics employing ad hominem arguments, evading the burden of scientific proof and threatening legal action against critical opposition. Governments concerned about Dianetics advocacy and practices have carried out their own due process, also often confrontational. Scientologists were finally granted pay-roll tax exemption in 1983 in Australia, following a series of state judgements and legal arguments. The rationale for this decision was technical, and did not flatter Hubbard:

> charlatanism is a necessary price of religious freedom, and if a self-proclaimed teacher persuades others to believe in a religion which he propounds, lack of sincerity or integrity on his part is not incompatible with the religious character of the beliefs, practices and observances accepted by his followers. (Mason A.C.J. et al., 1983)

In France scientologists were accused of defrauding French citizens (Vaux-Montagny, 2009), significant issues were raised in Germany (Moseley, 1997), and the Church of Scientology has pursued extensive litigation to achieve charitable status as a religion in a number of countries (Carobene, 2014, Richardson, 2009). Most recently, a controversy has arisen over Scientology practices of "stealth conversion" regarding their provision of educational materials to schools (Mantesso, 2019).

THE TROPICS IN SCIENCE FICTION

The two published papers that are combined in this chapter identify characteristics of tropical culture found in SF through complementary applications of the proximal method. The first paper uses text searches to identify tropical themes, and the second uses image searches of cover art to the same ends. "Trysts Tropiques: the Torrid Jungles of Science Fiction" (Menadue, 2017b) was my first attempt to apply the embryonic "proximal reading" method to identifying the cultural content of SF. In the previous chapter, I have described my investigation of the history of L. Ron Hubbard's Dianetics/Scientology between 1950 and 1999. My Hubbard article demonstrates a more evolved version based on my earlier experiences with the method. My dissatisfaction with the relatively unsophisticated prioritisation method I had employed in "Trysts Tropiques" led me to appropriate the PRISMA method that I had used for the literature review as a sensible, recognisably empirical, and replicable method for screening articles. It occurred to me that the methodical and replicable process of PRISMA could equally well be applied to my literary investigations, which were each a form of literature review, demanding searching, screening and then description of the most relevant findings. "Trysts" is an example of the methodology being applied as an

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aid to discovery, in contrast to the previous example, which was rigidly executed and included techniques for sorting, graphing and statistical analysis. A subsequent call to write another tropically themed paper provided an opportunity to attempt a different form of the proximal method, and to attempt to validate the findings of "Trysts" from a complementary perspective. For "Cities in flight: A Descriptive Examination of the Tropical City Imagined in Twentieth-Century Science Fiction Cover Art" (Menadue, 2018a), I employed a selection process based on cover image analysis. The two papers together illustrate dissimilar applications of the methodology to the same topic. This demonstrates how the methodology can provide complementary results that draw similar conclusions when examining tropical culture from a hypothetically "alien" perspective. The use of SF as a tool for identifying human expectations of the tropics and tropical cultures led to a consideration of how the tropics can be identified from images of alien landscapes and peoples – the identity assigned to the tropics as a commonly accepted cultural "fact" of western tradition is revealed under a SF lens as a truly arbitrary designation that can have no especial relevance to indigenous peoples who are not products of that culture.

Trysts Tropiques: The Torrid Jungles of SF

In response to a call for papers by the journal eTropic on topics concerning liminal, "horror," aspects of the tropics, I searched the corpus for occurrences of the stemmed words "tropic," "jungl" and/or "rainforest" and the occurrences of these terms were factored with a parallel search for the stemmed groups "vampir," "zomb" and "ghoul." The aim was to uncover stories that featured supernatural monsters in a tropical setting. The word "desert" was not included as it was not possible to separate geographic uses from other meanings – without visually assessing covers, which is how I proceeded in the next article on this topic. The term "tropic" did identify some desert settings, but the majority of works discovered featured jungle environments. The magazine issues

selected by the search criteria, were ranked by multiplying the total occurrences of the first terms by the total of the second terms. The contents of the fifty highest-ranking issues were all examined, focusing on the context in which the search terms were found, and including outward reading of editorials, letters and factual articles.

Unlike *Tristes Tropiques*, the wistful work of the structural theorist Claude Lévi-Strauss[12] (1961), the application of the methodology to identifying and reviewing a body of works located in the tropics revealed the history of tropical SF to be dynamic, and mutable over time – but initially concentrated in transgressive behaviours and themes. In early twentieth-century SF, the tropics were "torrid" in both a human, emotional sense as well as by Aristotle's definition of a geography that is virtually uninhabitable due to the hostility of the climate (Physics, 362a33-362b29). Depictions in twentieth-century SF and fantasy of the tropical environment are wild and seductive – more a source of "trysts" than of sad reflection. By the end of the twentieth century, however, the science fictional tropics have become transformed into something positive and less fearsome; a rich ecological reserve, endangered, and in need of preservation. Tropical SF narratives reflect a changing public understanding of the tropics, and this illustrates the value of SF as a record of the history of changes in social and cultural values.

From early pulp issues of the 1920s, and continuing to the 1950s, SF depicts rainforest and jungle environments as a place of fascination, seduction, and danger. This is mirrored in editorial and "factual" content of magazines of the period. The organised, controlled environment of the civilised world, with its farms, roads, cities and rule of law, is in stark contrast to adjacent lawless, chaotic tropical environments. Across a liminal boundary, we enter the domain of the monstrous, and are freed from the civilised constraints that inhibit us from expressing our baser instincts. In this environment, participants freely indulge in behaviour that is as liminal to their culture as the jungle is to their civilisation. Later SF reveals a more moderate, or positive, view of the tropics, including discussions of environmental degradation and physical symbiosis (Cowper, 1984, Herbert, 1972). There are factual articles that are similarly sympathetic; in *Omni* (Bower, 1979, Montgomery, 1988) and *The Magazine of Fantasy & Science*

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[12] Lit. "tropical sorrows."

Fiction (Asimov, 1995). These reflect growing environmental concerns and a more realistic public understanding of the tropics.

Tropical tropes in pulp SF

> A girl had stepped from the jungle wall into the clearing. She wore a brief halter of furred skin with a loincloth of the same... She was beautiful and wild, emanating the aura of a cat… he could see her finely chiseled features, her gleaming white teeth, her flower-red lips. She was ravishing. Wayne's eyes caught all this in a fraction of a second. He felt himself turning a brilliant scarlet as much because of her laughter as because of his nakedness. The skinny six-foot scientist knew and was keenly conscious of what a ridiculous figure he must cut in her eyes and he resented it. Covering himself as best he could with a handful of grasses, Wayne started to walk toward the girl. Her beauty he had already noted, in spite of his missing glasses. (Recour, 1949: 90)

"The Swordsman of Pira" by Charles Recour, published in *Amazing Stories*, is typical of selections from the early decades of pulp SF. Next, a monstrous humanoid emerges from the jungle pursuing the girl and is promptly killed. Wayne snatches up the loincloth from the body to cover his modesty and the girl, Kayna, reveals (by sign language) that the monstrous "Krag" is an enemy. Later, after rapidly learning to speak English, she explains that the Krags emerge by night from the jungle to abduct the women of the Pirans:

> "… They are interested in only one thing: women and girls. For some reason they are incapable of breeding females and so they must steal our people to build their race…" Kayna explained bitterly. (p. 93)

Narrative themes of violence towards women, sexual or physical, are commonly found in this period and such salacious material often drives the plot. The characterisation of heroic protagonists also displays formulaic and stereotypical typologies. In this story, the heroic Wayne is a full professor at the age of twenty-eight, a jungle war veteran, and a former captain of varsity fencing, but has been diminished by academic life:

> In spite of the baggy drape of his clothes it was apparent that he had a good frame, even if it was sparsely covered with meat. His six feet of height looked less because of the perpetual stoop and roundness of his shoulders from too much time over ponderous mathematical and physical tomes, but there was really nothing wrong with him that a few weeks of rugged living

He is typical of the "more attractive, more capable versions of the average reader" (Attebery, 2002: 40) that we find in stories of this period. He arrives naked and unequipped in an alternative universe, meets the ravishing Kayna, and is rapidly transformed by "rugged living"; his muscle tone and myopia soon recover, and his skill with a sword is put to good use as he works to thwart the evil plans of the Krags.

The story is set in three locations: the fearsome, wild jungle of the Krags; the island city-state of the Pirans; and, between the two, the sea, which acts as both a physical and a metaphysical boundary. The sea has liminal characteristics as a transitional space between jungle and civilisation, and provides a restful interlude for Wayne to continue his adoration of Kayna:

> [they] headed out on the awful bosom of the Sea of Korus. Only it didn't really look awful, on the contrary, Wayne thought to himself it looked magnificent. Now out of the dense jungle, he could see the beauty of the setting sun, the awesome but not fearful proportions of the sea... Nor did the presence of Kayna, her long black hair wind-blown, do anything to make it unpleasant. She stood in the stern of the boat, her hand confidently guiding the tiller and there was a smile of satisfaction on her face. Wayne went over beside her. The fragrance of her took his breath away. (p. 105)

Wayne's obsession with Kayna is emphasised through the course of the narrative, and the narrative is richly imbued with detailed physical and sensory descriptions of Kayna's beauty, which appears to have been contrived to appeal to the fantasies of Attebery's "average reader." When they reach the city of Korus-tan, it is a peaceful and welcoming place, ruled by Kayna's benevolent father. Wayne saves the city from the Krags and stays with the besotted Kayna. "Swordsman of Pira" embodies all the common thematic concepts of the stories of this early period: the wildness of the jungle compared to a more ordered external world; the irresistible "prize" female; the transformative effect of location upon characters in the story; the presence of a transitional boundary between the civilised and the wild; the identification of the jungle as the location of fearful and dangerous beings, and that civilised (male) protagonists have the capacity to confront and change the nature of the jungle and its human and non-human denizens. Wayne stays with Kayna at the end of the story; motivated by a desire to save her from the indignities and suffering she would experience if he took her

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home to his world. The same assumption is found in "The Leopard Girl" by Doug Wilcox, published in *Fantastic Adventures*: "She might have the keen intelligence it took to live with the most dangerous beasts. But she couldn't survive if she were thrown into civilization" (Wilcox, 1942: 53-54). Civilisation is incompatible with the primal necessities of survival in the jungle environment. To cage the wild and irresistibly sensual jungle women is to destroy them.

The jungle is transformative, and infectiously wild, enabling visitors to be liberated from their civilised inhibitions. A lack of moral restraint is a common theme across a broad range of pulp fiction of this era, whether SF, detective, western or horror titles. The graphic violence and pornographic content of pulp comics in the post-war period led to a movement to censor them, culminating in the adoption of a voluntary code by publishers in 1954 to avoid legislative restrictions (Nyberg, 1999: 52-55). This was a response to the determination between 1947 and 1948 by officials, including the FBI Director, J. Edgar Hoover, that juvenile delinquency was increased by their corrupting influence (Lent, 1999: 11-12). The reduction in lurid content has been held responsible for the decline and collapse of some titles, which no longer met the demands of their readership for transgressive material, but other contributory economic and business factors affected the market of the time (Kidman, 2015). Evidence suggests a more complex model applies to the success of magazines, combining business, public opinion and readership factors, as was evident in the failing of *New Worlds* by the end of the 1960s. Board members of major distribution companies, shocked by the magazine content, banned it from their outlets. Champions of the "moral majority" promoted negative and sensational news stories, and readers were alienated by a lack of consistent editorial practice. All of these were influences on the political decision to withdraw UK Arts Council funding, and the collapse of *NW* that followed (Greenland, 1983: 19-20). It seems that changes in content reflect a range of social and cultural factors indicating that magazine SF is representative of broader interests rather than dependent on a simple censorship model and provides a mirror to reflect historical changes that is more nuanced than is suggested by Nyberg and Lent.

A feature of SF narratives that evades censorship is the transference of responsibility for transgressive behaviour to non-human or post-human characters. This

transference of agency from human to supernatural protagonists provides authors and publishers with a justification for more lurid and salacious prose than would be acceptable in magazines and comic pulps featuring human adversaries. As I discussed in the Introduction to this thesis, the success of Pat Mills' *2000AD* over the more reality-based *Action* is another indicator that SF context makes content less open to public criticism as a model for human behaviours, and opens the boundaries of the genre to include almost any content that can be made to fit the defining criteria of SF. An example of this can be found in "Prometheus II" by Stuart James Byrne, published in *Amazing Stories* (Byrne, 1948: 8-87). The hero, Germain, has a spectacular dream vision of ghouls boiling their naked human victims alive in a subterranean volcanic lake: "a scene of living Hell such as had not been imagined by Man since the days of Dante." Not satisfied with this torment alone, the "fiendish" ghouls used machines that "controlled their victims' minds and made them do anything they wanted them to do. And they filled the lake with energizing, stimulative life rays, which would not allow the men and women to die, in order that their agonies might be prolonged" (p. 54). The author attempts to employ the barest notions of the "plausibility" that I discussed in defining SF, even in this most gratuitous and fantastic tale. Physical brutality is supplemented by sexual violence, orchestrated by the inhuman ghouls, and described in typically florid prose:

> Here a great Bacchanalian orgy was being carried on. Hundreds of men, mingling with the ghouls …reveled in unspeakable horror. A very beautiful dancing girl …was made to dance suggestively on the long banquet table, naked. The men around her poked at her and tripped her. Some broke glasses in her path, and others made her dance on the broken fragments… One great brute of a man then climbed on the table and, encouraged by the satanic crowd, cruelly embraced her before them all. Then, to Germain's uncontainable horror, he took a sword from one of his companions and proceeded to chase the poor girl along the table. When he caught her, he hacked her to pieces, furiously, passionately, while the onlookers rolled off their seats with laughter or fainted from the excitement of their own perverted passion. (pp. 54-55)

The ghoul leader justifies their behaviour as a necessity of moral relativism. "So it is with the nature of the Cosmos. There must always be construction and destruction. For every force exerted there must be an equal and opposite reacting force. The one phase must complement the other. Since existence is balanced between these two extremes it

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follows that the one extreme is no worse or no better than the other" (55). A simple, often Manichean, representation of physical, spiritual or cultural values is commonly found in all the SF stories identified in this study. This is typical of pulp fiction of the first half of the twentieth century, as Jess Nevins explains:

> Pulp fiction, regardless of genre, has some easily identifiable characteristics: an emphasis on adventure and drama and an avoidance of the mimetic mundane; a privileging of plot over characterization; use of dialogue and narration as means for delivering information rather than displaying authorial style; regular use and exploitation of the exotic, whether racial, sexual, socioeconomic, or geographic; simple emotions strongly expressed; repeated use of common tropes, motifs, and plot devices, to the point of rendering them clichés; adherence to the real or perceived limits of specific genres, with concurrent lack of literary experimentation; and a clear-cut moral stance, with good usually triumphing over evil. (Nevins, 2014: 93)

Pulp fiction writers often demonstrated remarkable inventiveness and hyperbole, in jungle stories to emphasise distinctions between the wild and the civilised: "The fighting man of Callisto is also a farmer – and he must be a fighter because of the swarms of vampire monkeys which infest its jungles and raid its farms" (Steele, 1943: 208). Editorials routinely support unsubstantiated assumptions, such as the possibility of were-animals among "savage tribes of Africa" (Wilcox, 1942: Editorial note p. 63), and historical contact between lost civilisations of Earth and Venus (Stoneham, 1948: Editorial note p. 232). The mise en scène of the tropical environment is used to justify transgressive actions, and pseudo-scientific evidence is commonly used to bolster the realism of the setting and the plausibility of the story content. Brian Stableford, in an analysis of the allure of Edgar Rice Burroughs's 1912 pulp-serialisation *Tarzan of the Apes* in *Interzone* (Stableford, 1991) identifies the jungle as a means to escape civilised constraints and as a form of wish-fulfillment fantasy which is accepting of our uncivilised urges:

> *Tarzan of the Apes* is a curious celebration of Rousseauesque ideas about the nobility of savagery and the idea that a fundamentally virtuous human nature is routinely spoiled and perverted by cultural artifice… (50)

Stableford describes the wild, unconstrained mythology of the jungle in *Tarzan* as answering universal, primitive, urges and suggests that the allure of jungle symbolism

and the freedom it represents is based on fundamental human drivers, that it embodies utopian, adventurous ideals and provides a need for fantasy wish-fulfillment:

> …if we were honest, there would probably be few among us who could claim to be entirely unafflicted by fantasies of doing violence… to those who annoy and frustrate us in the thousand trivial ways which everyday life permits and necessitates… Men are the masters and agents of change: [Tarzan] is at home in the jungle not because he is bestial but because he is strong enough to subject the jungle to his ennobling influence (51).

Despite its savagery, the jungle can be civilised, controlled and tamed by a man.

Liminal spaces

Monsters such as the Krags and the ghouls of Byrne's story leave the jungle to find their victims. Others live in the jungle but are separated from it by a defined boundary. In *The Legion of Space* by Jack Williamson, published in *Astounding Science Fiction* (Williamson, 1934), the evil Medusae, who have captured the female love-interest of the story, live in a city which is:

> A strange, amazing place… incredibly huge. All built of black metal. Surrounded with walls a full mile high, to keep back the terrible jungle. There's a colossal fortress in the center, a gigantic tower of black metal… guarded by weapons that could annihilate all the fleets of the system in an instant. (105)

Access to the Medusa city is extremely difficult, being eventually achieved by way of a conveniently placed aqueduct, but once in the city the protagonists are helpless as the Medusae levitate and have no need of conventional roads or pathways. A more abrupt demarcation of a physical boundary is found in M. C. Pease's "The Final Answer" published in *Science Fiction Adventures* (Pease, 1953) in which the liminal space between the city and the jungle is kept scorched clear and sterile by incendiary devices. A solitary gatekeeper-cum-executioner controls the only exit from the city, and it is common knowledge among the citizens that certain death awaits in the chaos and disorder of the jungle outside. Sorin, the heroine of the story, is exiled for rejecting the civilised, but stagnant, culture of the city, but is rescued by a Tarzan-like savage who lives in symbiotic harmony with the forces of nature. At the end of the story, however, Sorin is decreed to be unique by the symbiotic overmind of the jungle and allowed to retain her individual identity alongside the hive-mind of other symbiotes. She desires to

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return to the city and reintegrate it into the world outside and must retain her (civilised) self-identity for this purpose. "The Final Answer" is one of only two stories identified in which the placement of civilisation is reversed – the city is enclosed by the jungle. But in this case, as in C.T. Stoneham's "The Lion's Way," published in *Famous Fantastic Mysteries* (Stoneham, 1948), the jungle is either all that is outside, or the civilisation beyond the jungle is a barrier in itself; Japanese occupying forces in the case of Stoneham's story. Jungles are often presented as the liminal space, or physical barrier, between external civilisation and hidden cities, caverns or similar residences of evil forces, in "Gods of Venus" by Richard Shaver, published in *Amazing Stories*:

> …a vast structure lay here under these ancient trees of the jungle. From every cranny and carving… sprang countless airplants. Mosses trailed across the time-forgotten doorways and great arched windows. Orchids flung their subtle, sensuous colors from the ledges of the rock walls…Most of these ruins lie in the wilds of Venus' jungles, far from traveled routes, and are little visited or spoken of. (Shaver, 1948: 47)

Over time, the nature and purpose of the boundary changes, to match increasingly complex narratives. In "Jacob's Rock," published in *Amazing Stories*, Paul McAuley describes tunnels and passages that form a no-man's land between jungle sanctuary and external space-habitat, the jungle being the exotic, hollow core of an asteroid inhabited by outcasts who offer protection and assistance to the heroine (McCauley, 1989). In "Stolen Faces, Stolen Names" by Ray Aldridge, published in *Science Fiction Age*, an existential journey is made through a tropical island forest by a band of competing clones, all called "Nomun." Their progress is enforced by a lethal robot pursuer and they must navigate among trees, that telepathically transmit the living memories of the original clone, in a quest to identify which of them is that "authentic" original (Aldridge, 1995: 47). In post-millennial stories the liminal space may be the whole of the focus. The narrative of Christ Butler's "The Turn," published in *Asimov's Science Fiction Magazine* (Butler, 2007) takes place on a raft eternally following a river that divides jungle on one side from desert on the other. The raft-dwellers have no clear purpose: "Everyone on The Raft carried out their duties without hesitation, but no one knew why" (p.182). This appears to embody the neutral, content-free nature of the liminal boundary, as is also found in "The Final Answer" and "Swordsman of Pira," but

in the more modern context may stand as a metaphor for a more broadly cultural lack of certainty of place and purpose. In this story we learn nothing about the land to either side and although Quill, the "Archer" of the raft displays a longing to discover what the jungle conceals, he never acts on it.

Changing perception of the tropical environment

Early representations of the tropics are of a wild, dangerous, mysterious and sensual place. It is a land of opportunity: a source of raw materials (and inhabitants) for exploitation. Editorial comments and "factual" articles that support these assumptions accompany the stories. Harley Waldeyer's "Ferocious-Fantastic-Frightening" column in *Fantastic Adventures* offers "Some fantastic facts about the gorilla," which he describes as a powerful and formidable creature, and most dangerous "…in the jungle, where the great beast is among primitive surroundings" (Waldeyer, 1942: 37). An editorial comment on "Gods of the Jungle" by Nelson S. Bond in *Amazing Stories* (Bond, 1942) supports the possibility of the fantastic premises of the tale despite the author misplacing Angkor in Burma rather than Cambodia:

> The mural here described is no invention of the author. It actually exists.
> Many and ludicrous have been the attempts of savants to give a logical
> explanation of its meaning. Readers of scientific fiction, less hindered by
> dogma and prejudice, may be willing to accept it as factual proof that at one
> time in history intercourse did exist between this earth and the planet Venus.
> -Ed. (232)

Bond's story begins with a classic pulp SF vision of the tropics: "Burma by day was beautiful - but its beauty was that of the wakened Amazon, bronze girdled and strident riding to battle with breasts straitlaced, with soft hands gripping the sword." (194). By night, Burma is:

> A new land: a sweet, wild land of mystery and charm… of silver and
> shadow… cool, chaste, serene! As untouched and untouchable as the
> brooding gods of its people. Burma – a land of stirring song and stranger
> story… his nostrils scented wisps of sandalwood and musk… the faint,
> exotic pleading of native pipes… (195)

In the issue of *Amazing Stories* that features "Swordsman of Pira," there is a factual article giving a Herodotean description of savage peoples and horrors; a simple

classification of civilised and savage, and the difficulties faced in civilizing these regions:

> The horribly mutilated bodies of the white men … were found here. They were staked to crevices in the supporting stone walls of the temple by wooden rods driven through their bodies. The whole grisly scene had the air of a sacrificial event… Later investigators discovered that actually there was an Indian society, the "Xanphene," the equivalent of the leopard societies of Africa, whose function was to guard the purity of the jungle… (Yerxa, 1949: 23)

Another reason given for disaster is "the sheer voracity of a fecund jungle" and the prospects for colonial exploitation are poor: "In the not distant future we may see a time when the land surrounding the Amazon will be thrown open to civilization, but it will be considerably more moderate than the high powered oil-engine civilizations that white men usually like to establish" (23). In the second half of the twentieth century the tropical environment is depicted in a more sympathetic fashion, its denizens are not so simply defined, and the relative values of the civilised external world are questioned. A steady process of rehabilitation leads to emphasis of the value of tropical environments. By the end of the century this is expressed primarily in ecological and pharmaceutical terms, reflecting changing scientific knowledge and cultural awareness. This is reflected both in fiction and in factual articles and editorials. "A Message To The King of Brobdingnag" by Richard Cowper, published in *The Magazine of Fantasy & Science Fiction* (Cowper, 1984) was dedicated to James Lovelock, whose popular work *Gaia: A New Look at Life on Earth* had been a recent success (Lovelock, 1979). The story concerns the implementation of a genetically engineered algae crop in tropical regions by a company thinly disguised as Monsanto. Even the scientists working for the project are divided about possible outcomes:

> "But what about your contract? Doesn't Monagri stipulate-"
> "I don't give a whore's fuck about my contract! If we don't blow the lid right off this one, they'll only go and try it again somewhere else." (85)

Ernest Jaworski, director of Monsanto's Biological Sciences Program, had publicly announced Monsanto's new capacity to genetically engineer seeds only sixteen months previously, saying: "It will now be possible to introduce virtually any gene into plant

cells with the ultimate goal of improving crop productivity" (The Times (Shreveport), 1983). As a result the company received increasing criticism leading to public actions, such as the 1990 "Millions against Monsanto" campaign (The Organic Consumers' Association, 2017). Interests in global ecology had grown significantly since Lovelock gave his first lecture on the subject to only two attendees at Princeton in 1969 (Lovelock, 1979: Introduction). Cowper's story is culturally significant in associating the very recent introduction of genetic crop engineering with Lovelock's Gaia hypothesis – before global activism against crop engineering became commonplace. In the story, the result of tampering with the natural order is portrayed as catastrophic, when an aggressively competitive algal strain, which will overwhelm and out-compete all other plant life, is seeded into the wild in Far North Queensland: "We have passed a sentence of death on the biosphere, and there is no court of appeal. It is only a question of time – or God" (p. 92).

A science feature that provides a more balanced perspective of jungle and civilisation is Kenneth Bower's "Darwin's Archipelago," published in *Omni* (Bower, 1979). Bower's piece combines a mildly negative view of the tropics with criticism of the human culture around it. A later feature article in *Omni*, "Amazon Apothecary," recognises the value of the tropics to science (Montgomery, 1988), and the agriculturalists and farmers who were exemplars of civilization in pulp stories of the 1930s and 1940s are now the savages, who threaten the tropical ecosystem:

> But if laboratory scientists are acquiring a new reverence for tropical plant life, it is not one shared by loggers, farmers, miners, and cattlemen working in tropical countries themselves. Balick points out that thanks to those people, rainforests worldwide are being destroyed at a rate of many millions of acres per year. As this land disappears, the cultures with which it is linked will vanish as well. (1988: 42)

In 1995, Janet Asimov wrote about issues of deforestation in a similar vein:

> In the past fifty years half the tropical rainforests have gone. … Entire ecosystems are being destroyed, and will never recover. Tropical rainforests play a huge role in the planet's climate, contributing oxygen and removing carbon dioxide. They also contain more species of animals and plants than anywhere else. As the forests dwindle, scientists are frantically trying to find still uncounted useful foods and possible medicines… caring for important fellow life forms like trees may insure our own survival. (Asimov, 1995: 100-101)

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Reviewers and critics have become more critical of writers who persist with outdated treatments of the tropics. When Gwyneth Jones reviewed Colin Greenland's novel *Take Back Plenty* in *The New York Review of Science Fiction* (Jones, 1990), she focused on his simplistic use of violent and lascivious jungle tropes. In the same issue, Robert Killheffer reviewed *Kalimantan* by Lucius Shepard, and quoted Shepard from his column "Stark Raving" for *Ziesing's Wired* (Shepard, 1990). Shepard's personal experience is that the jungle monsters are now human: "I remember being so fucking terrified, chased by this little gray Ford full of men in white shirts along a dirt road after searching for a friend at El Playon, where the death squads dumped the bodies of their victims." Killheffer praises Shepard for his rejection of previous tropical story characteristics in his novel: "Throughout the story Shepard borrows tropes from pulp jungle adventure, but he undermines them, denying the reader traditional payoffs and resolutions" (Killheffer, 1990: 13).

There is not only a changing perception of the tropical environment, but also an increasing tendency in the second half of the century to mock earlier stereotypes and identify them as kitsch. Earlier stories included unsubtle attempts at humour, often based in farce and innuendo:

> …he savored the heady and delicious perfumes of flowers that streamed in fine threads of scented air through their narrow glade, and peered hopefully along the jungle aisles in search of their hula girl, and her interesting goblets. (Philips, 1941: 37)

Gordon Eklund's 1973 story "The Beasts in the Jungle," published in *F&SF* (Eklund, 1973), is a pastiche of *The Island of Doctor Moreau* by H. G. Wells. The story starts with a scene in which one of the male jungle explorers resists sexual assault by an amorous human/baboon hybrid; the story continues in a comedic style which mocks the earlier portrayals of human protagonists in fantastic fiction, but combines this with a more serious ecological message, relating the attitude of the animal hybrids towards their own nature and that of their maker and the disastrous outcomes of the well-meaning interventions of the humans. The crux of the story comes when the (attractive) female character teaches the peaceful, vegetarian, hybrid animals who have set up home in the jungle about Jesus, and they immediately crucify their benign gorilla-leader. This

story is transitional to later stories, which are purely derisory towards the tropes of pulp fiction; in *Omni*, February 1986, Terry Runte satirises the pseudo-scientific editorials and associated stories of the previous era:

> Somehow by sheer coincidence the TV producer had stumbled across Mexzcapapapetalson The Great Lost Enclosed Shopping Mall of Gold. Here we have evidence that centuries before we ever thought of such things the Mayans had built this mall, conveniently located, with plenty of free parking and the kinds of bargains you can only get with volume sales. (Runte, 1986: 118)

Writing in an editorial piece in *Interzone*, David Langford mocks tropical tropes portrayed in B-movies screened during the 1991 Mexicon: "The theme of written SF was rounded off by a selection of videos all having titles like *Piranha Women in the Avocado Jungle of Death*. You probably had to be there" (Langford, 1993: 34). By the end of the twentieth century, the misinformed and sensational treatments of the early pulp era have been overthrown and ridiculed. The modern perspective on the tropical environment is more serious; it questions human roles and responsibilities for maintaining the natural environment, which are reflected in the narratives that have evolved in SF.

The female jungle

In SF of the early twentieth century, the demarcation between the wild, dangerous jungle and the civilised world is emphasised by the use of female metaphors to describe the jungle. This practice is abundant in SF of this early period. In "Gods of Venus," the jungle is described by an Earthly visitor as feminine and mysterious: "Beneath that shining sea of soft-breasted cloud-mass lay, I knew, vast unknown seas, and great island continents covered by primeval untouched jungles." (Shaver, 1948: 14), and the inhabitants are decidedly risqué, to an Earthman's eyes: "Naked, artfully tattooed, sensuous, strong, active bodies, racing on errands vital to the welfare of their world, as well as the welfare of earth. Weapon-harness, their only garments!" (p. 8). The jungle warriors have been transformed by the vicissitudes of tropical life and are clearly distinguishable from their urban counterparts:

> These were a different stamp than the city dwellers of his race I had seen heretofore. They were men of the swamps and forests that the Ruler had

summoned to aid me in finding my affianced. They were hunters used to combat with the wild life of the Venusian jungles, so much more dense and riotous than the worst jungles of Earth. (p. 24)

Malevolent characters and forces are generally not natural products of the jungle, which often has naturally positive characteristics, as in the telepathic symbiosis of the world-tree in "The Final Answer" (Pease, 1953). In "Gods of Venus," however, a sinister goddess, Nonur, portrayed in the lasciviously baroque style of the period, inhabits the hidden city:

> Her beauty was undeniable, a dark brunette, her skin was white as paper, her flesh soft and shapely, her limbs undeniably graceful and supple. But her deep emerald-lit blue eyes were pale and venomous, her lips were sated with past orgies of cruelty, her fingers twitched upon her sleek thighs like a cat contemplating an approaching, unsuspecting mouse. The glittering, transparent mesh of her revealing gown was of the finest of the Elder fabrics, and she made a picture of extreme beauty, overlaid by a revulsion that has no connection with beauty, but is another thing. The beauty was a camouflage, an affectation of a vile kind, and the truth of the thing that she was all too apparent, too fearful. The bound girl beside me shuddered, pressed closer to me as if for human contact to warm away the cold chill brought by a sight of Nonur, successor to Hecate. (pp. 67-68)

Eltona, a rival, civilised goddess, reanimates cybernetic organisms to form an army with which she intends to defeat the evil Nonur. Both female characters are depicted as exceedingly beautiful, but the jungle-dwelling Nonur combines eldritch beauty with inhuman cruelty whereas Eltona, who seeks the assistance of the earthmen to defeat Nonur, is as beautiful but entirely benevolent. This binary opposition in the portrayal of the exotic is mirrored in more recent depictions of Asian women:

> When Asian Americans do appear in movies and other pop cultural venues, stereotyped and narrowly defined roles are pervasive. For example, Asian women have been frequently portrayed as passive, exotic, and humble, or at the other extreme, as oversexualized, treacherous, and evil. (Lee and Joo, 2005: 655)

Examples of these polar opposites can even be found in a single paragraph in mid-century SF:

> Hank talked for a long time before we turned in - of the immense steaming jungles of Venus, of that tropic planet's girl-warriors in their gleaming ray-proof armor, racing on the crystal spider-walks they spin like great glittering

> cobwebs through the tremendous tree growths. He talked of the ancient
> love-cults whose rites and ceremonies he described at length; their struggle
> with the horror cult of the cruel Hecate, the Mother of Sin - the Cult of the
> Limping Hag. (Shaver and McKenna, 1946: 24)

Exotic women are often explicitly described as having Asian, as well as animal, characteristics: "Her skin was the soft, fine ivory of the Eurasian. Ivory, shading to tawny gold with the contours of her body, deepening with the curve of her thigh, the round of her elbow, the shadowy cup of her breasts. Pantherine, too, were her eyes. Triangular eyes, long-lashed and lazy, with pupils of dusty emerald" (Bond, 1942: 233). Lee and Joo state: "Cultivation theory suggests that audience perceptions toward a group are influenced by how the group is portrayed in the media"(655). This may explain the consistency of the characteristics of the jungle in stories of this period, when there was little or no external real-world evidence to contradict pseudo-scientific articles and editorial commentary. The portrayal of the role of women in early pulp SF closely matches Lee and Joo's stereotypes. Women are commonly seen emerging from the natural environment (Recour, 1949), and dressed inappropriately: "it was a girl who stood in the opening, a black-haired, browned, slim girl whose smoothly tanned body was hardly concealed by the brief skin tunic she wore. She held a short spear and looked as lithe and dangerous as a tigress, her dark eyes watchful" (Hamilton, 1935: 410). Women can be manufactured artefacts, as in "Heart of Light" (Fox, 1946), or tropical symbiotes in "The Leopard Girl" by Don Wilcox, (Wilcox, 1942), and Herbert's "Greenslaves" (Herbert, 1972). The tropical setting provides writers with the opportunity to undress the female protagonists and present them as more exciting than their civilised counterpart, but only in the absence of a civilised competitor. When the emerald-eyed Lady Rakshasi departs, it is the civilised Sheila who is the preferable, sensible, alternative:

> …it was as if a disturbing fever had left the room. Ramey, feeling the gaze
> of Luke O'Brien curious upon him, felt a stab of warmth in his cheeks, and
> wondered just how much an ass he had made of himself. Apparently he had
> done a pretty fair job of it, for the one person whose eyes would not meet his
> was Sheila. And strangely, now that Rakshasi was gone, it was the clear,
> mist-blue sanity of Sheila's eyes that Ramey wanted most to look upon. He
> shook himself angrily... (Bond, 1942: 234)

With only one exception, all the female characters in the stories examined are portrayed as overwhelmingly beautiful. The only exception is the "crone" in "Citadel of Hate" by Lee Francis (Francis, 1943), but even she was beautiful in her youth, and is motivated to help the protagonists because her immortal lover neglects her in her old age. Occasionally, the roles are reversed, with a civilised woman being overwhelmed by the charms of a savagely handsome man. These are redolent of Burrough's *Tarzan*, as the savage man tends to have elite or royal status (Chandler, 1951), or supra-normal qualities (Pease, 1953), which, it could be argued, reinforce male dominance and status. The representation of women in these stories could be identified as an example of a cultural distinction between the nature (literally) of women and men. Sherry Ortner suggests that women:

> …are seen "merely" as being closer to nature than men. That is, culture (still equated relatively unambiguously with men) recognizes that women are active participants in its special processes, but at the same time sees them as being more rooted in, or having more direct affinity with, nature. [This explains] the pan-cultural devaluation of women, for even if women are not equated with nature, they are nonetheless seen as representing a lower order of being, as being less transcendental of nature than men are. (Ortner, 1974: 73)

The early stories, which demarcate the "natural" woman and the "civilised," and "scientific," man are standard fare of the pulp era. In parallel with other magazine content, such as advertisements for muscle-building supplements and manuals, Brian Attebery suggests that these "actions and characters" of pulp stories "embodied a cluster of beliefs and desires regarding the natural world and men's place in it." These beliefs include the possibility that if the average male reader was to be transported to Pira he would discover, like Wayne, renewed vigor and enhanced capabilities. This would, naturally, have a profound effect on the native females. Brian Stableford says in Interzone that *Tarzan of the Apes*, perhaps the story that epitomises the fantastical vision of the jungle in the early twentieth century, "[is] the purest kind of romance there is, because it is one of the few novels which does not pretend that romance must, in the end, be accommodated to social institutions" (p.52). This is true of "The Swordsman of Pira"; the freedom of romantic adventure possible in the tropical zone, cannot be

transferred to the civilised domain without risk. Tropical romance between civilised and savage is only successful in the non-normative space, and Wayne's deliberation that his romance with Kayna would not survive in his former world is a realistic one.

In magazine SF of the post-pulp era, the representation of women reflects changing roles and perspectives. In "Jacob's Rock," the hero is female and defeats an aggressive male protagonist (McCauley, 1989). She criticises the chauvinistic male characters, who display generic stereotypes: "Men, their cold closed faces, amusement at her presumption just beneath the skin" (p.89). In "Greenslaves," the female scientist Dr. Rhine Kelly is portrayed as coolly professional in the jungle, alluring in the city – an apparent reversal of earlier tropes: "When they had met in the A' Chigua nightclub in Bahia, she had seemed exotic and desirable to Joao. Now, she wore a field uniform instead of gown and jewels, and her eyes held no invitation at all" (Herbert, 1972: 25). This may be in spite of the change of scene, however: it transpires that she has been bodily integrated into a symbiotic relationship with the tropical insect nation. Rather than this causing or promoting unconstrained and sensual behaviours that are the by-products of the tropical environment, in this instance her seriousness is an indication of the business-like and civilised approach of the insects to clearing up the mistakes made by uncivilised humans. There is a transformation over time of the representation of women in the SF magazines; from attractive, and ultimately submissive, stereotypes in the earliest stories to more nuanced, heroic, roles towards the end of the century. This is analogous to the changing characteristics of the jungle: from mysterious, fecund, wild and ready to be tamed by civilisation, to valued, resourceful, and rightfully opposed to destructive, neoliberal, civilisation-by-exploitation.

The application of proximal reading methodology – for reducing selection bias, but also applying outward reading and degrees of separation to identify related material within and associated with the text – identified the cultural impressions left in the text, and the wealth of gender content correlates with pre-existing research. An interesting feature, however, and one that is expected of the methodology, is the discovery of Cowper's story featuring "Monagro" thinly disguised as another bioengineering company and being so closely temporally linked to real-world events and concerns. This provides additional evidence to support the aim of the methodology of revealing hidden material that can provide valuable insights into its contemporary cultural

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environment. As with Dianetics, we discover that the cultural history of the interplay between written text and the reader is more complex than might be expected, and that SF does provide a wealth of perspectives by its nature as an all-embracing genre.

Cities in Flight

Cities in Flight: A descriptive examination of the tropical city imagined in twentieth-century SF cover art. *eTropic, 17*(2), 62-82. doi:10.25120/etropic.17.2.2018.3658

To examine this topic using the proximal methodology was an interesting challenge. I had to find a way to identify cover images of SF that portray cities, or city-like structures, in tropical settings, but this would not be possible by text searching. I was interested in how the people and cities of the tropics might be identified from stories associated with SF cover art, and how this might reflect the cultural environment of the specific period of these covers being produced, or if these representations were symptomatic of more enduring cultural expectations of the tropics. The methodology applied here makes use of the "wetware" technology of the human researcher, as well as computer software –

combining a rapid visual assessment of a large number of images with a subsequent more careful sorting process and interpretation of the final selections. This also provided a serendipitous opportunity to contrast the findings of a complementary approach to identifying the history of human expectations of the tropics to that of the previous article "Trysts Tropiques," enabling some measure of validation, or refutation, to be applied to the approach.

As I have observed previously, the application of digital tools is valuable in highlighting and controlling the influence of our phenomenological bracketing of our work, but also enables us to reflect on, and gather insights, regarding the sources of that bracket – and how they might be derived from social and cultural constructs which we might not otherwise consider. In this case, this led to a gestalt realisation of "the tropics" as uniquely "Earthly" after analysing the appearance of the tropics found in other-worldly SF examples. This reframes definition of the tropics by emphasizing the

arbitrary nature of Aristotle's depiction of the "torrid zone." As Aristotle's division of the world into zones of relative comfort and attractiveness is so embedded in western culture, it is easy to forget this arbitrariness, and that it is not genuinely relevant either to geography or the peoples and cultures of the tropics.

Living Cities in the Tropics
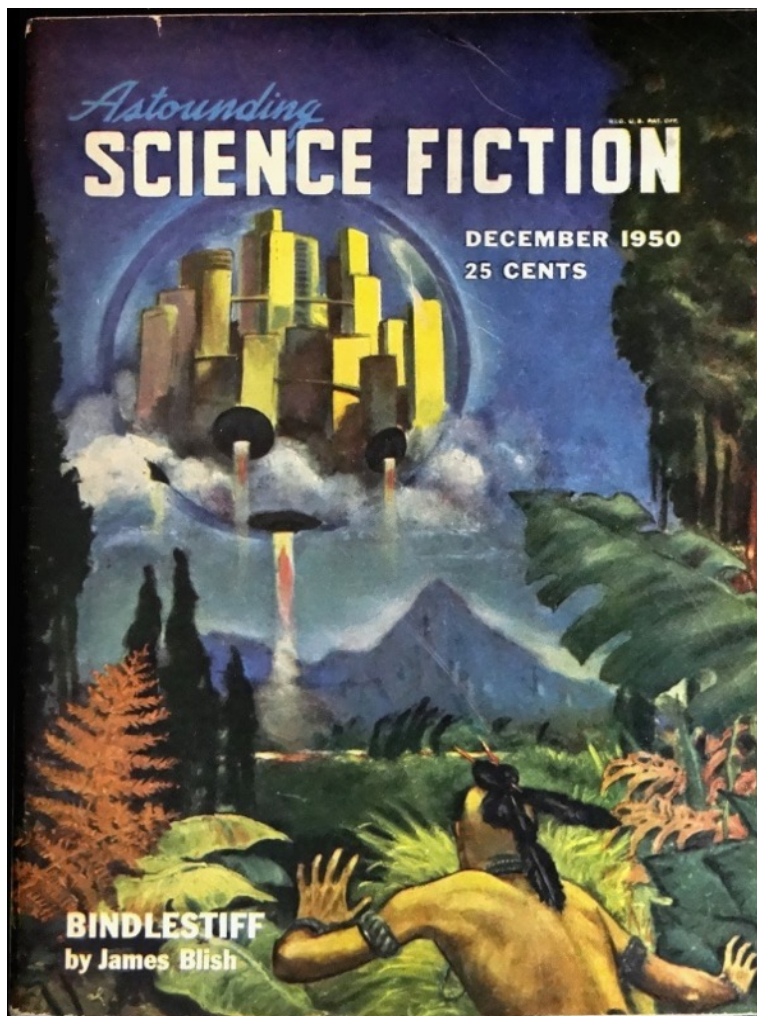
Fig. 26. *Astounding Science Fiction*, Dec. 1950.

Living cities in the tropics can be conceived through the imagination as created spaces concerned with peopled and lived experiences interacting with material, cultural and natural environments we associate with "the tropics." This combination comprises the

"tropical imaginary" of these places(Lundberg, 2018)1. The process of tropical space and place-making in representations of the tropics in SF art is especially interesting as it offers de facto examples that seek to portray an outside, alien, perspective. Myths, narratives, cultural and natural landscapes, the tropical city, and visions of the tropics, appear in SF art. One particularly arresting image inspired this investigation (Fig. 26). Akin to one of Henri Cartier-Bresson's photographic "Decisive Moments" (Cartier-Bresson, 2015) it provides dense, rich thematic content which merges a multitude of concepts in one fleeting instant. A flying city is placed in a tropical jungle setting being watched by a person depicted, through iconic imagery, as Native American.

Magazines and Cover Art

Cover art plays an important role in defining and marketing magazines – as both an indicator of content and a means of attracting attention, and readers, and it follows that cover art must conform to the expectations of its time. Michael Ashley provides examples of how cover art changes to reflect cultural transformations, such as the phenomena of rapid societal and technological change in the 1920s (Ashley, 2006: 51, 110), and also provides numerous examples which highlight the sustained correlation between content and covers of magazines: "Adventure, mystery and humour dominated *Pearson's*, and is the image that its covers projected" (2006: 167). When *Pearson's* changed its content, its covers changed to reflect this: "The covers became light-hearted sketches…and the humour section was expanded" (168). Ashley also describes how *Tip Top* "promoted itself as a magazine of 'adventure and mystery,' a fact evident from its action covers" (211), and he implies the fortunes of magazines were significantly linked to the cover art: "when *Tip Top* was rebranded as *Regent Magazine* in 1924, the covers became softer, depicting scenes of leisure and romance rather than adventure. The result was astonishing…the first new issue sold out within three days" (211). A lack of correlation between cover and content can be damaging, however, and it is necessary for the art to meet the expectations of readers. *Empire Frontier* magazine became "no longer representative of its title or cover," which caused it to "become confusing" for the reader (69), and the "bland white covers" of *The White* magazine "may not have helped, but the magazine lacked verve and with more exciting material around *The*

White magazine faded to grey" (222). *Cassell's* was rebranded as *Cassell's Family Magazine* and "with dull lifeless covers, sank into mediocrity" (53). Ashley also highlights cover art as a significant dynamic for *Mystery-Story*: "Not only were the stories as atmospheric and sensational as possible, but so were the covers. Bright, gaudy and full of action" (128). Ashley also variously describes how covers of successful magazines were attractive (2006: 45, 49, 114, 122, 139, 169), and correlated with success (53, 85, 122, 204), and cover art became collectable (44, 131).

Visible changes in cover art are particularly noteworthy considering the clarity with which I have found people identify SF. The imagery found as SF cover art provides a suitable method for exploring the changing cultural perceptions of the tropical, and from a methodological perspective, is useful for comparison of the assessment of content with that of visual appeal. This assessment of cover art should be considered in parallel to the investigation of content that I described previously.

Methods

For this iteration of the proximal reading methodology, a PRISMA framework (Liberati et al., 2009, Stevens et al., 2014) guided the selection of covers from an extensive catalogue of 5,705 individual images (Appendix A, Fig. 52). For this investigation, I included cover art from a wider range of SF sources than the magazines that I have used for text analysis. This is because there seemed to be no reason why contemporary cover art for books and anthologies would be less relevant than it might be for magazines, and the risk of incorrectly dating text sources due to later reprints does not apply so clearly to cover art. ImageSorter (Barthel, 2007) was used to enable this to be carried out visually.
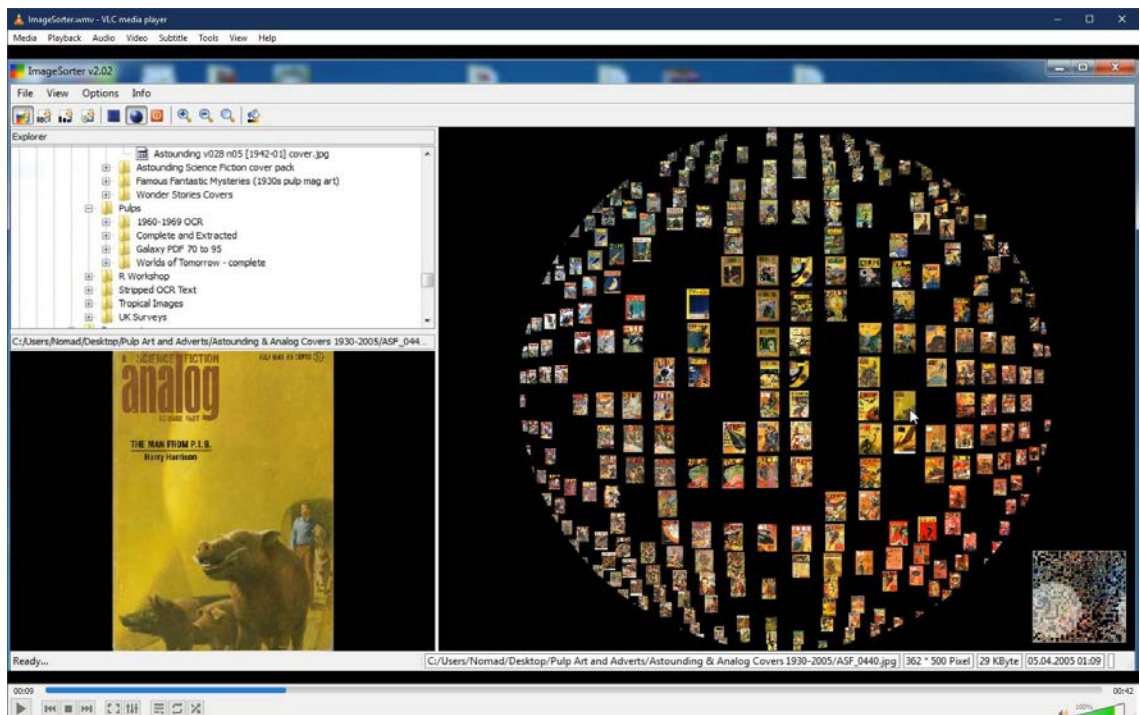
Fig. 27. *ImageSorter* **– easy navigation of large numbers of images**

ImageSorter creates scalable thumbnail images of folder contents and enables sorting by colour – which is not a feature commonly found in other applications. ImageSorter reads the first page of a PDF as an image, so laborious extraction of cover images from PDF format archives is not required. Colour sorting offers a method for rapidly filtering images likely to be irrelevant – those that are predominantly black or very dark may indicate scenes in space; white may depict arctic images, and these can be immediately rejected. Initial screening identified duplicate images, and this was followed by colour sorting once these had been removed. The 638 images remaining were screened by examining batches of larger thumbnails, and final selection was based on closer inspection of potentially relevant images. Fig. 27 shows the output window of ImageSorter. The globe of images to the right is a sub-selection of the entire collection, minimised at bottom right. When the mouse pointer hovers over a specific thumbnail the original is displayed at greater magnification (bottom left).

Findings and Discussion

The covers identified featured humans, indigenous peoples, either humanoid or alien, city-spaceships, ruins, jungles and deserts. Attitudes of protagonists were generally warlike, but neutral or even peaceful situations were also depicted. The scenes can be categorised into various SF tropes and traditions. Changes in the conception of these are apparent over time, and appear to mirror observations I have made previously about popular assumptions regarding the tropics. In cover art, we can observe assumptions made regarding the characteristics of indigenous inhabitants of tropical cultures, and particularly wet tropical cultures. Representations of tropical indigenous peoples (human or otherwise) employ iconography that implies a comparatively less civilised and less technologically advanced culture than that of the non-indigenous explorers and colonists who enter, or invade, their territory.

The Tropics

The unlimited opportunities for presenting worlds and situations afforded by SF required me to contrive visual measures of equivalence to the Earthly "tropics" with which we are familiar. Inclusion rules needed to be defined and applied. These were based on iconic human conceptions of tropical environmental conditions and typology that might be expected in Aristotle's "torrid zone" (Meteorology, 362a31-363a20). Firstly, predominantly dark or exclusively white images were excluded – based on the expectations given above that these would be in space, or arctic locations. Brief, random sampling of the exclusions showed that these were sensible expectations. To separate tropical images from those remaining, it seemed likely that tropical forests would be green and vivid - identified by jungle plants and dense plant life. Desert scenes would be predominantly yellow / orange, and tropical temperature could be assessed by the lack of need for protective (or any) clothing on the part of the inhabitants. I attempted to assess environmental conditions from the experience of the indigenous peoples being portrayed, and in some instances conditions that appeared "hot" for the locals required considerably more protection for human visitors (Figs. 34-35). Sometimes, however, this might have been a choice on the part of the artist, made with less consideration for environmental accuracy than aesthetic considerations of another sort.

The relatively few inhabitants portrayed, especially in vast, open, desert

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landscapes, might imply, as Veronica Davidov suggests, that "the indigenous savages were/are inscribed into a narrative of fascination with the unknown frontier wilderness, in which the imagined mysteries of the pristine [tropical] forests are projected onto their inhabitants" (Davidov, 2011: 471). She argues this may be based on "fantasies of deterritorialised 'wilderness'" (Davidov, 2011: 472), and thus may be a form of "imperialist nostalgia" (Rosaldo, 1989: 69). The general lack of depictions of sophisticated indigenous technology may be inspired by what Davidov describes as "perfectly pastoral geography…metonymically dependent upon the absence of technology, effectively splitting the 'wired' modern contingent of the population from the pre-industrial ecotopia" (Davidov, 2011: 481-482) This contrast enables the readers to command an immediate grasp of the situations depicted: the cover representations being "cultural shorthand" for a range of tropical scenarios. The associated tropes of mystery and fascination seem to reflect story content that I had found in my previous study of descriptions of the tropics found in SF magazines.

The Tropical City

A novel consideration when looking at science fictional places is what constitutes a "tropical city" from this perspective. Cities are not exclusively definable by traditional "bricks and mortar" conceptions. A variety of structures might have the same function – orbital habitations, generational spaceships, or even a digital cloud of transhuman minds as exemplified in the works of authors such as William Gibson, Vernor Vinge and Hannu Rajaniemi (Gibson, 1984, Rajaniemi, 2010, Vinge, 1992). The author James Blish is known for his series of short stories that were later published as *Cities in Flight* (Blish, 1971), and the *Astounding Science Fiction* cover for December 1950 (Fig. 26) illustrates the earliest of these stories.
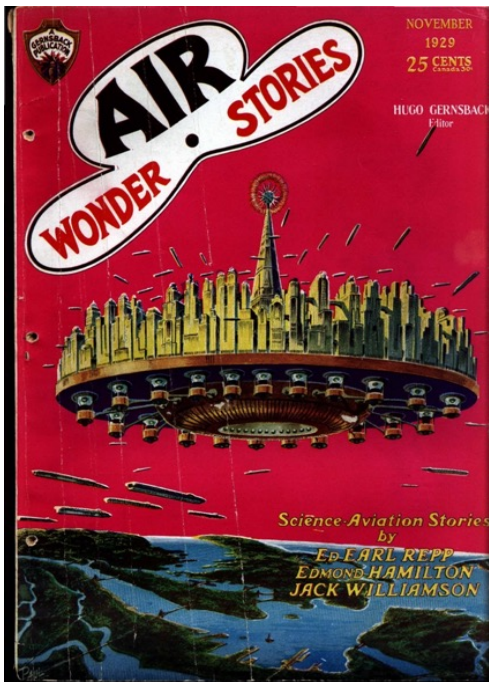
Fig. 28.   The flying cities of SF. *Air Wonder Stories*, **Nov. 1929**
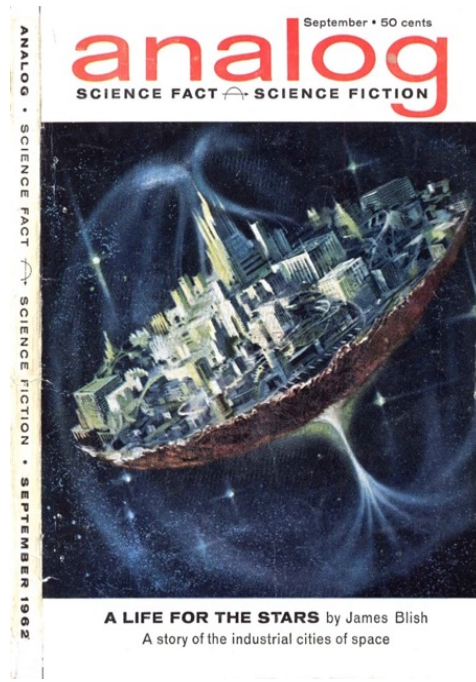
Fig. 29.   *Analog Science Fact Science Fiction*, **Sep. 1962**

The trope of the flying city-spaceship is commonly found in SF (Figs. 28-29), and we can look to Laputa in part three of *Gulliver's Travels* for an earlier example. James Blish continued this theme (Fig. 29). In Blish's narratives, the "city in flight" is an escapist/adventurous post-colonial trope associated with encountering indigenous cultures, and it became apparent during the filtering process that the concept of a "city" in a SF context is richly variable, and not dependent on fixed infrastructure. Giant spacecraft were therefore included as a form of SF "city" (Figs. 26, 30-33, 35-36, 39-40, 42-44), not unlike the "cities" of American aircraft carriers, which may have 6,000 crew (Naval Technology, 2018), but on an even larger scale considering the huge resources required for interstellar journeys, and the necessity to support generational populations. This "mobile city" suggests a colonial mythology overlies representations of city-structures in alien settings, and those in tropical settings may be informed by the history of western colonisation. Interestingly, the city is most often seen from the outside and from afar, as an imposing feature of the landscape, or an illustration of the source of origin of the visitors. Only one scene shows the inside of a city (Fig. 37), and one other (Fig. 38), appears to be in the liminal space between city and the surrounding

region. If we consider that in the history of European exploration of the Earth, ships set out with instructions to not only discover, but to claim new lands, then we might interpret giant spaceships similarly as the harbingers of a colonial culture: prefabricated cities, rather than merely transport for curious travelers. A characteristic of these fictional city-structures is the normative expectation inherent in the artwork – that the inhabitants are civilised and technologically advanced, whereas the people of the tropics outside are primitive and lack advanced technology. This simple dichotomy is visible in the greater majority of the covers identified.

Indigenous Peoples
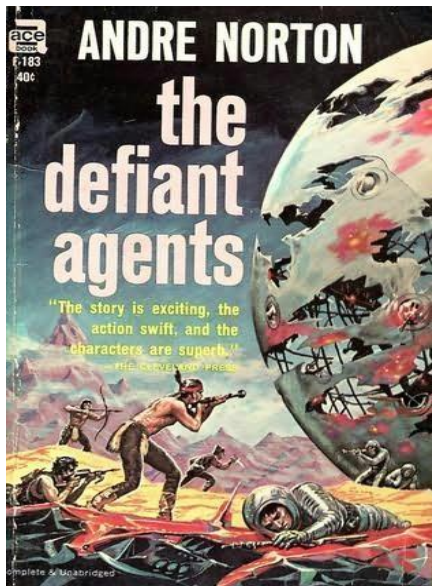
Fig. 30.   *The Defiant Agents*, by A. Norton, 1963
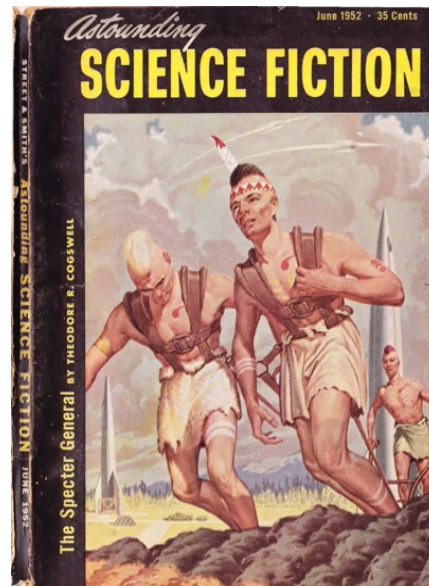
Fig. 31.   *Astounding Science Fiction*, June 1952

Fig. 32. *Aboriginal Science Fiction*, **Fall 1992**

Fig. 33. *Amazing Stories*, **Nov. 1960**

Indigenous inhabitants of tropical zones usually appear less technologically advanced, and less civilised, than other-worldly visitors. This becomes less binary as the century advances, and power relationships displayed between indigenous and non-indigenous participants become more neutral in later work (Fig. 32), but some tropes are persistent. Humanoid indigenous peoples in American publications exhibiting low technology or lack of cultural evolution are often associated with Native American iconography (Figs. 26, 30-32.). This is rarer in British magazines. Ashley has commented on how a Native American did appear on a cover of *The Golden Mag*. in a story of conflict between Native Americans and white settlers (Ashley, 2006: 80). The association of violence and primitivism with Native Americans is embedded in American culture. Jodi Byrd states in *Living My Native Life Deadly*: "The possibility of an eruption of unanticipated Indian violence and the expectation of the hostile Indian savage seeking revenge for historical crimes remain a powerful threat within non-Indian imaginings" (Byrd, 2007: 316), and Native Americans typify a romanticised, low technology, culture: "the juxtaposition between the break-down of modernism's logics…and the romantic nineteenth-century images of Indian guides only reifies the exclusion of Indians from the processes of modernization" (317). Arrows and pow wows are nineteenth-century indicators that continue to resonate (2007: 318), and the trope "evokes a much simpler time of wild-life and frontier" (2007: 318). As Reginald Horsman writes in *Race and*

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Manifest Destiny the accepted scientific stance in the mid nineteenth-century was that "the Indians were doomed because of innate inferiority, that they were succumbing to a superior race, and that this was for the good of America and the world" (Horseman, 1986: 191). This colonial expectation is found in early SF covers depicting Native Americans, stereotyped by dress, violent attitudes and lack of technology, justifying colonial exploitation. Chad Barbour develops this concept further: "the 'vanishing' Indian willingly releases his land and bestows his authentic 'Americanness' upon the advancing 'new' Americans. And along with that transmission of land and identity, the Indian also provides an admirable model of manliness for white males" (Barbour, 2015: 279). This combination of "noble savage" and "doomed civilisation" is prevalent in American cultural representations of the Indian, as Philip Deloria says: "Savage Indians served Americans as oppositional figures against whom one might imagine a civilised national self. Coded as freedom, however, wild Indianness proved equally attractive, setting up a 'have-the-cake-and-eat-it-too' dialectic of simultaneous desire and repulsion" (Deloria, 1998: 3).

In the SF genre, the Native American serves as a shorthand for a culture that is rugged and masculine, which provides worthy adversaries, but which cannot, and should not, stand in the way of technological progress and colonial strategies. As iconography, the Native American is very readily identified, and as the visual indicators are part of a white imagining, Richard Slotkin argues that these indicators "extract Indianness from the Indian" (Slotkin, 1973: 357), Barbour states that this "process of appropriation…preserves the former [Indianness] in visual signs and material objects while the latter [the Indian] is abandoned and marginalised" (2015: 270). The depiction of Native Americans is both value-laden, and superficial – without any realistic understanding of "the Indian" required or requested. Barbour further suggests: "Indianness is a multivalent tablet upon which white culture inscribes its ideals and fears" (270). It follows that in American SF adventures the Native American trope provides excellent material for depicting generic primitives, as it has been reduced to iconography in American culture – "the power of Indianness lies in its divorce from actual Indigenous peoples" (270) – without a definite sense of origin of place or cultural embodiment. Notably, Native American iconography features more prominently on

these magazine covers than that of other cultural stereotypes. No Asians are implied on these covers, which is surprising as the use of Asian characteristics to portray aliens has been described as a common feature of SF between the world wars (Cheng, 2012: 148-149). This may be a statistical artefact of the relatively small number of tropical environments that were identified by the search, or an indicator that in SF the Native American provides more readily digested material.

Representations of Women

Fig. 34. *Amazing Stories*, **Jul. 1953**
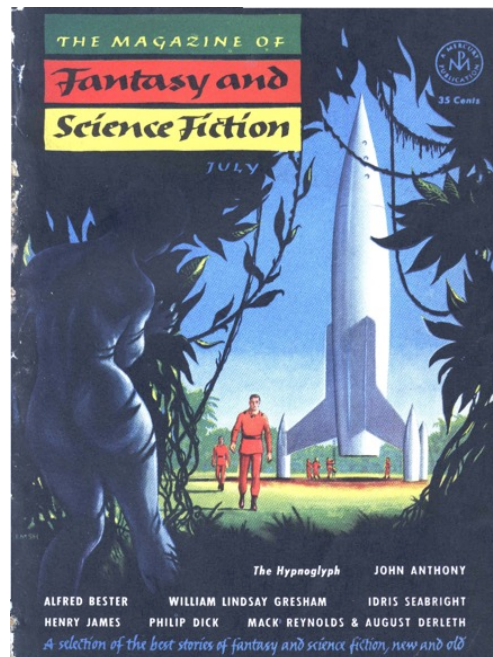
Fig. 35. *The Magazine of Fantasy and Science Fiction*, **Apr./May 1953**

Sexualised portrayals of naked or semi-naked women are a standard feature of the cover art (Figs. 34-37) – perhaps artists excused this on account of "tropical" settings. Women become slightly more sensibly dressed over time, but still gratuitously depicted (Figs. 36-37). Women are less frequently found on more recent covers, and their depiction tends towards a higher degree of sophistication, even if they are still not portrayed from a neutral perspective (Fig. 37). The portrayal of gender is a simple binary, and the only clearly female representations are of humans. A brief inspection of the story content relating to women in these environments finds simple, traditional, tropes – women as Amazon warriors, and willingly submissive to the advances of male explorers. The only

powerful female character is in "The Wizard of Anharite," from *Worlds of If* (Fig. 37), but she is described as a science fictional witch, another traditional female stereotype.

Fig. 36. *Saturn*, **May 1957**   **Fig. 37.** *Worlds of IF*, **Dec.1972**
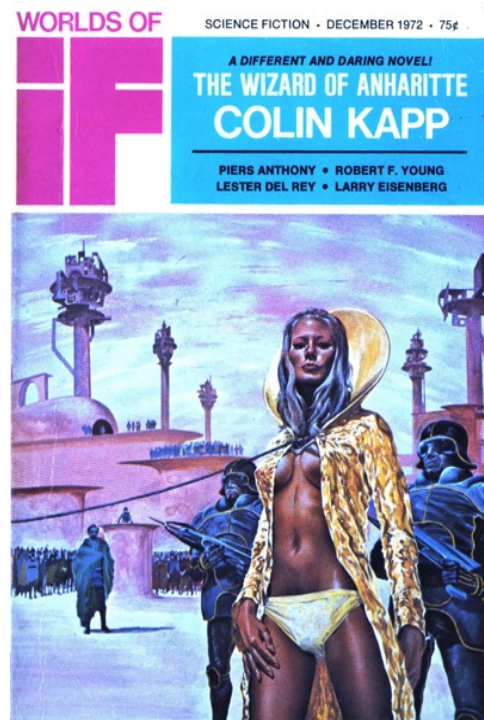
Changes in the portrayal of the female to meet cultural expectations have been described in non-SF magazines, with stronger representations featured in or around the 1920s. During 1922 *Premier* magazine "changed to portraying women rather than depicting scenes from stories" (Ashley, 2006: 172). In *The Yellow* covers changed in 1926 "to present a stronger image of women's stories" (238), and for *The Novel* in April 1919 "The cover reflected female liberation with a woman aeronaut, and over the next year most covers portrayed women in new guises. The feminist angle was strong" (145).

The Tropical "Native Belle"

The contrast between salacious portrayals of women and scenes of violent conflict may reflect what Veronica Davidov describes as "the positive and negative qualities Europeans projected onto their colonised subjects, distinguishing between 'hard' primitivism, which imagined the 'primitive' subject as courageous and brave in the face

of the hardships inherent in their 'wild' lifestyle, and 'soft' primitivism which saw them as languid and sensual, harmonious, and one with their natural surroundings" (Davidov, 2011: 469). Liz Conor has described the representations of Indigenous women in material culture in the context of Australian exploration and settlement by Europeans, determining that "feminine beauty would become a defining discourse of racial difference between 'civilised' and 'primitive' women" (Conor, 2006: 197). Chad Barbour remarks: "The physical body exposed in this way also marks a certain primitiveness or savagery (clothing, or lack of, long being associated with the perception of civilisation)" (Barbour, 2015: 278). The lack of any evident embarrassment, regardless of scant clothing, suggests Conor's "native belle," who is "unselfconsciously beautiful: hers was not a beauty of artifice; it was not therefore modern" (2006: 198). Conor remarks that observational technology, such as printing and photography, enabled dissemination to a European audience that "shaped the lens through which Indigenous women were seen and perceived as racially different…. The depictions of the manners and customs of the native woman was intensely focused on their visual effects" (202). This tradition of remote aesthetic appreciation of the tropical woman appears to linger on SF covers. Conor observes that nineteenth-century explorer Edward John Eyre "proposes an improvement on the native – the hair is 'purified' – thus redeeming a beauty that is marred or defaced, or which Aborigines are incapable of appreciating themselves" (206). The white explorer controls notions of beauty – and interactions between SF explorers and their "native belles" are imbued with this notion – that a "redemptive colonial gaze beautified the unwitting native belle" (213). Conor notes: "An 'immoderate fondness' for Indigenous beauty was the 'passion' of colonials, who 'extended the dominion of mind' over Indigenous women's bodies, shaping the conventions of representing those bodies as docile to colonialism" (213). This is perhaps more obvious in narrative content of magazines which "always resolved in favour of good, rightful and civilised protagonists" (Menadue, 2017b: 138) than on the covers; but power relationships are clearly indicated by the fact that the "native belles" remain in concealment (Figs. 34-36), or are captive (Fig. 37).

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Representations of the Attitudes of Tropical Peoples
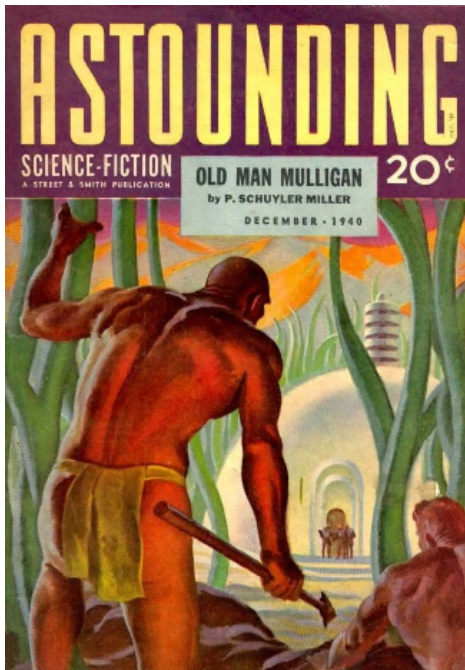
Fig. 38. *Astounding Science Fiction*, Dec. 1940
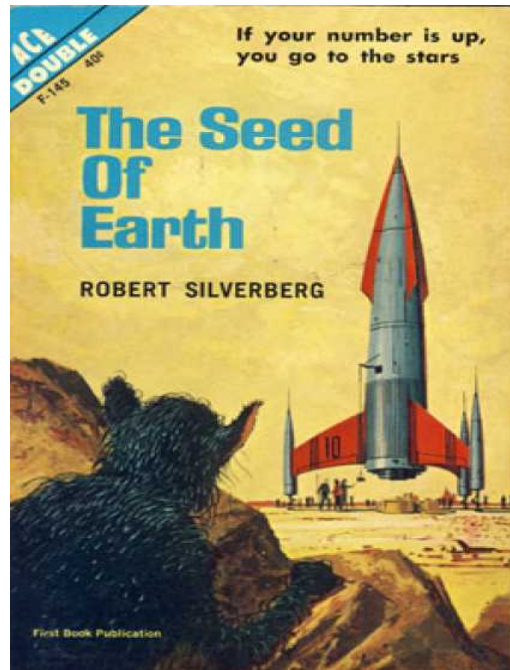
Fig. 39. "The Seed of Earth," 1962
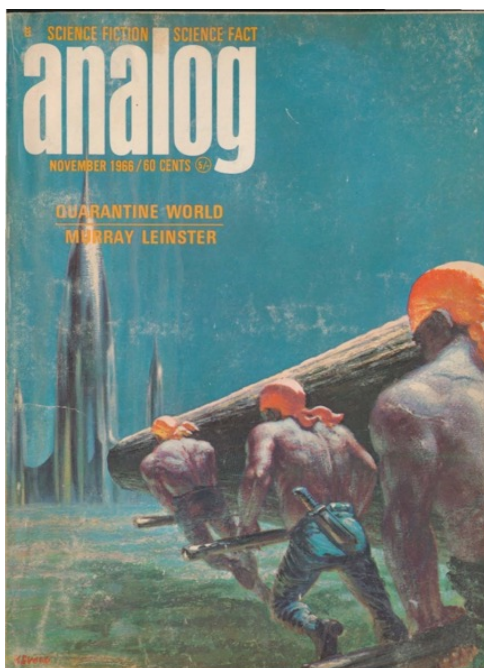
Fig. 40. *Analog Science Fiction Science Fact*, Nov. 1966
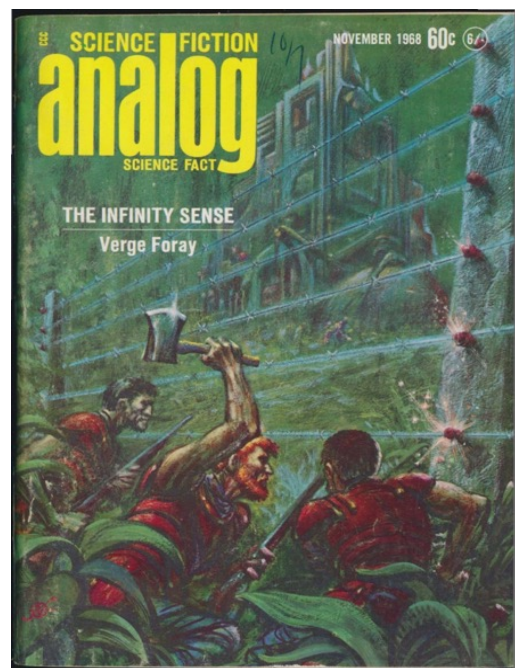
Fig. 41. *Analog Science Fiction Science Fact*, Nov. 1968

Neutral observers feature on some covers, with no clearly hostile intent. These are universally portrayed from the perspective of the Indigenous characters, and may imply wariness (Figs. 34, 36, 38-39) or surprise (Fig. 26). Far more common are images of direct conflict between Indigenous peoples and outsiders, whether humanoid or alien species (Figs. 30, 33, 40-41). Individuals are almost universally found bearing arms of various degrees of sophistication; from spears, axes and bows to futuristic weapons. There are many situations in which Indigenous people are openly hostile (Figs. 30, 33, 36, 40-41). Tropical inhabitants are armed with weapons indicating low technology – bows, axes, knives, spears, blowpipes, even a battering ram (Fig. 40). This implies tropical cultures are primitive and warlike, a myth perpetuated in the interests of colonial settlement on Earth – here generally analogous to the exploration and exploitation of the Americas, implied by the Native American trope discussed above.

Dereliction and Lost Civilisations

Fig. 42. *The Magazine of Fantasy and Science Fiction*, **Apr. 1957**

Fig. 43. *Amazing Stories*, **Mar. 1960**

Three covers portrayed archaeological sites – rockets visiting the remains of imaginary alien cities (Figs. 42-43), and a gigantic derelict spaceship in an alien landscape (Fig.

44) – a reversal of the explorer-conqueror trope. The discovery of remains of lost civilisations, and ones that suggest significant technology, is redolent of the European history of exploration of non-European cultures, and romantic idealization of archaic culture. This comes with the rejection of contemporary inhabitants as living manifestations of the continuation of those cultures, and implies that the region is now uncivilised: culture no longer exists.

This feeds the argument of "Terra Nullius" in a cultural context – that the recent inhabitants are not the original owners or inheritors of the land, and therefore can be exploited or supplanted, exemplified by the colonisation of South-East Asia by the French, British, Dutch and Portuguese, South America by the Spanish and Portuguese and Africa by a variety of European countries, and, of course, the British colonisation of Australia.
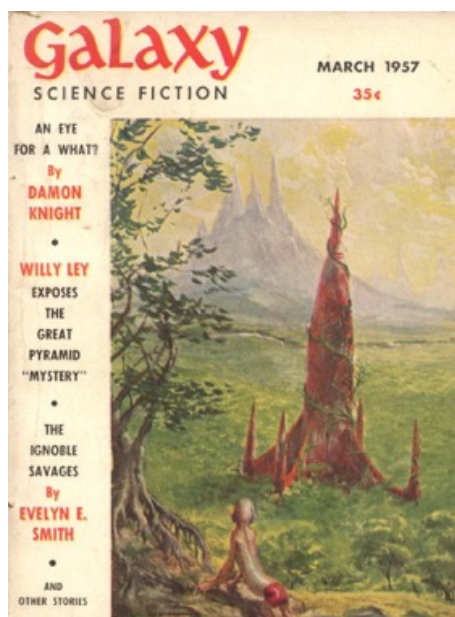
Fig. 44. *Galaxy Science Fiction*, **Mar. 1957**
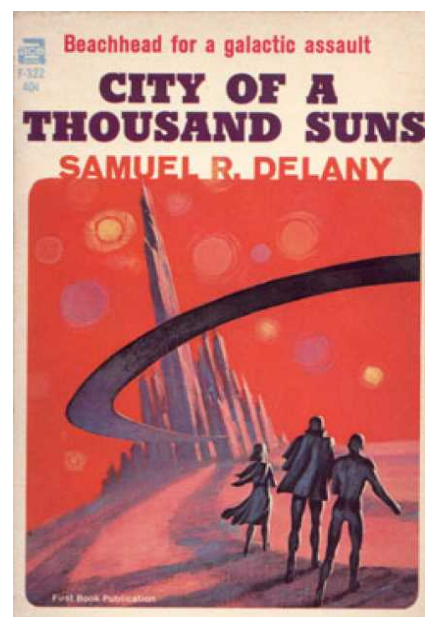
Fig. 45. **"City of a Thousand Suns," by S. R. Delany, 1965**
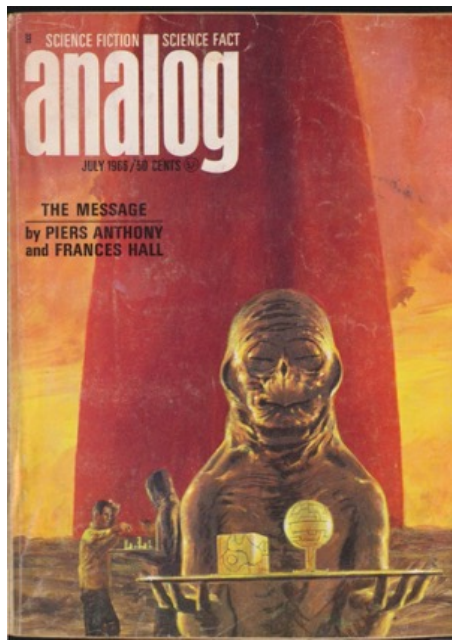
Fig. 46. "The Message" by Piers Anthony & Frances Hall. *Analog*, **Jul. 1966**

Fig. 47. *Worlds of IF*, **Sep. 1969**

Tropical Culture

The complexity of the tropical environment became more diverse and sophisticated over time. This supports the findings in "Trysts Tropique*s*" and effectively complements the cultural content of the magazines over this period from this second perspective. A feature of city-like structures is a scale beyond what might be considered the "space tourism" of exploratory SF tropes. Implications of colonisation, control and conflict directed towards Indigenous peoples is frequently seen meeting violent opposition. The "watchers" might have been depicted as wary due to the association in popular culture, and SF narratives, of advanced technological civilisations encountering less resource-focused cultures with the intention of domination and exploitation. Neutral and more positive imagery appears when equality between Indigenous and non-indigenous people is portrayed (Figs. 32, 46), or civilisations appear to be extinct (Figs. 42-43).
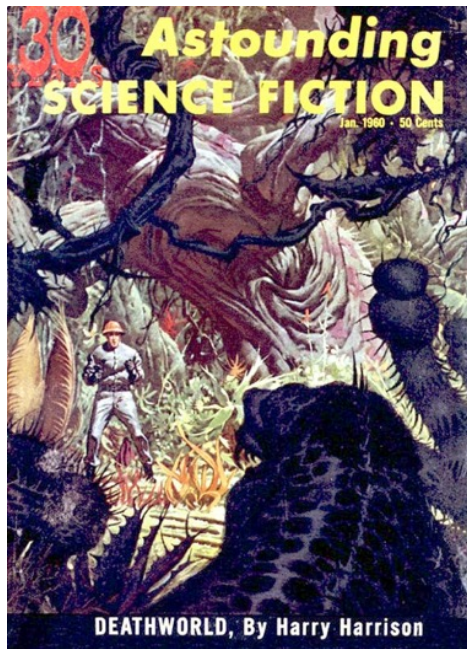
Fig. 48. "Deathworld" by Harry Harrison. *ASF*, **Jan. 1960**
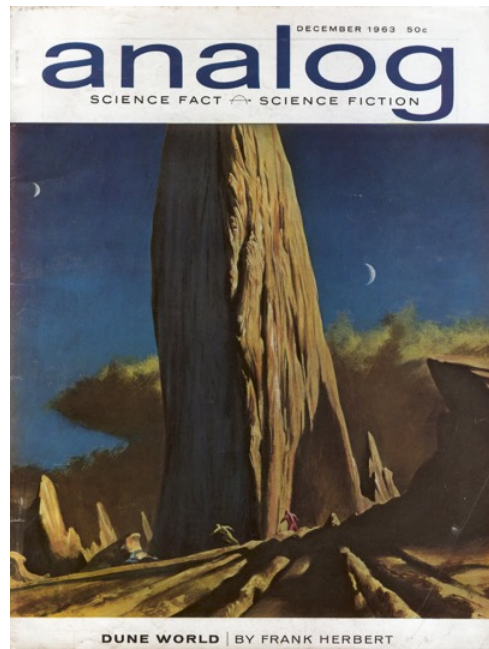
Fig. 49. Frank Herbert's "Dune World." *Analog*, **Sep. 1963**

Indigenous civilisations portrayed in desert environments (Figs. 30, 32, 37, 39, 42-43, 45-47) are generally more sophisticated and less warlike than those of the wet tropics (Figs. 34, 36, 38, 40-41). This portrayal of the "uncivilised" wet tropics compared to the "civilised" dry tropics is consistent with other portrayals of tropical and desert environments in SF cover art. Examples of this cultural distinction would be "Deathworld" by Harry Harrison (Fig. 48), compared to "Dune World" by Frank Herbert (Fig. 49) – both originally published in SF magazines. "Deathworld" portrays a hostile tropical world where settlers discover the jungle environment contains plants and animals whose only apparent motivation is to exterminate humans (although the "twist" of the story is that they are responding to the aggression they find in the human colonists). In "Dune World", by comparison, the ascetic, sophisticated, and violent, desert culture of the Fremen nomads (closely modeled on Herbert's conception of Arabic cultures) triumphs over and supplants a decadent imperial culture, which at the beginning of the story is the dominant force in the galaxy. The heroic protagonists of *Dune* are "the 'good savage' that is a prominent archetype in the symbolic universe of postcolonial environmentalism. The 'good savage' lives in harmony with the Eden-like

ecosystems that are interpolated into the cartography of ecotourism" (Davidov, 2011: 470)

The treatment of indigenous peoples – including the implications of Native American iconography – provide an appropriative categorical gloss over the disenfranchisement of tropical peoples, and this "moral right" of "civilised" outsiders to colonise and displace becomes a normative feature of tropical environments and inhabitants in the first part of the period examined for this research paper. In *The Exotic and the Wild* Veronica Davidov argues that colonial discourses illuminate "the extent of colonial preoccupation with the categories of culture and civilisation and the anxieties about the fluidity of inclusion and exclusion that belies such distinctions" (Davidov, 2011: 468). Postcolonial awareness of disturbing colonial heritage may influence later cover art choices by editors – polarised representations of aliens versus humans decline as we move towards the present (Figs. 32, 46-47), reflecting an audience less preoccupied about inclusion and exclusion criteria for civilisation, and perhaps because SF today is at the forefront of literary movements that address a popular culture audience familiar with eroding traditional notions of gender, race and sexuality. There is an alternative explanation, which is that the notion of the Native American, for example, is no longer exotic, and no longer something "that exists prior to its 'discovery'" (Mason, 1998: 1). Peter Mason adds: "It is the very act of discovery which produces the exotic as such and it produces it in varying degrees of wildness and domestication. In other words, the exotic is the product of the process of exoticization" (1998, p. 2). It may simply be that the myth of the Native American has been evaporated by historical and cultural change, and that is why it tends to be absent on later covers that feature forms of "noble savage."

Limitations

The volume of cover art examined is not exhaustive, but does represent a significant proportion of the total SF magazine corpus over this period. In addtion to the magazine corpus, I included an additional 842 Ace book covers – my availability of book covers was significantly lower than for magazines. Only two book covers were identified, however (Figs. 39, 45). The fact that desert and jungle environments have very distinct features reduces the problem of researcher bias, but there was also the necessity to

decide which spaceships might be "cities" based on my personal experience of the genre. To reduce selection errors, inclusion criteria tended towards all examples of spaceships to avoid ambiguous classification on the basis of personal phenomenological bracketing. Choices had to be made on how to classify a "tropical" scene, based on Earthly conventions, and the "alien" tropical was observed from the dress of the indigenous inhabitants. The covers shown in Figs. 30-35, are included as possible examples of tropical savanna, rather than being in a temperate-equivalent zone.

The Classification of "The Tropics"

It becomes clear that there is a fundamental problem in demarcating the tropics in a fictional alien environment. Because of this, the classification of the tropical zone on Earth is revealed to be historically arbitrary, based on Aristotelian cartography – which is clearly not translatable to other worlds. The attempt to differentiate between tropical and non-tropical scenes in the process of selection has been framed from a human, Earthly, perspective, which creates questions about the human logic of the assumptions that are made about the tropics on Earth. In this example, the availability of the fictional "other" of the alien worlds and peoples of SF, clearly exposes the fictional basis of the "othering" of tropical peoples and societies that arises from the western, Aristotelian, tradition.

THE SURVEYS

Science Fiction & Fantasy – Your Experiences

The first online survey, *Science Fiction & Fantasy – Your Experiences* was publicly available from the 17th November 2015. The survey identified characteristics of readers of SF, their knowledge and experiences of works, authors and sub-genres. It examined their attitudes to science and SF, and their judgement of the similarity between real and fictional scientists. It was initially disseminated by direct email to friends and associates, and to their Facebook pages. At the end of April 2015, when the responses had risen over 250, the Science Fiction Writers of America and other literature and SF Facebook and web pages were approached to ask if they would post a link to the survey. Following this, a further five hundred responses were received within the next few weeks. An archival copy of the survey is maintained online (Menadue, 2015), and the resulting dataset is permanently stored in an online repository (Menadue, 2016b).

The survey data included here is from the period to 17th November 2016, a calendar year from first posting, which comprised 909 unique responses. The survey

was designed to gather three types of information from the respondents:

a. Demographic
b. Free text discussion of interests and perspectives
c. Likert scales for more specific questions

Responses from the administrators of pages were almost uniformly neutral to posting the survey (they did post it), with only one exception in which the group administrators required further information. Data from this survey was used to explore changes in demographics of readers and also provided additional information on reading habits that were unexpected. A finding was that there appeared to be no correlation between family readership and the volume of reading reported by respondents. Initial data analysis was published in the journal article: "Who Reads Science Fiction & Fantasy, and How Do They Feel About Science? Preliminary Findings from an Online Survey" (Menadue and Jacups, 2018). Contrary to otherwise declining reading habits, responses indicate the SF and fantasy audience read consistently high volumes of books, as well as watching genre TV and film. Reading SF and fantasy appears also to have a role in sustained, and cognitively beneficial, adoption of reading by young people and is complementary to other forms of consumption, rather than competitive.

SF was also found to have an influence on the perception and acceptance of science by the public. These results support earlier work that suggests SF is a valuable research tool for public engagement with science.

Science Fiction & Fantasy – Your Opinions

The second survey, *Science Fiction & Fantasy – Your Opinions*, was derived in part from analysis of responses to the first survey. This included respondent feedback to the content and structure of the survey, and ideas developed in the intervening time during the course of PhD research. This was posted online on the 10th November 2016 and disseminated in the same manner as the first survey. By the 22nd November it had received over 200 responses, and again benefitted from exposure on the Science Fiction & Fantasy Writers of America Facebook page. The second survey asked more searching questions than the first, intended to elicit responses in more depth, and specifically regarding attitudes towards the genre, and its defining features. This survey is also

accessible online for review (Menadue, 2016a), and the dataset stored in a permanent archive (Menadue, 2017a). The responses to this survey provided the empirical data used to support the argument for a popular definition of SF proposed in the article "An empirical revision of the definition of SF: it's all in the techne" (Menadue, Giselsson and Guez, 2018), which has been used as the basis for *Defining Science Fiction* in Part I.

DISCUSSION

THE HYPOTHESIS

1. The content and context of a popular literature significantly reflects the culture of a specific period.
2. Magazine SF provides an especially rich and relevant source of cultural information.
3. A methodology that combines digital and traditional methods can effectively enable identification and examination of this cultural content.

I have explored the relevance of SF, applied it to investigating human culture and addressed this in three parts: the characteristics of SF and the SF audience, the possibility of a methodology for identifying cultural artefacts in SF text, and a study of specific cases. In the following discussion, I reconsider this exploration in this order, and the implications of the findings related to the original hypothesis.

The "Nature" of Science Fiction

From my survey and genre analysis, it seems that the people who consume and enjoy SF are their own arbiters of what it contains, and provide robust definitions based on simple categorical indicators. The explanations given by respondents for categorisation of works such as Dune (Herbert, 1965), and the use of the term "science fantasy" called upon the two clearly defined categories of SF and fantasy, rather than creating something distinguished by its own terminology, and this reinforces the finding that these genres are very clearly separated in the minds of individuals. Effective use of SF in research that features public engagement should acknowledge the persistent cores – science/technology for SF, and magic for fantasy – that reflect "the people's choice," rather than relying on traditional academic definitions or the assertions of authors, which are not founded on empirical analysis of phenomena.

The evidence indicates that the core characteristics of SF and fantasy, of techne and magic, reflect an enduring human way of thinking about the world, and this way is the human embodiment of *techne*. The phenomenological experience of what it is to be human in an experiential, physically consistent and humanly modified and shaped world drives the genre categorisation of fictional works. Wittgenstein's *family resemblance* is a twisted thread wound around a persistent core of real and specific characteristics. As John Frow, concluding his work Genre, suggests: "Through the use of genres we learn who we are, and encounter the limits of our world" (Frow, 2006: 144). I would suggest that who we are, and the limits of our world, are fixed in certain specific dimensions, and this is reflected in our recognition of SF as techne. It is a "techne-fiction" of plausible unrealities, inspired by the tool-using possibilities that came from the evolution of an opposable thumb. Kubrick's ape throwing his bone club in the air in *2001: A Space Odyssey* (Kubrick, 1968), is an iconic representation of the emergence of technology, and indicates the long-standing human facility for techne that underpins our comprehension of SF.

The Academic Literature

In Part I, I identified how SF has been used as a metaphor and as an illustration of human culture by researchers in fields that are not restricted to studies of SF literature. As such, there are indicators that SF is employed as a lens through which human culture may be viewed to discover new interpretations. These may be relevant to cultural, social, scientific, and literary studies, and support efforts at improving science communication, and especially science education. Researchers have described the effectiveness of popular SF in capturing the imagination of the public, and creating unrealistic portrayals of science and scientists. This has both positive and negative impacts on science communication, and may even affect priorities in science funding. It seems that in the public imagination, SF is closely linked to real science, and this can be problematic for the dissemination of research. Rather than ignoring these links due to their fictional origins, it is necessary to engage with the public to learn about their hopes, fears, and expectations of science, and to consider how SF may be employed for diegetic purposes. Raising awareness among scientists of the significance of these factors may build researcher capacity for successful science communication. Convergence of research between the humanities and natural sciences may be one route to supporting and encouraging more positive communication with the public, the credibility and efficacy of interdisciplinary science, and consequently more efficient and beneficial outcomes of research. This convergence should be driven by the increased application of structured and quantitative methodologies to the analysis of SF, and other traditionally humanistic forms, now that the technology exists to do this effectively and rapidly. This might reduce the researcher bias in selection and interpretation of sources that is at the heart of the rejection of humanistic approaches by natural scientists. This breakdown of barriers is especially important when we consider the human, cultural perspective that can be added to hard sciences by this method, and how this may affect the effectiveness of science communication and the reputation of science in the minds of the public.

Science Fiction, Science and Society

Considering the significance of the relationship between academic research and SF, it is perhaps sensible to comment on this briefly as there is a significant historical relationship that shows no signs of ending. In the modern era (post 1926) both in the US and in the UK in particular there were movements within SF and SF commentators who directly addressed this relationship from both scientific and cultural perspectives.

Under the editorial stewardship of John W. Campbell from 1937 to 1971, *Astounding Science Fiction* promoted the transformation of the genre into one that focused on plausible depictions of science and technology in future societies. Campbell's influence on authorship encouraged SF to become distinguished from fantasy into pseudo-realism, presenting visions and applications of science that the reader could believe to be possible. Serious discussions about future science appeared regularly in letters to the editor, supposing *when-is*? rather than *what-if*?. When Campbell took over the editorial role, the socio-political environment was one of polarisation between pro- and anti-communist organisations and individuals. Campbell was outspokenly anti-communist, as was Robert Heinlein, Campbell's most successful author. Many writers, however, expressed a communist, idealistic focus, and this contrast was indicative of this polarisation. An integration of the human and "non-human" in science for the benefit of all was proposed by the Futurians, a group of twelve early SF contributors – including the writer Isaac Asimov and the magazine editor-writers Donald Wollheim and Frederik Pohl – who formally proposed that a modern SF should have this focus. The aims of the Futurians were discussed at a SF convention in 1937, when they allied themselves with the progressive, humane aims of science itself:

> …opposing all forces leading to barbarism, the advancement of pseudo-sciences and militaristic ideologies, … SF should by nature stand for all forces working for a more unified world, a more Utopian existence, the application of science to human happiness, and a saner outlook on life.
> (Michel, 1937: np)

From the Futurians onwards, many SF writers and scientists have shared similar aspirations, and there have been many scientists who also write SF. Connections to real-world science have been strengthened by "hard" SF that in parallel to "hard" science

focuses on "in-our-universe" plausibility, which may make it accessible to readers who are interested in science.

As a commentary on human culture, the British New Wave was an influential source of SF and fantasy ideas, which illustrated the boundless and unconstrained potential for SF to not only focus a lens on contemporary culture, but to transcend it. The author J.G. Ballard said in 1986, albeit expressing a particular cultural prejudice: "What most of us have to fear about the future is not that something terrible is going to happen, but, rather, that nothing will happen… If you want an image of what the future is going to look like, it will be a suburb of Dusseldorf, and that might not be a good thing for the human spirit" (Nordlund, 1986: 20:54-22:06). He added:

> I wanted to write about change and possibility, I wanted to write about the next five minutes, not the last thirty years, and the only form of fiction that seemed to have the vocabulary of ideas that would let me describe the next five minutes was science fiction… I wanted a science fiction for the present day. It seemed to me when I started writing in the late fifties and early sixties that the future was a better key to the present than the past, and one had to look at the next five minutes to understand what was going on now. (Nordlund, 1986: 12:26-13:18).

Ballard's description of SF modelling the present from the possible, actualising, future is qualitatively different from using the past for the same purpose: the future is unknown and mutable, it includes the potential for change. SF can inspire human interest by imagining the new and linking it to the now. To do this, however, it has to be embedded in the cultural present if it is to resonate.

The SF historian Adam Roberts has implied that the inclusion of human interests is due to the dependence of SF upon processes that are "aesthetic rather than logical-deductive" (Roberts, 2005b: 6): the aesthetic process implies a necessity to address broader human interests. Sherryl Vint argues that "we might see SF as a parallel project to science studies because SF often returns to science the full material world of people and passions and politics that is carefully excluded by its official culture" (Latham, 2014: 310). Vint argues that Craig Baldwin's avant-garde found-footage SF films, in her view:

> …provide a fuller picture of the culture of science than do the sanitized reports of its official culture, which diligently work to strip away these

> social factors that are ingredients in its production as much as are chemical reactions, molecules, the laws of physics, and cellular structures. (Latham, 2014: 310)

It seems that we not only have the cultural perspective discovered in the text, but we also should maintain an awareness of the direct interest and involvement of editors, writers and commentators – themselves as much part of the contemporary popular culture as the readers. SF is demonstrably comprehensive in appeal and in influence, and there is scope for further investigation of the history of the producers of the literature including their expressed interests and motivations to complement the material that I have explored here. Moreover, we can observe that it has strong connections with science, and not due to an interest in science alone, but in science as part of the social fabric. This interconnection is a feature of SF as Aldiss' omnipresent "cultural wallpaper."

Proximal Reading

As a creative methodology that reflects a personal journey, "proximal reading" has provided me with an anchor to which this research has been attached, or perhaps a mire from which I have reached out to grasp vines and tufts of grass in the hope of self-rescue. In the process of developing and applying the methodology, I have gained a range of skills in digital technology, delivered three conference presentations, published the articles and data that comprises the majority of this thesis and been presented with further opportunities to write books (as well as the work in processs on posthumanism, *Trysts Tropiques* led to an offer from a publisher to write a full-length study of the topic) and a book chapter. This process of development has, however, enabled me to test, refine, and apply the pragmatic approach that I described in the introduction. The case studies have provided a range of examples of the application of the proximal reading method to different topics and to different degrees of separation and inclusion. The first example, Hubbard Bubble demonstrates a thorough, single-dimensional use of the method to assess a very specific, and easily isolated, single topic ("Dianetics" and "Scientology" are trademarks, so the use of them is likely to be especially unequivocal). As such it provides a historical assessment of material selected empirically, minimising initial selection bias. The treatment of this topic illustrates how the proximal approach

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contrasts with close reading (Smith, 2016), and the broad sweep of distant reading (Khadem, 2012, Moretti, 2005b) but retains elements of both. In this instance, the methodology continued to reveal stories, editorials and factual articles that would not be easily found by hand searching alone, and, again, would have been prohibited by the scale of the corpus if it were not for the use of digital text-searching and data-mining techniques. This was, as I have remarked, the most process-driven implementation of the method. The other cases used the flexibility to increase reach and scope.

Case Studies

Each of the case studies provided a different approach to applying the methodology to investigate how a cultural concept, or phenomenon, was reflected in the primary texts, and how popular expectations and views might have changed over time, or reflect more fixed, enduring, attitudes and beliefs present in the parent culture. This has, by necessity, been a wide-ranging investigation of SF tropes and their cultural evolution over time, and my scope has been limited by time and resources in terms of the depth of analysis of any single element. The approach provided an objective method of selecting sources for analysis based on theme-specific search criteria and quantitative ranking. Reading around the story content gave a valuable perspective on the views of contemporary commentators and factual content to compare with fictional and real-world values. The methodology demonstrates that quantitative digital techniques provide an opportunity to make a bias-free selection from corpus texts, to source the content for qualitative analysis regarding the relationship between content and culture.

Hubbard in his Dianetic Bubble

References to Dianetics and Scientology in the pages of SF magazines are not easily distinguished from those concerning pseudo-science and fads in general. John W. Campbell provided an initially positive platform in the pages of *Astounding*, but Dianetics was subjected to immediate criticism in competitor magazines. Rational argument for independent scientific evaluation of Dianetics was countered by rhetoric, which attacked or discredited critics, but implied, and actual, threats of litigation were not numerous during this period. Size and frequency of Dianetics and Scientology

advertising fluctuated: advertising changed cyclically from 1950 to 1984, when it ceased to appear in the sample corpus. There was a noticeable trend that might be associated with a resurgence of the Scientology brand in the mid-1970s, and although it is beyond the scope of this article, parallel investigations of causes for such variations may be suitable subjects for further study.

Almost immediately after being revealed in *Astounding Science Fiction*, I have described how Dianetics became the subject of critical appraisal and analysis, parody and satire, and there was no evidence that it was considered significant by readers and editors after the late 1950s. Soon after it emerged in the SF magazines, Dianetics came to be considered irrelevant, rather than revolutionary. In later magazine issues, retrospectives attributed its emergence to an unsophisticated period when SF included many esoteric interests, such as the Heironymous Machine and the Shaver Mysteries – as one of many naïve beliefs, fads, cults and deceptions promulgated in the history of SF.

The debate regarding Dianetics and Scientology revealed in the pages of the magazines is of particular significance considering the persistence of Scientology to this day, despite being subject to consistent logical critique, and unmet demands for independently confirmed evidence. This might be explained by the success of scientologists in achieving recognition as a religion. Religions are reliant on faith, and magical experiences, rather than empirical and replicable results. A lack of scientific evidence may simply confirm the validity of Scientology as a church, not answerable to demands for scientific proof. When considered in the light of the findings of my work on a popular definition of SF, it is notable that the fortunes of Scientology fluctuated in SF magazines as the perception of it being logical, plausible and technological shifted towards it being perceived as implausible, and supported on faith rather than evidence. If SF is categorised by techne, the expectation would be that Scientology would stop being considered by readers, editors, and writers as serious material for an SF magazine when it was revealed to be based on magical concepts unsupported by empirical evidence. The contents of the magazines seem to illustrate this effect.

The Tropics

In the two studies focused on tropical peoples and environment, I applied the methodology in different ways. One looked at text for instances of tropically themed words, the other looked for tropical-seeming images in cover art. In both cases very similar cultural perspectives could be seen on the subject, either in the written text, or in the visual portrayal. This seems to support the hypothesis that the literature reflects commonly held values, seen by gathering data from two directions, and that identifying primary sources by a digital approach is effective in capturing appropriate material for study.

Trysts Tropiques

Pulp stories in the first half of the twentieth century appear to express less cultural ambiguity than later stories. There is no compromise in early stories; the oppositions of right and wrong, civilised and savage, good and evil are clearly stated, and always resolved in favour of good, rightful and civilised protagonists. The ambiguity of later stories both parallels the changing public perspective on the tropics, and also the increasingly existential concerns of modern society. The ending of *Greenslaves* by Frank Herbert (Herbert, 1972) sees humans being physically integrated with insects to create beings that can survive the unfolding human-created environmental catastrophe. This provokes an existential crisis on the part of the narrator that would not be expected in pulp stories of the '30s and '40s as he fights against the conversion of himself into a hybrid being, and confronts the brain of the insect hive that has repaired his father's failing heart:

> Joao fought down a shiver of revulsion, said: "I'm a slave now; I'm in bondage to you." "Not true", rumbled the voice. "A slave is one who must produce wealth for another, and there is only one true wealth in all the universe – living time. Are we slaves because we have given your father more time to live? … let the sun work on your skin and the chlorophyll in your blood, and when you come back, tell me if the sun is your slave." (p. 31,131)

The cultural interest has changed from simple contests between good and evil to become expanded into the setting of the story, the actors looking for their own, self-

aware meaning, rather than this being prescribed by the formulaic vagaries of the plot. Editorial and factual articles also reflect this change in status over time: the non-human, natural setting is portrayed as more significant, desirable and pure than the corrupt, venal and exploitative external civilisation, and is a backdrop against which we now see human exploitation of the environment as undesirable, and even savage. It appears that twentieth-century SF magazine content, both fictional and non-fictional, provides clear images of changing attitudes towards, and perceptions of, the torrid zone from exuberant exploitation to concerned preservation. Changes in gender roles and characteristics also evolve through these stories, and the appearance of ecological topics in SF such as Cowper's *Message To The King of Brobdingnag* (Cowper, 1984) indicate that SF writing, while not necessarily at the forefront of social movements, is often strongly associated with them.

Cities in Flight

Portrayals of living cities in tropical settings are not commonly found in SF cover art, but can be categorised by the persistence of tropes – primitivism of Indigenous cultures, exploitative, simplistic depictions of women, and the prevalence of conflict – also identified in text analysis in *Trysts Tropiques*. There is a difference between the portrayal of the tropical jungle compared to the tropical desert – the former exhibiting primitive cultural values, whereas desert-dwellers appear more sophisticated and technologically advanced. None of the jungle dwelling people have cities of their own, and actively attempt to destroy civilised cities and structures. The only cities which appear to be Indigenous are in deserts or desert-like spaces, and are generally portrayed as ruins, not living cities. This follows "lost civilisation" tropes, and reinforces the colonial assumptions that indigenous people are inferior, especially regarding cultures that are analogised to the history of colonisation and exploitation of the lands and peoples of indigenous cultures on Earth. We can see changes in cover art that reflect how popular perceptions and impressions of tropical cultures and peoples have developed over time from very simple tropes into more nuanced reflections, which may parallel the increasing understanding and knowledge that were disseminated among and between human cultures over the twentieth century. Intriguingly, the city retains its

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status as a center of civilisation, even when derelict, and to some degree isolated from, rather than continuous with, the tropical environment.

A valuable outcome of this study was to highlight the sharp relief afforded to the human cultural concept of the tropical world when considering what "tropical" would signify on an alien world that had never known Aristotle, and did not have European colonial cartography. In these circumstances, we would not be talking only of the "Tropics of the Imagination" – the tropics would be entirely imaginary, and only meaningful to a human other steeped in cultural convention. Our assumptions of the characteristics of the tropical environment are readily focused by this science fictional lens. I realised that "the tropics" is not a term that should be assumed to be of relevance to the indigenous inhabitants of the cartographical "torrid zone" of Earth any more than it might be to the indigenous peoples of alien worlds.

CONCLUSIONS

The core of this work has been an investigation of SF as a source of insights into human culture, and of those that can be identified by use of a suitable digital humanities method. To be a source of insights, it was necessary to establish if SF is relevant to a significant population that is broadly representative of the public. It was also necessary to ascertain if it is more widely influential, rather than only existing in the popular imagination. This has implications for academic research and research outputs.

The literature review established there is a significant interest in applying SF concepts and ideas in research and in educational disciplines in general. This, allied with the broad demographic interest in SF found from surveys indicates that it is very much a current and culturally significant phenomenon deserving of attention. Discovering that SF is easily categorised from a popular perspective adds to the status of the genre as a source of insights that are grounded in a shared understanding, adding reliability to the cultural information identified in the case studies. The case studies demonstrate how SF can be used an indicator of changing human cultural interests and values across a wide range of topics, and that proximal reading methodology is effective

in teasing out relevant sources and examining them at a level of detail that is appropriate to the questions being asked.

SF is used in research across a range of disciplines and the value of identifying popular movements in SF extends to providing an indicator of current attitudes towards emerging research – major "hard SF" examples being artificial intelligence and genetic engineering. Interest is also found to extend to less immediately obvious examples such as environmental conservation, seen emerging in studies of tropical SF. (Incidentally, I found "cli-fi" being used by survey respondents to describe SF with a climate change focus). SF is a valuable cultural medium to feed into research objectives. The genre provides an indicator of public interests, and can be successfully mined to discover insights into values and interpretations related to a wide range of cultural topics and themes. It is clear that as a popular culture, SF tends to retain the impressions of public culture of the time.

Complementing traditional and thematic approaches to literature analysis with tools taken from the digital humanities can offer remarkable benefits in synthesising insights into popular cultural values and beliefs from the investigation of a corpus of popular literature. This also exposes instances where the assumptions of researchers and the narrow focus of some academic approaches fail to identify or respect the popular perspective. The conclusion is that SF is a useful and relevant subject for cultural analysis, and provides insight into changing popular interests, values, and expectations. Application of an appropriate methodology to the analysis of genre is found to provide reliable and replicable evidence of cultural change. The relevance of such investigations is increasing over time as audiences come to reflect a significantly more general demographic profile than they have been associated with in the past. This, and the clarity of their understanding of SF as a genre make SF a commonly and clearly understood phenomenon with this public.

The disruptive potential of digital humanities research comes from the freedom to include analysis of empirical data to complement traditional approaches. The novel finding discovered in preparation of the article on the demographics of readers demonstrates this: a correlation between SF readership and academic success was found to be independent of family reading. Enjoying SF also correlated with significant and

sustained reading volume that started at school age. Synthesis of the results with existing data on children's reading preferences for fantasy and SF leads to the conclusion that making SF available to children as 'free and voluntary' reading material is likely to provide lasting benefits.

We have no option but to include digital approaches in humanities research; these are already with us as part of the framework of our present culture, from the facility of using advanced library searches to identify relevant literature, to the digital communications systems we use to share and communicate amongst each other regardless of distance. These technologies alone have revolutionised the way that researchers in the humanities are able to approach their subjects and form collaborative networks. Integrating other digital technology to increasingly facilitate research is a logical progression, and one that needs to be considered as a standard approach, rather than a mysterious and complex vision of an inhospitable future.

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APPENDICES

A. PRISMA FLOW DIAGRAMS

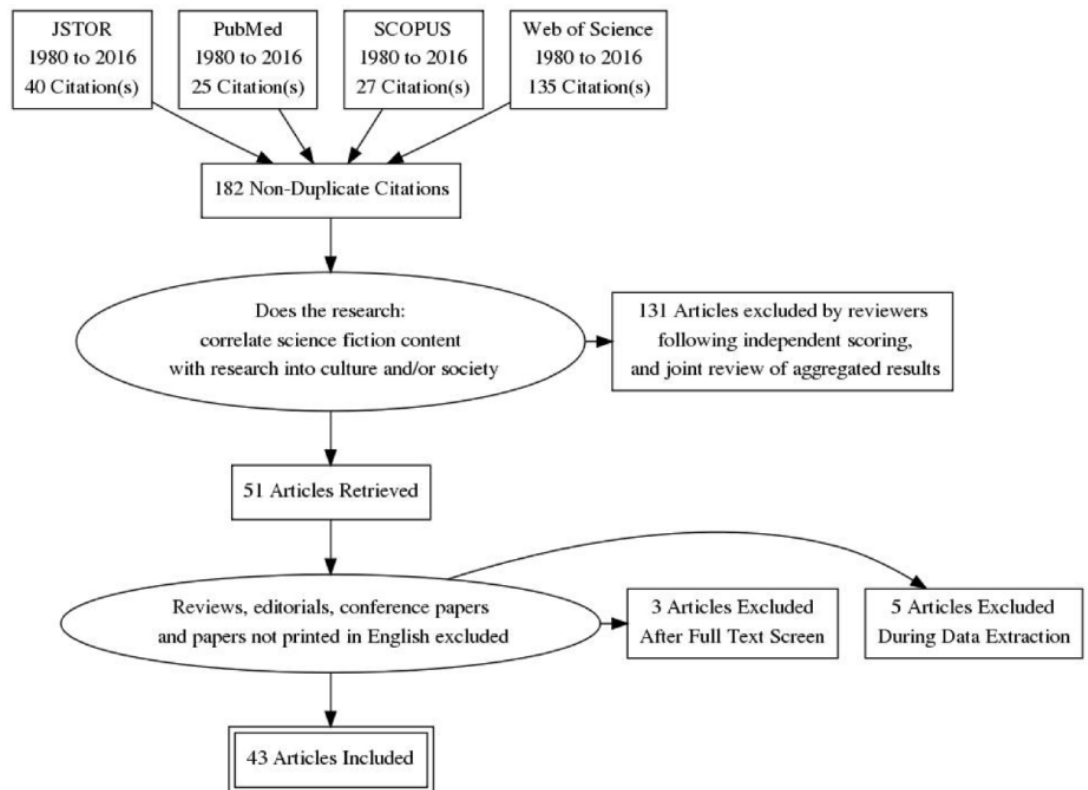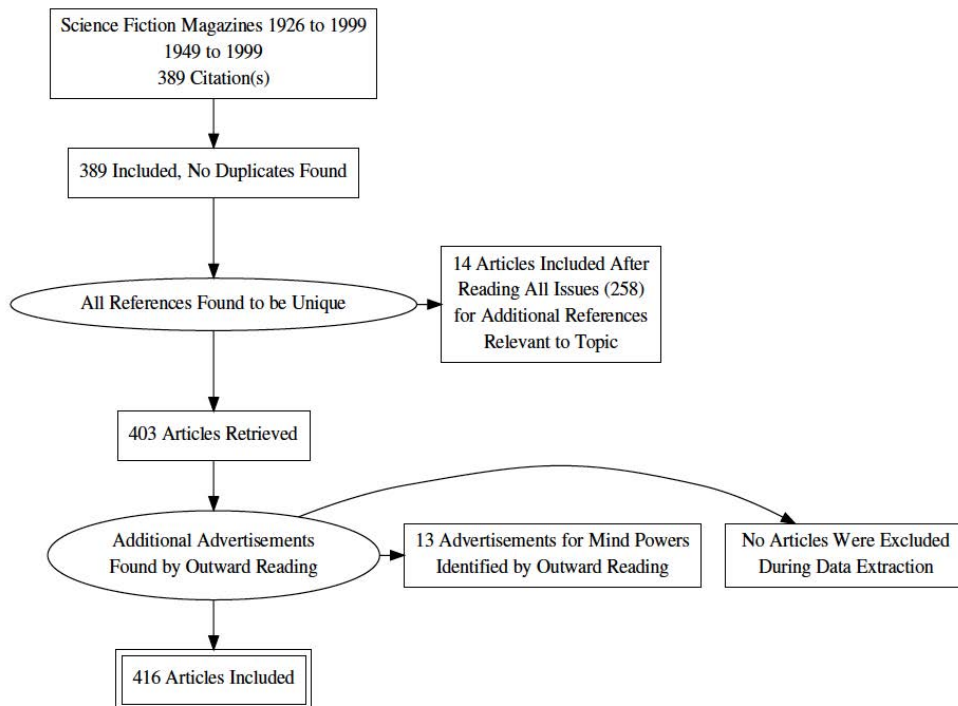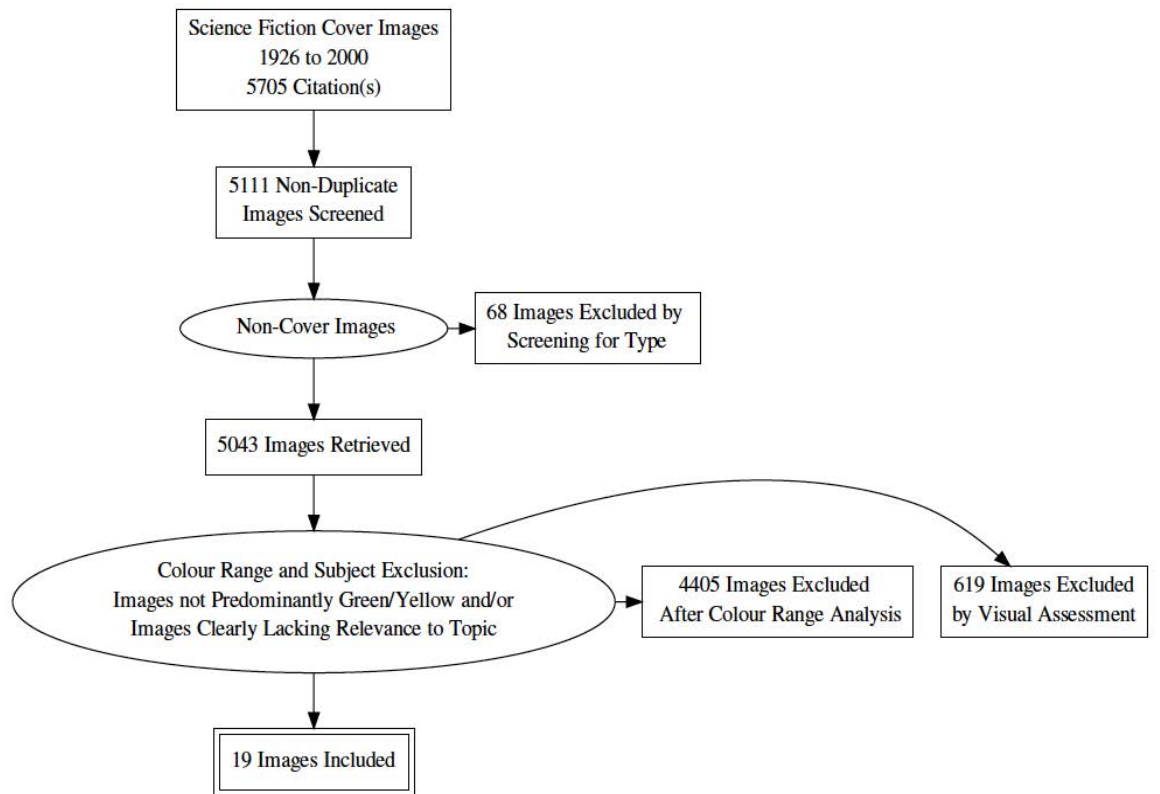Human Culture and Science Fiction: A Review of the Literature…

Fig. 50. PRISMA selection of articles for literature review.

Hubbard Bubble Dianetics Trouble…

Fig. 51.   PRISMA flow diagram for Dianetics / Scientology sources.

Cities in Flight…

Fig. 52. PRISMA diagram of systematic image selection process.

B. RISKS AND LIMITATIONS

Data risks

The project relied upon the collection and analysis of survey data from the general public, and also the extraction and analysis of text from primary sources. There is a risk that quantitative survey data will be insufficient for multivariate analysis and/or that qualitative data will prove difficult to collect. For the online survey quantitative risk was mitigated by early ethics approval and online dissemination of the survey, which resulted in a significant number of responses (n>900 for the first survey and >200 for the second). To reduce the risk of not collecting sufficient qualitative data, the online survey was designed to have a mixture of quantitative and qualitative questions. The number of online survey responses were significant, and included lengthy qualitative responses. The question of how representative the survey is of a more generalised population is difficult to assess – a range of demographic questions were included in the survey to enable correlative analysis to be made against known demographic characteristics of the countries of origin of the respondents, but this is not a perfect measure, as is discussed in Appendix E.

Copyright Considerations

Archiving and analysing electronic texts of works that may be in copyright for non-commercial research purposes has been found to be acceptable under the fair use classification of United States copyright laws (17 USC, sec. 107). Fair use across multiple research jurisdictions is considered to apply to this thesis for the following reasons: quotations and extracts only represent a very small proportion of text from online archives; no payment was made for third party digitised text, and this has been employed without redistribution and for research purposes only.

Time and material constraints

Due to the intensive nature of scanning and encoding printed texts, it was envisaged that there might be insufficient time to generate a useful corpus within the time limitations of the thesis. To mitigate this, quantitative text analysis was given priority in the research project, followed by more complex qualitative coding. If there was insufficient time to carry out all the analytical aims, the quantitative results would be complete (the quantitative analysis is largely computational and does not require such extensive coding as the qualitative). Work on digitising source texts using optical character recognition began immediately after commencing research, to maximise the volume of digitised text available for analysis. I had already made a significant investment in expanding my personal collection of SF magazines before commencing on my PhD studies. This was aimed at filling gaps in my collection of major titles, and especially *Astounding Science Fiction*, as it contains the longest sustained run of monthly reader feedback columns of any SF pulp, is the longest continually running serial in the genre (from 1930 to present) and contained significant editorial content. The identification of sources of magazines that had already been scanned into individual page images by enthusiasts and the availability of these online was a major benefit, and enabled the inclusion of titles and individual issues beyond the limitations of my private collection – and reduced the necessity to digitise large numbers of magazine issues, with the attendant overhead that would result.

Technical issues

There is a risk that the quality of quantitative text analysis will be reduced by inaccuracies in digitisation of text by optical character recognition. The failure of OCR tools to correctly identify text increases with the age of the issue being scanned as, being printed on poor quality pulp paper stock, the early editions (up until the 1960s) have degraded in print clarity and suffered from paper browning. A manual comparison of OCR processing outputs against original copies indicated that up to 40% of text is corrupted in editions published before 1936, and up to 20% for editions between 1936 and 1940. After 1940 a much smaller proportion of the text is corrupted, and by 1950

this is 5% or less. This has potential impact on the statistical reliability of the computational analysis. To clarify this, the limitations of the OCR process have been described here in the Methodology section and in Appendix G with more precision than might otherwise be necessary. The larger the volume of digitised text available for analysis, the more likely it is that the proportion of corrupted text will not affect the significance of statistical analysis. Corrupted text is very obvious when calculating word frequency, and is easily excluded from the results. A potentially more difficult problem, more so if the study had been conventionally limited to story content, would have been whether to exclude advertising and editorial text from scanned copies to prepare them for analysis. The proportion of advertising and editorial content is small compared to the story content, and considered to be statistically insignificant compared to the volume of fictional text for word counting purposes. For thematic investigations, the inclusion of advertising, editorials and features is a benefit, as has been discussed in the methodology. Some terms may be readily recognised in output and their bias reduced by stop-word filters which exclude specified words from analysis. For example, because the name of the serial is printed at the bottom of every page it is added to the stop word list to prevent it from skewing output. The prevalence of the words "science" and "fiction" must be acknowledged in word frequency accounts as being strongly biased simply by naming conventions. This was also identified in survey analysis for the purpose of defining SF as compared to fantasy, and similar measures taken to eliminate this bias are described in *Defining Science Fiction*, in Part I.

Personal factors affecting the research project

I have extensive knowledge and experience of the SF genre, and I am aware that I have strong preferences, assumptions and opinions arising from my subjectivity. An approach to address this qualitative research problem is for the researcher to apply the phenomenological method of bracketing (epoché) formulated by Edmund Husserl (1859-1938) to isolate internalised, subjective expectations from the research activity by self-reflectively identifying and actively excluding this bias from the interpretation of findings. One of the primary outputs of my research has been to develop a methodology that minimises selection bias, and includes careful record keeping of the process of identifying and analysing primary sources. This is intended to reduce the influence of

the investigator's preconceptions and experience, and to provide a replicable method for comprehending choices that are made in analysis that emerge from the epoché of the researcher. To address bias in survey design, I built into the research plan a second iteration of the online survey to clarify causes of data outliers and unexpected responses to questions asked in the first iteration. Surprising responses were received to some of the questions in the first iteration of the online survey, which exposed omissions and misconceptions in the survey design – clearly artefacts of my own subjectivity. The second iteration of the survey included questions about unexpected responses that frequently appeared in free-text answers to the original survey, expanded demographic questions to allow for more variety to reflect a more diverse population of respondents than had originally been envisaged, to remove questions that have received uniformly consistent responses (i.e. almost all of the responses were identical) as these were of little statistical value, and, finally, and to add questions related to emerging issues identified as the study progressed. This included identifying a need for a popular genre definition as existing academic definitions appeared to inadequately describe non-academic impressions of SF. The planned flexibility of the second survey consequently proved to be invaluable.

C. DATA MANAGEMENT

Data

All research data is stored on the James Cook University eResearch portal, with a minimum five-year retention period following successful completion of the thesis, as recommended in Part 2 of the Australian Code for the Responsible Conduct of Research (NHMRC, 2007). All data is stored in multiple formats to ensure future accessibility – Excel, comma-separated, pdf and unformatted text, depending on the data type.

1. Online survey results are stored with a copy of the survey questions.

2. Quantitative text analysis undertaken for the research includes data tables generated for assessing the replicability and reliability of published articles, and which list sources found by the methodology along with classifications applied to them by the researcher as applicable.

3. Primary text that is not in the public domain is not stored on the eResearch portal as text files as it will be difficult to ascertain whether future use will remain within copyright limits. Use of texts for this thesis have been classified as 'fair use'– Fair-use has been successfully applied in prior text analysis projects using copyrighted material as a dataset (Hoover, 2013) as noted in the Copyright Considerations section in Appendix B. Copies of relevant copyrighted issues of texts are available on the open market or in specialist research libraries to subsequent researchers who intend to replicate or extend upon the research findings.

Anonymising the data gathered in the surveys is problematic as some of the free text responses contained sufficient information to locate and/or associate respondents, and could feasibly be used by a third party in breach of privacy, and open access is consequently subject to negotiation with the IP owner. The first iteration of the online survey (Menadue, 2016b) is listed in the Australian National Data Repository.

D. ETHICS APPROVAL

The project requested permission for some participants to be interviewed online or in person, and the collection of personal information (anonymously) by an online survey. It was assessed as negligible / low risk by the James Cook University Human Ethics Committee and was approved in October 2015, under approval number H6299

A provision for face-to-face interviewing was included in the ethics application, in order to address the possibility that interviews might be held with individuals from the UK and the USA in addition to Australian subjects. This was addressed by enquiries to the governing bodies for human ethics in both countries and confirmation that the undertaking would be exempt from additional country-specific applications for ethics approval. (See http://www-public.jcu.edu.au/researchservices/ethics/index.htm for information on the ethics process and procedures applied to this investigation). This "belt-and-braces" approach ensured that the research data and results would meet ethics requirements in all domains.

E.   ONLINE SURVEYS

Summary

Survey data from the survey *Science Fiction & Fantasy – Your Experiences* (Menadue, 2016), was gathered between 17th November 2015 and 17th November 2016 at which date it was stored in the Australian National Research Database. A total of 909 unique responses were received. A descriptive statistical analysis of the survey responses was published as "Who Reads Science Fiction and Fantasy, and How Do They Feel About Science? Preliminary Findings From an Online Survey" (Menadue and Jacups, 2018).

The subsequent survey, *Science Fiction & Fantasy – Your Opinions* (Menadue, 2017a), had been planned from the beginning of the research project to be based on information that arose in the first survey and to ask additional questions to answer matters that arose in the course of the research. The difficulty of defining SF to the satisfaction of people from varying disciplinary backgrounds arose when writing the literature review, and this led me to include questions on definitions in the second survey in order to clarify this matter, which otherwise seemed impossible to resolve. There were 232 responses to this second survey, collated for a six-month period between 11th November 2016 and 10th May 2017. The findings of these surveys are discussed in Part I.

Survey Limitations

Both surveys were distributed online, and distribution limitations of the surveys were consequently very similar. Research on the characteristics of online surveys has found that these have a comparatively low drop-out rate and provide more complete data responses compared to postal surveys, but are inherently influenced by self-selection (Dolnicar, Laesser and Matus, 2009). An online survey cannot reflect the attitudes of a broader segment of a SF audience who are not regular users of the internet, or are not followers of social media.

Martine Van Selm and Nicholas Jankowski have discussed how targeting specific

online communities can be an effective method of harvesting survey responses, and specifically for what Walter Swoboda et. al. describe as "expert interrogations" (Swoboda et al., 1997: 243), also highlighting the cost-effectiveness of this approach and the openness of responses that is encouraged by anonymity (Selm and Jankowski, 2006: 437). Selm and Jankowski also acknowledge the limitations arising from technology use, and being unable to control the pattern of respondents due to lack of control over survey dissemination (438). We might consider a cluster of 1.1% of respondents to the first survey who reported to be from Finland to be an example of this effect, rather than reflecting a true geographical proportionality of SF readers. The survey was only available in English, as were the survey instructions and promotion, which reduces the responses by non-native speakers of English and influences survey dissemination – this makes the results only clearly applicable to an Anglophone audience, albeit one that includes respondents who are non-native English speakers, and spread across the globe.

Complex media engagement practices, involving two-way interactions, are found in online audiences, and this is considered to make online survey design and application challenging, and unlike pre-technological research paradigms (Livingstone, 2013, Yun and Trumbo, 2000). Overcoming limitations of the characteristics of online surveying (Callegaro, Lozar and Vehovar, 2015), can only be reduced by multi-modal and methodical sampling beyond the resources available to this study.

It should be considered that most responses came from people who are clearly familiar with the genre, and this combines both an opportunity and a limitation. The limitation is, naturally, that there were fewer people who did not already have an interest in and experience of SF. This opens up criticism that the responses are not representative and lack significance to a broader population. This is a valid criticism, but the demographic profile in many ways seems compatible with the larger population and not clearly indicative of a special sub-set. This is the case especially in terms of gender, age distribution (allowing for access to technology required to complete the survey), the variety of work related activities and economic status reported. The statistically significant number of responses and the breadth of their interests in other literature, are indicators that the respondents are by no means particularly unusual

(except that they tend to read a great deal more than was expected, and are highly educated). The relevance of responses in the self-selected domain of "SF" was increased by the availability of "expert interrogations" highlighted by Swoboda et. al. This would apply particularly strongly to the opinions survey, which focused on definitions, as approximately half the responses came from people visiting the Facebook page of the Science Fiction and Fantasy Writers of America. This made it even more compelling that I found no significant differences between definitions given by professional writers, and those of other respondents. Dissemination among SF writers and fans made it possible to select a text that the majority had read – *Dune* – to provoke informed responses on distinctions between fantasy and SF, and increase the statistical significance of the findings.

The Surveys

Following is the content of the two surveys presented to the audience. They are introduced by information about the survey source and intention of the research that conforms to research ethics requirements, presented exactly as it was published with the survey. Answer sections are framed with [A] when necessary to clarify supporting text associated with possible responses. A distinction between answer formats is indicated by squared brackets [F] for free-text answers, [L] for list options, [Ln] for Likert Scale responses across a numerical range – these were [L5] (with a range of 1-5), and [L10] – [N] for single number responses, and [Y/N] for yes or no options. Range responses (e.g. ages) are indicated by [R].

Science Fiction & Fantasy – Your Experiences

This is a survey seeking to find out what people choose to read, and particularly what it is they like about their experience of Science Fiction and Fantasy literature. This survey is split into two halves - one where you are asked questions about what you read and how you feel about it, the second contains general background questions. The survey is not compulsory! You can answer as many or as few questions as you like and stop at any time without explanation or prejudice. Your answers will be completely anonymous, and you cannot be identified by answering this survey. If you would like to add more to your answers than you can manage to fit in here, please email me at:

ben.menadue@jcu.edu.au
Thank you for your participation in my project,
Ben Menadue, Cairns, Australia. The survey is intended to run for a year from
November 2015 to November 2016.

Information Sheet - The Background to this Questionnaire
The Research Project: Science Fictions and Cultural Facts – how people's experience of
SF and fantasy can help us build better, more considered outcomes for research through
collaboration between stakeholders. You are invited to take part in a research project
about people's experience of SF and fantasy literature. The study is being conducted by
Ben Menadue and will contribute to his PhD thesis at James Cook University. The aim
is to identify how people experience new ideas they read and to see if this knowledge
can help scientists work together and with the public to make research more effective in
providing benefits to society. The survey provides the researcher with information on
how you have experienced Science Fiction & Fantasy literature in your life. If you
know other people who might be interested in taking part, please feel free to pass on the
link to this survey. If you have any questions please contact Ben Menadue and/or
Richard Lansdown: Researcher: Ben Menadue Email: ben.menadue@jcu.edu.au
Supervisor: A/Prof Richard Lansdown Phone: 07 4232 1051 Email:
richard.lansdown@jcu.edu.au College of Arts, Society and Education James Cook
University, Cairns, Qld. 4870 Australia This survey is being carried out under the terms
of the James Cook University Human Research Ethics Committee Approval H6299 If
you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office James Cook University, Townsville, Qld, 4811
Australia Phone: (07) 4781 5011 (ethics@jcu.edu.au)

First, some questions about what you read.
It might be that what we choose to read has an influence on how we see the world
around us, or we might make reading choices that are influenced by what's going on in
the world. Either way, it's an interesting thing to think about.
1. How much do you enjoy reading compared to doing other things?
(for 'reading' please include audiobooks - in this and later questions)
[A] I'd much rather be reading [L5] I don't read much [A]
2. What sort of books do you like to read in general? [A] Click as many or as few as
you want. [L] Mystery, Suspense or Thrillers, Drama, Fantasy, Sci-Fi, Adventure / War,
Realistic Fiction, Humour and Comedy, Biographies, Places and Events, Ideas, Horror,
Other non-fiction, Magazines, Poetry, Romance, Literature, Blogs, Short Stories,
Newspapers, Factual Science (non-fiction), Other: [F]
3. Do you always have something around that you are reading? [A] You might not be
reading it right now, but you'll pick it up and read some of it later today or perhaps
tomorrow [Y/N]
4. About how many books have you read in the past month?
(not counting magazines, including audiobooks) [N]
5. How many magazines do you read in a month? [N]
6. How many of the books were Science Fiction or Fantasy stories?
Please add in any Science Fiction or Fantasy magazines here as well. [N]

7. What themes in Science Fiction & Fantasy do you like to read the most?
Please select a few that you really like, no more than five if you can.
[L] 'Hard' technology and future science, Wild, Weird or Supernatural, Mystery and Magic, Grand and Majestic - Big Ideas, Personal Stories, Fantastical, Cyberpunk / Virtual Worlds, Romance, Heroic, Horror, War, Time Travel, Superhumans and Superheroes, Powers of the Mind (Telepathy, ESP...), Suspense and Thriller, Humour and Comedy, Poetic or Literary, Disasters, post-apocalyptic, Dystopian - everything's going bad, Utopian - the future's looking good, Other: [F]
8. What was the last Science Fiction or Fantasy book that you read?
The name of the book: [F], Who wrote it? [F], The name of the author: [F]
9. How much did you like it? [A] Not really [L5] It was great! [A]
10. If you disliked it (or any part of it) please say why:
Please check all that apply [L] The story wasn't well thought out, It wasn't very well written, I didn't like the ending, It was too unbelievable, I didn't like the people / aliens in it, The cover was much better than the book, The idea was stupid, It was upsetting to read, It had too much sex, It was too violent, It was boring, It was too long, Other: [F]
11. If you liked it (or any part of it) please say why: Please check all that apply [L] The plot was really good, It was very well written, I loved the ending, You could imagine it could be real, The characters / aliens appealed to me, The cover / marketing was excellent, The ideas in it were brilliant, It was an exciting read, I wished it was longer, Other: [F]
12. How old were you when you first started reading Science Fiction and Fantasy? [R]
13. Do you read it as much now as when you first started reading it? [F]
14. Are you just as interested in Science Fiction and Fantasy as you used to be, more interested, or is it not something you read so much anymore?
[A] I read more now [L5] I don't read much SF&F these days [A]
15. Do you generally prefer Science Fiction or Fantasy?
[A] Mainly Fantasy [L5] Mainly Science Fiction [A]

Some more detailed questions about your reading choices.
16. You've provided some useful information on how much and what you read, now there are some questions about why you read it and what you like about it.
17. Which ideas in Science Fiction & Fantasy do you find the most moving, or inspirational? Please say what the idea or theme is and then say something about each one, in as many or as few words as you want. These might be topics you've indicated earlier, or some new ones. [F]
18. Why do you choose to read a particular book?
You can select more than one item, here. [L] I like the cover, I've read the author before, I like to try something new, A friend recommended it, I liked a review I read, It looks like it's about one of my favourite story types, I've read everything else, Other: [F]
19. If you have a favourite author - who is it? [F]
20. What do you like about that author? [F]
21. If you were stuck on a desert island with no hope of rescue, which three SF&F books would you like to have with you? You get Harry Potter and The Lord of the Rings for free, so you don't need to mention them here unless either of them has a really, really special place in your heart. [F].
22. Why did you pick those books? [F]

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23. If you could swap The Lord of The Rings and/or Harry Potter for a different book, would you do this? Select which one, or both, or leave it as it is if you want to keep both. [L] The Lord of The Rings, Harry Potter (any of the books)
24. Do other people in your family read a lot? [Y/N]
25. What sort of books do they like to read? Click as many or as few as you want. [L] Mystery, Suspense or Thrillers, Drama, Fantasy, Sci-Fi, Adventure, War, Realistic Fiction, Humour and Comedy, Biographies, Places and Events, Ideas, Horror, Other non-fiction, Magazines, Poetry, Romance, Literature, Blogs, Short Stories, Newspapers, Factual Science (non-fiction), Other: [F]
26. Do you also like Science Fiction and Fantasy Films and TV Shows? [Y/N]
27. If you do, what are your favourites?
28. Say what you like about them too, if you have time. [F]
29. There are probably books, films or authors that you don't like - what are they? It's often helpful to know what people don't like as much as what they do like. [F]
30. Why don't you like them? [F]
31. What's your favourite Science Fiction or Fantasy book of all time? [F]
32. Why is it special to you? [F]
33. How much do you like Science Fiction & Fantasy?
[A] About the same as other things I read [L5] It's the best thing ever [A]
34. How special is good Science Fiction and Fantasy compared to other writing?
This is about whether you think SF&F is inferior to 'classic' literature and isn't very good or worthwhile by comparison. [A] It's trashy [L5] It's as good, if not better [A]
35. Would you say you're a bit of a dreamer, or more of a realist? [A] Dreamer [L5] Realist [A]
36. Does Science Fiction help you relate to Science in general? This and the following questions are about how you think attitudes to Science Fiction and Fantasy might influence how we relate to new ideas and concepts in the real world. [A] Not really [L5] Yes it does [A]
37. Do you think reading Science Fiction and Fantasy opens you up to new ideas? [A] Not really [L5] Definitely [A]
38. Do you think reading Science Fiction and Fantasy makes you more likely to believe in 'real' science? [A] Not at all [L5] Yes, very much so [A]
39. Do you think that other people who have doubts about science might be more open to it if they read Science Fiction? [A] Probably not [L5] It would definitely help [A]
40. Do you think scientists in SF seem more grounded and understandable than scientists in real life? [A] I think real scientists are more understandable [L5] Yes, I can relate to them more easily[A]
41. Do you ever find yourself feeling a bit ashamed to be reading Science Fiction & Fantasy? For instance, do you apologise for it when someone notices it, or perhaps hide the cover when you're reading in public. [A] I should be reading something more worthwhile [L5] Not at all, I'm proud of what I read [A]

Some questions about you
These are what is known as 'demographic' questions. They help us to see if people like different things in books because they are older, or live in different places, or speak different languages. You don't have to answer any of these questions (you don't have to

answer any of this questionnaire) but if you do it helps us build a more accurate picture of what people like and why they might like it. As it says at the beginning, your responses are anonymous, and you cannot be identified from your answers.

42. Where in the world do you live? First select the region, then please put the name of your country (or abbreviation e.g. .UK, USA, NZ) in the 'other' box at the bottom of the list. [L] Australia or New Zealand, Western Europe, North America (US and Canada), Central or South America, Pacific Islands, Caribbean, South East Asia, Central Asia, Eastern Europe, Middle East, Africa, Other: [F]

43. What is your native language? This is the one you speak most at home. [L] English, Other: [F]

44. Are you in a relationship with someone? [L] Yes, No, Maybe, I'd rather not say, Other: [F]

45. What is your gender? [L] Female, Male, Other: [F]

46. How old are you? This helps us get a good idea if peoples preferences vary much with their age. [R]

47. What level of formal education do you have? 'Professional or Technical Trade' here is if you are qualified in any trade, (for example an electrician, mechanic, surveyor) which required further education after school. [L] School, University, Post-Graduate University, Professional or Technical Trade

48. How important do you think your life experience and learned skills are compared to your formal education? People continue to learn and develop skills through their lives outside of their career and formal education, these can be very useful in determining what we do with our lives.
[A] Not important [L5] Very important [A]

49. What is your main occupation? [L] Employed, Self-Employed, Retired, Student, Unemployed, Other: [F]

50. What job do you normally do, or have you done in the past? [F]

51. If you could pick any job or career at all, what would you pick? [F]

52. How good are you at working with your hands? Making, fixing and handling things, often using tools. [A] It all falls apart [L5] I could build a space-station [A]

53. Are you happy with how much income you have? This is not a question about how much you actually earn, but more about how you feel about it. [L] I never have enough money, even for day to day things, I do well enough but a bit more would be helpful, I'm happy with what I have, I'm doing well, I have more than I need, I've got enough that I don't really have to think about it

54. How good are you at solving puzzles and working things out in your head?
[A] I solve puzzles with a hammer [L5] I'm the world chess champion [A]

55. Do you learn new physical or manual skills easily? This isn't a question about whether you are good at doing them. [Y/N]

56. Do you find it easy to understand new and unfamiliar ideas? [Y/N]

57. Do you think of yourself as happy to consider all sides of an argument, or do you have strong opinions of what you think is right and wrong? Try to come down on one side of the fence here - pick the answer that is likely to be your first reaction to a new argument. [A] [L] I'm always happy to consider all the options, I prefer my own opinions [A]

58. Is there anything else you would like to add about your experience of Science Fiction & Fantasy? We are very interested in what you have to say about your

experience of reading and enjoying Science Fiction and Fantasy in your life and how it may have influenced you. There may be things you want to say about Science Fiction & Fantasy in general. Please write anything else you feel like saying here and write as much or as little as you like. [F]

59. How did you discover this survey?

This adds information about the link between what people are interested in and how they find things out. [L] From a news article, Referred by a friend/colleague, A circular from your organisation / school, From an internet search, A blog, twitter or other social media, Other: [F]

Science Fiction and Fantasy: Your Opinions

This is a survey seeking people's opinions on Science Fiction and Fantasy literature. It follows on from the 'Science Fiction & Fantasy Your Experiences' survey which started in November 2015. We were very interested in feedback people gave asking for more flexibility and options for in depth answers and have followed that when designing this survey. There are fewer questions than in the previous survey, but they allow for longer and fuller answers if you want to say more. The survey takes approximately five minutes if you skip the text answers, but there is no limit to how much you can put down. Note that your answers are completely anonymous, and you cannot be identified by answering this survey.

Thank you for your participation in my project, especial thanks to those of you who took part in the first survey and are coming back for the second round!

Ben Menadue, Cairns, Australia.

Information Sheet: The Background to this Questionnaire

The Research Project: Science Fictions and Cultural Facts – how people's experience of science fiction and fantasy can help us build better, more considered outcomes for research through collaboration between stakeholders.

You are invited to take part in a research project about people's experience of SF and fantasy literature. The study is being conducted by Ben Menadue and will contribute to his PhD thesis at James Cook University. The aim is to investigate how people experience new ideas they read and if this reflects broader ideas about the world, science and our interests and concerns. For this purpose, the survey provides the researcher with information on your opinions about and experiences of Science Fiction & Fantasy literature.

This current survey adds to the previous 'Science Fiction & Fantasy, Your Experiences' survey which was started in November 2015 (available at https://goo.gl/forms/SJV9PE0Yi3fbOk2T2 if you're really keen on surveys and want to do that one as well!), but it is not necessary to have done that survey first (or at all) to take part in this one. To continue with this survey, please click on the 'Continue' button to the bottom left of the page.

If you know other people who might be interested in taking part, please feel free to pass on the link to this survey.

If you have any questions please contact Ben Menadue and/or Richard Lansdown:
Researcher: Ben Menadue
Email: ben.menadue@jcu.edu.au
Supervisor: A/Prof Richard Lansdown
Phone: 07 4232 1051
Email: richard.lansdown@jcu.edu.au
College of Arts, Society and Education
James Cook University, Cairns, Qld. 4870 Australia
This survey is being carried out under the terms of the James Cook University Human Research
Ethics Committee Approval H6299. If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811 Australia
Phone: (07) 4781 5011 (ethics@jcu.edu.au)

The survey...
The survey has list questions as well as boxes for you to make longer answers. 'Free text' answers can often be given in a few key words we're not expecting you to write whole sentences or paragraphs about a question unless you want to, the text boxes are the default size for the form, so don't feel we are expecting you to fill them up.
The survey is entirely voluntary and we'd rather you answer briefly or skip questions and get to the end of the survey than stop because it's taking too long to answer everything...
Finally, when you're giving multiple answers could you separate each one with a comma otherwise we'll be looking for a book called 'Electric Sheep City' if you don't use commas in an answer like: 'Do Androids Dream of Electric Sheep, City, The Quantum Thief'...

First, some questions about what you read.
Our reading interests and choices might be influenced by what's going on in the world around us and might influence how we respond to what we see – we think that's an interesting idea for discussion.
1. How much do you enjoy reading compared to doing other things?
(for 'reading' please include audiobooks in this and later questions)
[A] I'd much rather be reading [L5] It fills in the time between doing other things [A]
2. What sort of books do you like to read in general?
A few key words that describe your interests will be very helpful, examples might be; poetry, history, real science, SF, humour, biographies, fantasy... there are many many more possible answers, so put as many or as few as you like. (Please separate each sort by a comma). [F]
3. About how many books have you read in the past month?
Please include audiobooks and eBooks in this and the next questions [N]
4. How many of these were Science Fiction or Fantasy Books? [N]
5. How many magazines do you read in a month? [N]
6. How many of the magazines were about Science Fiction or Fantasy? [N]

7. What sort of Science Fiction & Fantasy do you like reading?
There are lots of themes and ideas in Science Fiction & Fantasy, ranging from 'hard' science fiction about technology and realistic science to romances, comic books, humour, space opera, gender themed, dystopian, weird, horror, existential, war, time travel, suspense, steampunk, cyberpunk... The list is almost endless, and new ones appear all the time... Please put as few or as many as you like (but please separate them by commas). [F]
8. Do you generally prefer Science Fiction or Fantasy?
[A] Mainly Fantasy [L10] Mainly Science Fiction [A]
9. How important are the types of things (rather than the plot) in a book to whether it's Science Fiction or Fantasy? You might consider that dragons and magic always make it fantasy and spaceships and aliens make it SF... or not see it as being so clear. There are some books that have both dragons and spaceships in them...
 [A] I don't think the specific content matters [L10] I think the difference in content is what makes the difference [A]
10. Does the way the story is written (the way the plot works) influence whether you think of it as Science Fiction or Fantasy? 'Hard' Science Fiction has often been seen as based on logic and possible realism. Other Science Fiction and Fantasy stories might have stories that require supernatural and logically impossible things to happen... Are different approaches to telling the story important in deciding whether something is Science Fiction or Fantasy?
[A] A story can be put together any which way and be either [L10] Science Fiction and Fantasy have recognisably different ways of telling stories [A]
11. Is your distinction between SF and fantasy influenced by what other people say about the story?
[A] Never L [10] Always [A]
12. How much does the picture on the cover or the promotional material influence whether you see something as Science Fiction or Fantasy... Sometimes the pictures might even be the best part of the whole book...
 [A] I don't judge a book by its cover [L10] I make assumptions from the promotional material [A]

A bit more philosophical...
These questions ask for a more careful response than the other ones in this survey. These have mainly been included because of the feedback from people who wanted more freedom in their answers and more space to describe them rather than being restricted by selecting from a list. That feedback made us feel a bit foolish for not having expected that F&SF readers and fans might be more freethinking than your average survey respondent, We live and learn...
13. For you, what makes a good story? Sometimes we like a particular style of story, perhaps the perspective of how it is told, particular themes and ideas, types of plot. People can have very different ideas of what makes a 'good book'... [F]
14. For you, what makes a bad story?
What ideas, styles, themes or other content does not capture your interest or is just something you don't like. [F]

15. Imagine what the best SF&F book ever written would be like. What would it say on the back of the book? So, what would the synopsis of the story be for it to make you really want to read it this isn't a 'marketing' question, it's about what short, simple statement sums up what you really want to read... [F]

16. What is it about a book that makes you think of it as fantasy? Trying to come up with definitions of fantasy and SF is very difficult your thoughts on this could be very helpful. We asked a couple of general questions earlier about the importance of content or structure in making your decision, but you might think it goes deeper than that... [F]

17. What is it about a book that makes you think of it as SF? Not a question that should surprise you, considering the last one... [F]

18. Now, what might be a tricky one... Is Frank Herbert's "Dune" Fantasy or Science Fiction...? (If you haven't read "Dune", it scores very well on lists of the best SF&F books ever, but we're not suggesting reading it before answering this question...) [A] Definitely Science Fiction [L10] Fantasy without a doubt [A]

19. Why "Dune"? That's a good question – it's because "Dune" is one of the most read books in Fantasy and Science Fiction and it will be familiar to a lot of you. "Dune" has a lot going on in it, in terms of plot and content, and how to define it is something we argue about here... While we're at it, perhaps you'd like to explain here why you ranked "Dune" like you did on the Fantasy or Science Fiction scale? (If you haven't read "Dune" please leave this blank). [F]

Some questions about your specific interests in particular books
You've provided some very useful information about your reading habits and your opinions on what you read in general, now we'd like to hear about your personal choices...

20. Which ideas in Science Fiction & Fantasy do you find the most moving, or inspirational?
These might be topics you've indicated earlier, or some new ones. [F]

21. If you have a favourite author of Science Fiction or Fantasy who is it? [F]

22. What do you like about that author? [F]

23. What are the best Science Fiction and Fantasy books of all time? (Please remember to put commas between them...) [F]

24. Is there something these works have in common that makes these books appealing to you? [F]

25. What's your absolute favourite Science Fiction or Fantasy book of all time? You've had a question that lets you put down as many as you liked earlier, now we're seeing if you can pick just one...Yes, we know that's not going to be easy... [F]

26. Can you describe why this book is your favourite? How would you recommend it to someone as a good read, or is it a very personal choice [F]

Questions about the value of SF and fantasy to the real world... A question that we're interested in is if Science Fiction and/or Fantasy has a purpose that goes beyond entertainment and is linked to real world events, concerns and interests.

27. How often does Science Fiction make you think about the purpose and benefits or risks of scientific innovations now and in the future? This and the following questions are about how you think attitudes to Science Fiction and Fantasy might influence how we relate to new ideas and concepts in the real world.

[A] Never [L10] All the time [A]

28. Would you say that Science Fiction is useful in encouraging us to consider and evaluate what's going on with real science?

[A] I don't think it is [L10] Yes, very [A]

29. Do you think reading Science Fiction and Fantasy makes 'real' science on the same topics more understandable? This is a bit different from the last one it's more about if SF&F helps to teach people about real science

[A] Not at all [L10] Yes, very much so [A]

30. Do you think that science benefits from people reading Science Fiction? Does it make people more informed about science, more interested in it and supportive of research that is being done today...

[A] It makes doing real science harder and can damage its reputation and inhibit research [L10] It helps people understand, accept and trust science and scientists and is a tool for helping progress [A]

31. Do you think scientists in Science Fiction seem more human, and have more human concerns, than 'real' scientists? 'Real' scientists are sometimes seen as being remote from other people's interests and opinions. Are they actually any different in this respect to scientists in Science Fiction?

[A] I think real scientists seem more normal [L10] I can relate to fictional scientists more easily [A]

32. Science Fiction and Fantasy what's the point? Yes this sounds like a school essay topic... It's an opportunity for you to say what SF and fantasy do for people and society that goes beyond the simple questions above. We can't think of everything and, from experience, if we didn't give an opportunity for you to say whatever you like here on this important subject we'd be getting an inbox full of feedback about this afterwards...
[F]

Some questions about you

These are what is known as 'demographic' questions. They help us to see if people like different things in books because they are older, or live in different places, or speak different languages. You don't have to answer any of these questions (you don't have to answer any of this questionnaire) but if you do it helps us build a more accurate picture of what people like and why they might like it. As it says at the beginning, your responses are anonymous and you cannot be identified from your answers.

33. Where in the world do you live? First select the region, then please put the name of your country (or abbreviation e.g. .UK, USA,

NZ) in the 'other' box at the bottom of the list. [L] Australia or New Zealand, Western Europe, North America (US and Canada), Central or South America, Pacific Islands, Caribbean, South East Asia, Central Asia, Eastern Europe, Middle East, Africa, Other: [F]

34. What is your native language?

This is the one you speak most at home. [L] English, Other: [F]

35. Are you in a relationship with someone? [L] Yes, No, Maybe, I'd rather not say, Other: [F]

36. What is your gender? [L] Female, Male, Other: [F]

37. How old are you? This helps us get a good idea if people's preferences vary much with their age. Remember the survey is totally anonymous. If you are a Time Lord, Jedi Master or a Hobbit, we'd prefer a reasonably accurate biological Earth age here if possible or you can just leave it blank... [N]

38. Since we set ourselves up for this one, here is the only frivolous question in this survey.
Are you: [L] A Time Lord, A Jedi Master, A Hobbit, The Watcher, The Kwisatz Haderach, Not as frivolous as people who answer any of the above, Other: [F]

39. What level of formal education do you have? 'Professional or Technical Trade' asks if you are qualified in any specialist trade or profession for which you undertook additional, recognised, formal education to enable you to practice (as examples: an electrician, acupuncturist, mechanic, surveyor, welder, beautician, accountant, carpenter...)
[L] School, University, Postgraduate University, Professional or Technical Trade, Other: [F]

40. How important do you think your life experience and learned skills are compared to your formal education? People continue to learn and develop skills through their lives outside of their career and formal education, these can be very useful in determining what we do with our lives.
[A] Not Important [L10] Very Important [A]

41. What is your main occupation? If you are in more than one category, please select both.
[L] Employed, Self Employed, Retired, Student, Unemployed, Home maker, Volunteering, Other: [F]

42. What job do you normally do, or have you done in the past? [F]

43. If you could pick any job or career at all, what would you pick? [F]

44. How good are you at working with your hands?
Making, fixing and handling things, creative arts and crafts, DIY et. al.
[A] Putting up a picture is a hazardous operation [L10] I could build a space station out of coat hangers and some string [A]

45. Are you happy with how much income you have? This is not a question about how much you actually earn, but more about how you feel about it.
[L] I never have enough money, even for day to day things, I do well enough but a bit more would be helpful, I'm happy with what I have, I'm doing well, I have more than I need, I've got enough that I don't really have to think about it

46. Is there anything else you would like to add about your opinions about Science Fiction & Fantasy? We are very interested in what you have to say about your experience of reading and enjoying Science Fiction and Fantasy in your life and how it may have influenced you. There may be things you want to say about Science Fiction & Fantasy in general. Please write anything else you feel like saying here and write as much or as little as you like. If you would like to have feedback on your comments or participate further in the project, please put your email here the survey is absolutely confidential so we can't contact you otherwise even if you'd like to talk to us some more! [F]

47. How did you discover this survey? This adds information about the link between the what people are interested in and how they find things out.

[L] From a news article, Referred by a friend / colleague, A circular from your organisation / school, From an internet search, A blog, twitter or other social media, Other: [F]

F. THE CORPUS

The collection of magazines used as sources is composed of 4,211 individual issues. Complete runs of all issues are included for the titles marked [C] in Table 12 below. Partial runs of other titles ranged from a minor selection through to near complete series. In the table, for the incomplete series, I have given the publication dates of the first and last issues held and the total number of issues that are included in the digitised corpus over that period. There are some rare and unusual titles alongside those which are more familiar, including high quality fanzines such as *Janus /Aurora* and *On Spec*. Some titles only lasted for a few issues, especially in the boom years of the 1950s, but others endured, and still endure today such as *Analog* and *Fantasy & Science Fiction*. To reflect the open and inclusive nature of the genre, I have included rather than excluded titles – I excluded some on reviewing content that were clearly specialist / niche magazines that lacked any SF content as it would have been classified by the popular definition arising from this project e.g. *Witchcraft & Sorcery*. I have included others that may seem marginal (*Weird Tales*, for instance) because they did include stories that had some relevance. Over time, and for different research applications, the actual numbers of texts being searched has fluctuated as I have refined scope, or chosen to include or exclude certain categories or titles on other criteria. The intention has been to only include texts that are original editions – not reprints, as these would lack the close connection to the cultural period – but for the examination of cover art, which I carried out for "Cities in Flight…" I included book covers and those of magazines that were reprint editions, reasoning that cover art would likely be commissioned at the time, even if the stories were not new. I included one graphic novel magazine series – *Unknown Worlds of Science Fiction* – as the content are illustrated versions of SF stories rather than originating in the comics. Comics were omitted from the scope at the outset, but responses to my first survey indicated some respondents were puzzled by the lack of mention of them in a survey about SF. Consequently, I included comics in questions in the second survey. I could not add comics to the research corpus for reasons of practicality and scope of content. From the practical side, optical character recognition and subsequent text formatting of comic content resists reliable automation, and I lacked a digital corpus to work from – which would have required repeating the

process of sourcing and digitising I had undertaken for magazines. Comics also seemed to fall outside of the purpose of using magazines, as valuable "brand" characters and carefully structured long-running story arcs make comics arguably more likely to be resistant to innovation and novelty than other SF literature.

Table 12.   Magazine issues included in the research corpus

Magazine title and dates between which (inclusive) copies are held ([C]=complete run of publications)	From	To	Issues
A Meritt's Fantasy Magazine 1949 1(1) Dec to 1950 1(3) Apr	1949	1950	3
Aboriginal SF 1986 1(2) Iss 2 Dec to 2001 12(1) Iss 65 Spring	1986	2001	34
Absolute Magnitude 1994 Iss 1 Fall-Winter to 2004 Iss 21 Spring	1994	2004	20
[C]Air Wonder Stories 1929 1(1) Jul to 1930 1(9) Mar	1929	1930	11
Algol 1977 14(1) Iss 27 Winter to 1978 14(2) iss 28 Spring	1977	1978	2
Amazing Stories 1926 1(1) Apr to 1994 68(9) Winter	1926	1994	437
[C]*Amazing Stories* Quarterly 1928 1(1) Winter to 1934 7(2) Fall	1928	1934	22
Amra 1975 Oct to 1976 Apr	1975	1976	2
Analog 1961 66(5) Jan to 2007 127(9) Sep	1961	2007	189
Analog SF & Fact Magazine 2012 Jul-August to 2015 Jan-Feb	2012	2015	19
[C]Argos 1988 Iss 1 Winter to 1988 Iss 3 Summer	1988		3
Asimovs 1977 1(1) Spring to 2015 39(6) Jun	1977	2015	323
Astonishing Stories 1940 1(1) Feb to 1943 4(4) Apr	1940	1943	11
[C]*Astounding* 1930 1(1) Jan to 1960 66(4) Dec	1930	1960	361
[C]Astro Adventures 1987 Iss 1 Jan to 1989 Iss 8 Jun	1987	1989	8
[C]Aurora 7(1) Iss 19 to 10(2) Iss 26	1981	1990	8
Authentic SF Monthly 1951 Iss 16 Dec to 1957 Iss 78 Mar	1951	1957	11
Back Brain Recluse 1990 Iss 15 Spring to 1991 Iss 19 Summer	1990	1991	5
[C]Beyond Fantasy Fiction 1953 1(1) Jul to 1955 2(4) Feb	1953	1955	10
[C]Beyond Infinity 1967 1(1) Nov-Dec	1967		1
Chacal 1977 1(2) Spring	1977		1
[C]Comet 1940 1(1) Dec to 1941 1(5) Jul	1940	1941	5
[C]Cosmic Stories 1941 1(1) Mar to1941 1(3) Jul	1941		3
[C]Cosmos 1953 1(1) Sep to 1954 1(4) Jul	1953	1954	4
Cosmos New Series 1977 1(1) May to 1977 1(4) Nov	1977		4
Dark Horizons 1973 Iss 7 Dec to 2003 Iss 44 Autumn-Winter	1973	2003	15
[C]Destinies 1978 1(1) Nov-Dec to 1981 3(2) Spring	1978	1981	11
[C]Dream World 1957 1(1) Feb to 1957 1(3) Aug	1957		3
[C]Dynamic Science Stories 1939 1(1) Feb to 1939 1(2) Apr-May	1939		2
[C]Dynamic SF 1952 1(1) Dec to 1954 1(6) Jan	1952	1954	6
Extro 1982 1(1) Feb to 1982 1(2) Apr	1982		2
Exuberance Magazine 1991 Iss 2 Winter	1991		1
[C]Famous Fantastic Mysteries 1939 1(1) Sep to 1953 14(4) Jun	1939	1953	81
Famous SF 1967 1(3) Summer to 1968 2(2) Fall	1967	1968	5
Fantastic 1952 1(1) Summer to 1977 26(4) Dec	1952	1977	161

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Fantastic Adventures 1951 13(1) Jan to 1953 15(3) Mar	1951	1953	22
[C]Fantastic Novels 1940 1(1) Jul to 1951 5(1) Jun	1940	1951	25
Fantastic SF 1952 1(1) Aug	1952		1
Fantastic Story 1951 2(1) Winter to 1955 8(2) Spring	1951	1955	14
Fantastic Story Quarterly 1950 1(1) Spring to 1951 2(2) Spring	1950	1951	3
Fantastic Universe 1953 1(1) Jul to 1960 12(5) Mar	1953	1960	54
Fantasy 1946 1(1) Dec	1946		1
Fantasy and SF 1949 1(1) Fall to Fantasy and SF 1996 91(1) Jul	1949	1996	421
Fantasy and SF 2008 114(1) Jan	2008		1
[C]Fantasy Book 1947 1(1) to Fantasy Book 1951 2(2)	1947	1951	8
Fantasy Crossroads 1978 Iss 14 Sep	1978		1
[C]Fantasy Fiction 1950 1(1) May to 1953 1(4) Nov	1953		5
Fantasy Macabre 1980 Iss 1 Sep to 1990 Iss 13	1980	1990	2
Fantasy Stories 1950 1(2) Nov	1950		1
Fantasy Tales 1978 2(3) Summer to 1991 3(4) Winter	1978	1991	15
Fantasy Tales New Series 1988 10(1) Autumn to 1991 12(6) Spring	1988	1991	5
[C]Far Frontiers 1985 Iss 1 Spring to 1986 Iss 7 Winter	1985	1986	7
Far Point 1992 Iss 2 Jan-Feb	1992		1
Fiction 1966 Iss 155 Oct	1996		1
Forgotten Fantasy 1970 Oct	1970		1
Future Life 1981 May	1981		1
Future New Series 1970 Iss 7 Jan	1970		1
Future SF 1939 1(1) Nov to 1960 Iss 47 Feb	1939	1960	36
[C]Futuria Fantasia 1939 1(1) Summer to 1941 1(4) Spring	1939	1941	4
[C]Galaxy 1950 1(1) Oct to Galaxy 1980 40(1) Jul	1950	1980	253
[C]Galaxy 2nd Series 1994 1(1) Jan to 1995 2(2) Mar	1994	1995	8
[C]Galileo 1976 Iss 1 Sep to 1980 Iss 16 Jan	1976	1980	15
[C]Gamma 1963 1(1) Jul to 1965 2(5) Sep	1963	1965	5
Great SF 1966 Iss 2 Mar to 1968 Iss 10 Spring	1966	1968	5
Harsh Mistress 1994 Iss 2 Spring-Summer	1994		1
[C]If 1952 1(1) March to 1986 23(1) Sep-Nov (Worlds of If)	1952	1986	176
If Magazine Best SF Anthology 1950 Oct	1950		1
[C]Imagination 1950 1(1) Dec to 1958 9(5) Dec	1950	1958	63
Imaginative Tales 1955 1(3) Jan to 1958 5(3) May	1955	1958	16
[C]Impulse 1966 1(1) Mar to 1967 1(12) Feb	1966	1967	12
[C]Infinity 1955 1(1) Nov to 1958 4(2) Nov	1955	1958	20
[C]International SF 1967 1(1) Nov to 1968 1(2) Jun	1967	1968	2
Interzone 1982 1(3) Autumn to 2011 Iss 234 May-June	1982	2011	73
[C]Janus 1(1) Iss 1 to Janus 6(2) Iss 18 [Fanzine: became Aurora]	1975	1980	17
Lost Fantasies Iss 7 (1938 original – reprinted in 1977)	1938		
Magazine of Horror 1971 Apr	1971		1
Marion Zimmer Bradley Fantasy Magazine 2000 Iss 48	2000		1
Marvel Science Stories 1938 1(1) Aug to 1951 3(2)	1938	1951	8
Marvel SF 1951 3(4) Aug to 1952 3(6)	1951	1952	3
Marvel Stories 1941 2(3)	1941		1
Marvel Tales 1939 Dec to 1940 May	1939	1940	2
Midnight Graffiti 1989 Iss 4 Fall to 1990 Iss 5 Spring	1989	1990	2

Nebula 1952 Iss 1 Autumn to 1959 Iss 41 Jun	1952	1959	31
[C]New Destinies 1987 Iss 1 Spring to 1990 Iss 9 Fall	1987	1990	8
New Worlds 1946 1 No 1 Jul to 1970 No 200 Apr	1946	1970	130
New Worlds Savoy Manchester 1979 No 215 Spring	1979		1
New Writings in SF 1964 Iss 1 May to 1972 Iss 21	1964	1972	11
Night Cry 1986 Summer to 1986 Winter	1986		2
[C]Odyssey 1976 1(1) Spring to 1976 1(2) Summer	1976		2
[C]Omni 1978 1(1) Oct to 1995 17(9) Winter	1978	1995	198
On Spec Pig Writers Society 1989 1(2) Fall to 1996 8(4) Winter	1989	1996	5
[C]Orbit SF 1953 1(1) Sep to 1954 1(5) Nov-Dec	1953	1954	6
[C]Other Worlds 1949 1(1) Iss 9 Jan to 1957 Iss 21(42) Mar	1949	1957	43
[C]Out of This World Adventures 1950 Iss 1 to 1950 Iss 2	1950		2
Pirate Writings 1994 2(2) Summer	1994		1
Planet Stories 1939 1(1) Nov to 1955 6(11) Summer	1939	1955	35
Questar SF Fantasy Adventure 1980 2(3) Jun	1980		1
Riverside Quarterly 1967 2(4)	1967		1
[C]Rocket Stories 1953 1(1) Apr to 1953 1(3) Sep	1953		1
[C]Satellite 1956 1(1) Oct to 1959 3(6) May	1956	1959	18
Saturn 1957 1(1) Mar to 1957 1(4) Oct	1957		3
Science Fantasy 1950 1(1) Summer to 1966 24(81) Feb	1950	1966	36
[C]Science Stories 1953 Iss 1 Oct to 1954 Iss 4 Apr	1953	1954	4
Science Wonder Quarterly 1929 Fall to 1930 Winter	1929	1930	3
[C]Science Wonder Stories 1929 1(2) Jul to 1930 May	1929	1930	12
[C]SciFi Entertainment 1994 1(1) Jun to 1997 4(1) Jun	1974	1997	19
SF 1939 1(1) Mar to SF 1941 2(4) Mar	1939	1941	3
SF Adventure Classics 1967 Iss 1 Summer to 1974 Iss 32 Sep	1967	1974	27
SF Adventures (UK) 1958 No 2 May to 1963 No 30 Jan	1958	1963	6
SF Adventures New Series 1956 1(1) Dec to 1958 2(6) Jun	1956	1958	5
[C]SF Adventures (US) 1952 1(1) Nov to 1954 2(3) May	1952	1954	9
[C]SF Age 1992 1(1) Nov to 2000 8(4) May	1992	2000	46
SF Chronicle 2005 28(2) Feb	2005		1
[C]SF Plus 1953 1(1) Mar to 1953 1(7) Dec	1953	1953	7
SF Review 1975 Iss 15 Nov to 1976 Iss 17 May	1975	1976	2
[C]SF Stories 1953 Iss 1	1953		1
Shock 1960 1(1) May	1960		1
[C]Space SF 1952 1(1) May to 1953 2(2) Sep	1952	1953	8
Space SF New Series 1957 1(1) Spring to 1957 1(2) Aug	1957		2
Space Stories 1953 Apr	1953		1
Space Travel 1958 5(4) Jul to 1958 5(6) Nov	1958		3
Space Wars 1978 2(5) Dec	1978		1
[C]Spacemen 1961 Iss 1 Jul to 1964 Iss 8 Jun	1961	1964	8
Spacemen Yearbook 1965	1965		1
Spaceway 1953 Dec to 1969 Jan	1953	1969	2
[C]Star SF Magazine 1958 Jan	1958		1
Starburst SF in Film TV and Comics 1978 Iss 1 Jan to 1984 Iss 67 Mar	1978	1984	6
Starlog Film and TV 1976 Aug Iss 1 to 1994 Mar Iss 200	1976	1994	29

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Startling Mystery Stories 1966 1(1) Summer to 1970 3(5) Fall	1966	1970	11
Startling Stories 1939 1(1) Jan to 1952 Dec	1939	1952	8
Startling Stories New Zealand Edition 1953 Sep	1953		1
[C]Strange Adventures 1946 1(1) Nov to 1947 1(2) Feb	1946	1947	2
Terran Trade Authority 1978 Iss 1 to 1980 Iss 4	1978	1980	4
The Dragon 1976 1(1) Jun to 1977 2(4) Oct	1976	1977	2
[C]The Gate 1989 Iss 1 to 1990 Iss 3 Dec	1989	1990	3
The New York Review of SF Apr 1989 to Sep 2004	1989	2004	65
Thrilling Wonder Stories 1936 8(1) Aug to 1955 44(3) Winter	1936	1955	80
Thrills Incorporated 1952 Iss 23 Jun	1952		1
Twilight Zone Magazine 1988 Feb	1988		1
Unearth 1977 1(1) Winter to 1978 2(3) Summer	1977	1978	3
[C]Universe 1953 Iss 1 Jun to 1955 Iss 10 Mar	1953	1955	10
Universe Anthology 1976 Jun	1976		1
[C]Unknown 1939 1(1) Mar to 1943 7(3) Oct	1939	1943	39
Unknown British Ed 1939 2(3) Nov	1939		1
Unknown Worlds of SF 1975 Iss 1 Jan to 1975 Iss 5 Sep (graphic)	1975		4
Unknown Worlds of SF Special 1976 Iss 1 (graphic)	1976		1
[C]Vanguard 1958 1(1) Jun	1958		1
Venture SF 1957 1(1) Jan to 1970 4(3) Aug	1957	1970	16
[C]Vortex 1977 1(1) Jan to 1977 1(5) May	1977	1977	4
[C]Vortex SF 1953 1(1) to 1953 1(2)	1953	1953	2
Weird Tales 1928 12(6) Dec to 1948 40(5) Jul	1928	1948	4
Weird Tales Canadian Ed 1947 38(4) May	1947		1
[C]Wonder Stories 1930 2(1) Jun to 1936 7(8) Mar-April	1930	1936	65
[C]Wonder Story Annual 1950 1(1) to 1953 2(1)	1950	1953	4
[C]Worlds Beyond 1950 1(1) Dec to 1951 1(3) Feb	1950	1951	3
[C]Worlds of Fantasy 1968 1(1) Sep to 1971 1(4) Spring	1968	1971	4
[C]Worlds of Tomorrow 1963 1(1) Apr to 1971 5(3) Spring	1963	1971	26
Total number of indexed issues in corpus text database			4211

G. TEXT PROCESSING

Fiction printed on wood pulp is truly ephemeral, in structure as well as content – the poor quality of the chemically active pulp paper stock combined with the oil-based inks gradually destroys the integrity of the pages. Early pulp editions from the 1920s and 1930s are hard to find in good condition. Old pulp issues tend to crumble to dust on contact, as the books do in George Pal's 1960 film of Wells' *The Time Machine* when Rod Taylor sweeps them from the shelves of the Eloi city, infuriated by their state of neglect. This makes collecting pulp fiction problematic, as it is expected that your collection is going to disintegrate, possibly during your own lifetime, and reduces the availability of copies for research – especially ones that are in good enough condition to be photographed or scanned without doing them irrevocable damage. Added to this there is the problem that the diffusion of the fuel-oil ink through the porous paper gradually blurs the text to the point that OCR becomes impossibly inaccurate. The process I used to convert digitised print copies to text files of sufficient quality to be useful follows several stages. The Apple Automation app provides a convenient method for creating service and workflow scripts which enable the use of modular elements, scripts and expressions to manipulate and modify files and folders. The preparation for the workflow here requires that the texts have already been scanned or photographed, and a folder has been made for each issue containing one image file for each page, consecutively numbered so that they can be sorted. The name of the folder will be the name applied to the final pdf of all the images, so this should be suitable (i.e. include suitable information on publication, year, volume, issue number, and date) for the issue being assembled. A combination of standard Automator features with those built into Adobe Acrobat Pro are sufficient to enable all the transformations required to go from scanned magazines to indexed digital texts with only very minor scripting required, and this only to facilitate the automation. It is possible if there only a small number of texts to carry out all the tasks using a combination of Adobe Acrobat and Automator, but it would require additional manual steps in moving and renaming files and folders. For the purpose of my research this was not practical due to the volume of magazine issues, but

for a corpus of a few hundred texts it could be achieved relatively quickly without any additional scripting knowledge.
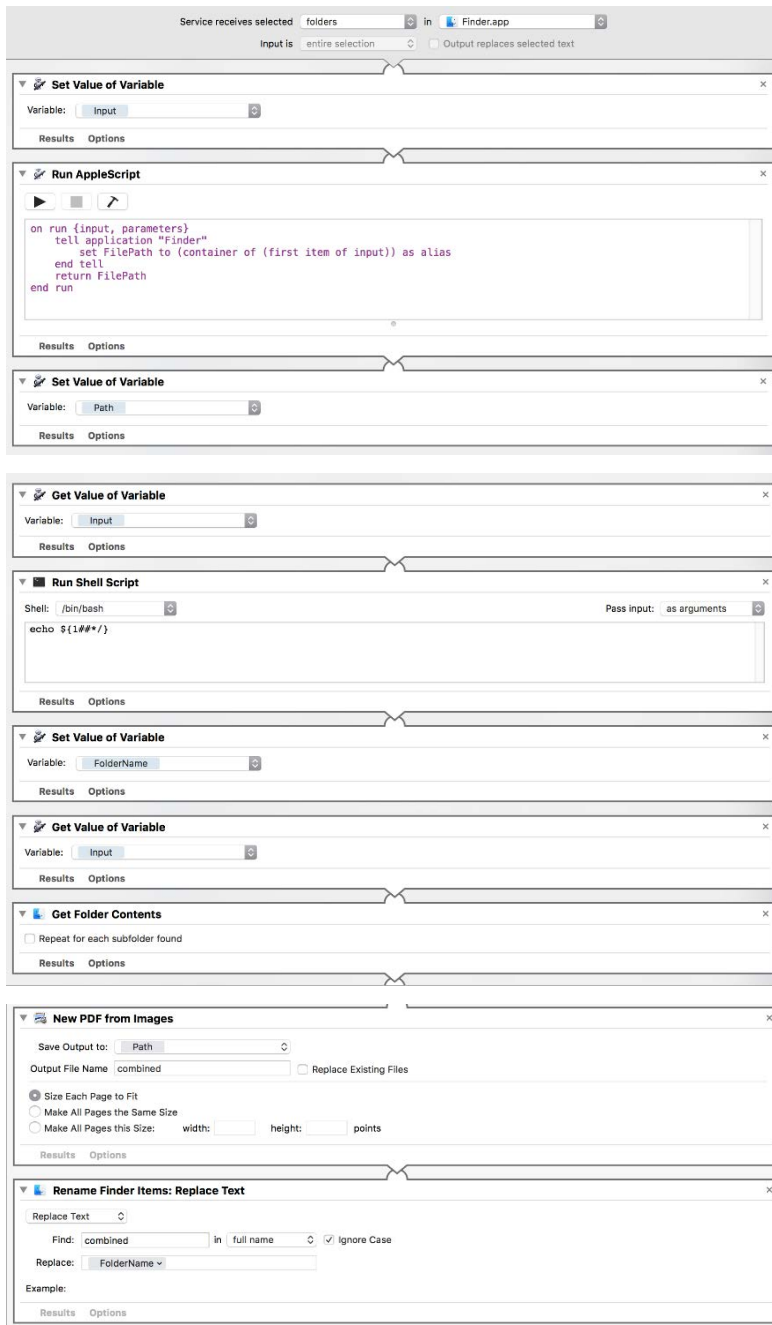
Fig. 53.   Combine folder of images to create PDF file
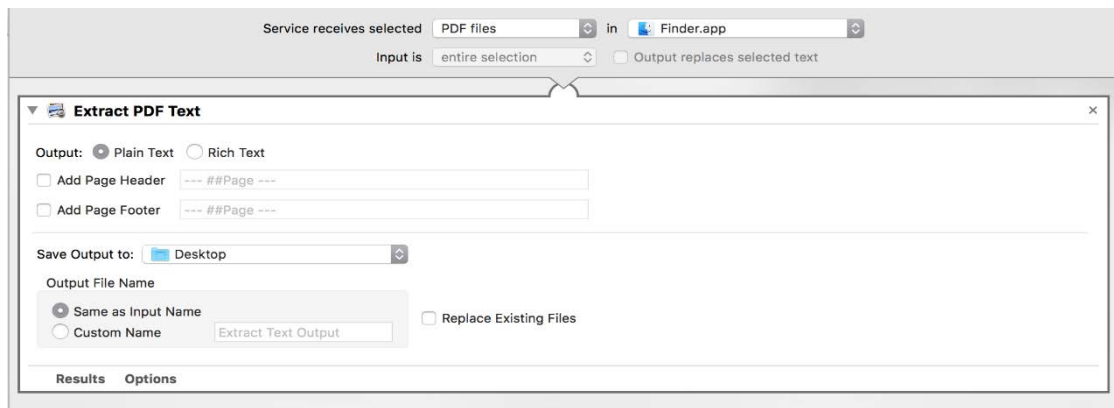
Fig. 54. Extract the text content from a pdf file

The workflow for the text processing undertaken for this study was as follows:

1. Creating an Adobe Acrobat pdf file from a folder of individual JPG images of the digitally scanned pages of text for each individual edition. Naming each file with the volume, number and date of publication (Fig. 54).

2. Passing the resulting pdf files (one for each edition) to Adobe Acrobat X Professional for Optical Character Recognition (OCR) using the built-in function of Acrobat for this purpose, as well as the batch-processing capability of Acrobat to accept multiple files at a time for OCR, saving the recognised text back into the original PDF file.

3. Extracting the OCR text from each individual converted PDF and saving it as individual text-only files with the same names as the original PDFs (the names of each edition). This utilises a standard building block of the Apple Automator inbuilt scripts for manipulation of pdf files.

The Apple Automator.app was employed to carry out 1 and 3. Action 2 is entirely carried out by batch processing using the inbuilt functions of Adobe Acrobat and requires no additional scripting.

Reservations

I found that the accuracy of text searching using NVivo was not improved by stripping anomalies from the OCR text, "nonsense words" and irrelevant characters were not returned by the search. The only performance gain from stripping anomalies, rather than simply converting images to text and saving the resulting files for processing in a readily accessible format, was to improve human readability of the files. As pdf or hard copies of the original magazines were available for consultation, it was not necessary to remove artefacts of the OCR process from the text files. This step is therefore unnecessary, and the process of converting page images to readable, catalogued text files does not require it. For thematic study, the original digitised PDF files or hard copies were used as the source material when proceeding to content analysis following the search. The purpose of NVivo searches of the text versions was to identify which copies to subject to detailed examination. One form of quantitative text analysis which is assisted by the removal of anomalies is word frequency. As each anomaly is recognised as a "word" by the software, word frequency analysis returns a number of "words" that is considerably larger when applied to untreated text files than when applied to files that have had anomalies removed. This was not a significant issue, however, as any word frequency search would return over a million words, the majority of which had only one occurrence and could easily be filtered out on the basis of this criteria.