

Breaking Disciplinary Boundaries: Heroism Studies and Contemporary Research Practices

Olivia Efthimiou
Murdoch University

This article explores story and science as products of human cultures, imagination, and innovation, using the recent emergence of heroism research as a case study. Drawing on in-depth interviews with experts in the field of heroism studies and beyond, the paper investigates interdisciplinary perspectives on heroism, and explores synergies between language used in the biological sciences and the hero's journey story arc. Story and metaphor are found to be important methodological tools in participants' contemporary research practices. The hero's journey, in particular, emerges as an interpretive apparatus that can inform interdisciplinary, novel and creative research practices, and facilitate the breakdown of increasingly dissolving disciplinary boundaries. The compatibility of narratives of heroism and biology indicated in this qualitative study is a promising platform for re-introducing diverse ways of knowing and ameliorating the split between competing knowledge cultures in contemporary scholarship.

Background and Aims

There has been increasing recognition of the role of interdisciplinarity in education and research.¹ The 21st century has marked a shift in research trends across a number of disciplines, especially due to the increasing relevance of technologies in our daily lives, and the demand for more complex and creative ways of thinking about our world. In particular, the focus in the sciences, psychology, and the social sciences which have traditionally concentrated on the study of disease, evil, maladaptive, and irrational behaviours, is now moving towards understanding positive behaviours and promoting personal and collective wellbeing. This has signalled an unprecedented rise in the study of such fields as resilience, flow, spirituality, sustainability, leadership, faith, and many more.

More recently, the academic community has witnessed a resurgence in the study of heroism. Heroism and heroic individuals represent the pinnacle of humanity – what we can become, do, and experience. This has resulted in the beginnings of a science of heroism.² But, as researchers are discovering, decoding the heroic process, its antecedents, and impacts is far from simple. The emerging field of 'heroism science' seeks to uncover the many complex layers of this state of human consciousness which has fascinated us since the dawn of humankind, as we look to the future in both awe and fear of what we might achieve.³

¹ R. Frodeman, J.T. Klein and C. Mitcham (eds.), *The Oxford Handbook of Interdisciplinarity*, Oxford, Oxford University Press, 2012.

² S.T. Allison, G.R. Goethals, and R.M. Kramer, 'Introduction: Setting the Scene: The Rise and Coalescence of Heroism Science', in Allison, S.T., Goethals, G.R., and Kramer, R.M. (eds.), *Handbook of Heroism and Heroic Leadership*, New York, Routledge, 2017, pp. 1-16.

³ Allison, Goethals, and Kramer, pp. 1-16.

What is heroism? A recent study finds that ‘the definition of what it means to be a hero has changed over time’.⁴ Highlighting the elusiveness of the concept, Harrison Weinstein states that ‘The lack of an accepted standard definition is a major hurdle’.⁵ Leading studies agree that heroism can vary significantly in context, type, and degree, pointing to the wide range of its contemporary manifestations.⁶ However, research seems to converge on the notion that heroism manifests in the presence of a moral, mental, and/or physical challenge, calling the individual to rise to it, which culminates in some form of psychological, spiritual, physical, and/or social transformation.⁷

Constituting the heroic as a deeply transformative process was first conceptualised by celebrated mythologist Joseph Campbell. His cross-cultural comparative analysis evidenced a common pattern in heroic narratives, regardless of local and period manifestations, the hero’s journey.⁸ The model details the discreet stages that a hero undergoes in order to achieve hero status. The heroic journey commences with a call to adventure (which can be heeded or denied initially) demanding a physical and emotional departure from the protagonist’s reality. An initiation into an extra-ordinary and unknown world ensues, followed by rites of passage, the discovery of a boon, and the return to the ordinary world, resulting in a deep personal transformation and gift to society. The concept of transformation is interdisciplinary at its core with its application across diverse areas and professions in the humanities and the sciences, such as nursing, education, and psychology—this conceptualisation lends itself readily to an interdisciplinary analysis of heroism as transformative.⁹

The need to tackle real-world problems has been a propellant that has resulted in the congregation and fusion of various disciplines under the common platform of heroism. Wolfgang Krohn states that ‘Whatever drives people into highly complex interdisciplinary projects...the need for manageable objects and presentable results in their reference community drives them out again’.¹⁰ But the implication of certain other factors drives such research a step further:

If...public and political concerns are strong enough to exert a more permanent pressure, the difficult process of discovering and shaping the components of a complex problem can continue and generate a complex field

⁴ E.L. Kinsella, T.D. Ritchie, and E.R. Igou, ‘UL Research Highlights the Importance of Heroism in Everyday Life’, <http://www.ul.ie/news-centre/news/ul-research-highlights-the-importance-of-heroism-in-everyday-life>, 2012, (accessed 25 July 2015)

⁵ H. Weinstein, *Beyond Courage: The Psychology of Heroism*, PhD Thesis, Palo Alto University, 2013, p. 2.

⁶ Z.E Franco, K. Blau, and P.G. Zimbardo, ‘Heroism: A Conceptual Analysis and Differentiation between Heroic Action and Altruism’, *Review of General Psychology*, vol. 15, no. 2, 2011, pp. 99-113; G.R. Goethals and S.T. Allison, ‘Making Heroes: The Construction of Courage, Competence and Virtue’, *Advances in Experimental Social Psychology*, vol. 46, pp. 183-235; E.L. Kinsella, T.D. Ritchie, and E.R. Igou, ‘Attributes and Applications of Heroes: A Brief History of Lay and Academic Perspectives’, in Allison, S.T., Goethals, G.R., and Kramer, R.M. (eds.), *Handbook of Heroism and Heroic Leadership*, New York, Routledge, 2017, pp. 19-35.

⁷ S.T. Allison and G.R. Goethals, ‘The Hero’s Transformation’, in Allison, S.T., Goethals, G.R., and Kramer, R.M. (eds.), *Handbook of Heroism and Heroic Leadership*, New York, Routledge, 2017, pp. 379-400.

⁸ J. Campbell, *The Hero with a Thousand Faces*, Princeton, Princeton University Press, 1949.

⁹ G.H. Wade, ‘A Concept Analysis of Personal Transformation’, *Journal of Advanced Nursing*, vol. 28, no. 4, 1998, pp. 713-719.

¹⁰ W. Krohn, ‘Interdisciplinary Cases and Disciplinary Knowledge’, in Frodeman, R., Klein, J.T., and Mitcham, C. (eds.), *The Oxford Handbook of Interdisciplinarity*, Oxford, Oxford University Press, 2012, p. 32.

of interactive interdisciplinary research. The problem, thereby, turns into a case.¹¹

The complex problem of heroism has generated the complex interdisciplinary field of heroism science, thereby becoming a *case*.

The purpose of this article is to examine the role of heroism as a case study for interdisciplinarity and transformative enquiry through the breakdown of disciplinary boundaries, based on a qualitative pilot study examining interdisciplinary perspectives on heroism. The purpose of this study was to develop a deeper understanding of the complex nature of heroism as a phenomenon that continues to be relevant in the 21st century, and evaluate its importance across the humanities, psychology, and the sciences. It aimed to provide an outline of synergies between disparate fields, whether explicit or implicit, in the momentum that is presently building in the study of heroism, which best capture novel and innovative interpretations and linkages of the phenomenon. Therefore, the multiplicity of more 'traditional' definitions and contexts of heroism in specific literary works of fiction or films, ancient history, philosophy, classics, ethics, and other such areas will not be addressed.

A core objective of this work is to highlight both culture and science as narratives, and how their joint reading can illuminate our understanding of heroism, and the production of knowledge. It aims to explore how the hero's journey, metaphor, and story, broadly, are tools for conducting and interpreting research for scholars and educators across a range of disciplines in the humanities and the (biological) sciences, facilitating creativity and innovation.

In-depth interviews with 12 experts from the following disciplines were conducted: positive psychology, social psychology, digital humanities, education, leadership, integral studies, workforce studies, evolutionary biology, and genomics. These were specifically selected as they represent areas in which key studies on heroism are taking place. The interviews were an opportunity for experts to critically reflect on their own research and education practices, and draw out commonalities between disciplines and different perspectives. These commonalities were most apparent in the way researchers used stories and metaphors to explain their perspectives; participants were specifically questioned on their use of story and metaphor in their work. In particular, scientists interviewed were asked if they consider themselves to be storytellers, and in what ways they think scientists tell stories.

To preserve the anonymity of participants in compliance with the study's ethics conditions, first-name pseudonyms have been used in this article (indicated in quotations), with only the areas of expertise disclosed. In instances where a participant referred to specific research projects during the interview which might identify them, this information has also been removed.

I will discuss participants' responses in the context of the 'two cultures' debate, in which the sciences and the humanities are considered distinct areas of knowledge.¹² First, I will briefly introduce this debate. I will then present responses that demonstrate the value of story and metaphor in the way in which participants conduct research. Third, I look at how the hero's journey metaphor is used as a vehicle for interpreting our world, our biology, and

¹¹ Krohn, p. 32.

¹² C.P. Snow, *The Two Cultures and the Scientific Revolution*, Cambridge, Cambridge University Press, 1959.

our evolution. Fourth, I discuss a key outcome of the study that the hero's journey as a mode of enquiry can serve as a bridge in the development of a story-driven science, and research practices more broadly. The article concludes with proposed future directions and a discussion on how the study of heroism can help with promoting science as storytelling that is in service of humanity and more robust research practices. Developing research practices that are committed to shared histories, collaborative dialogue, open knowledge exchange, and creative problem-solving stands to be of great value, by promoting positive transformative change in the researcher, their institution, and the broader community as benefactors of the research.

An Artificial Line? Humanities/Sciences and the Two Cultures Debate

There is clearly great diversity within the humanities and the sciences, with much research operating within unclear boundaries, and showing a breakdown in traditional disciplinary norms that is characteristic of postmodern thought. Emerging research is revealing how literature and rhetoric were important in the rise of the scientific revolution and naturalism; this cultural revolution was marked by complex and at times competing social dynamics and philosophies.¹³ This reveals science as generating its own unique culture(s), denoting the value of an interdisciplinary approach to the study of science and story.

Such milestones have been instrumental in advancing the view that 'elevating science above other forms of knowledge is untenable on a foundational level'.¹⁴ Known as the 'father of sociobiology', noted biologist Edward Wilson has addressed emerging evidence for the convergence of disciplinary fields in the presentation of his 'consilience program'.¹⁵ Wilson proposes that the 'key to bridge-building is the discovery and analysis of human nature, which consists of the epigenetic rules—the hereditary regularities in mental development', in which culture and biology share an equal footing, and offers examples such as incest avoidance and aesthetic judgment.¹⁶ Nonetheless, Snow's landmark lecture which fuelled a heated debate on the two cultures of the sciences and the humanities continues to this day—Snow's work addressed the dangers that we stand to face as a result of this divide, including the pressing problem of science advancing at an exponential rate at the expense of human rights, resulting in inequities between first-world countries and developing nations.¹⁷ Scholars maintain that this divide is still very real.¹⁸ There has been increasing unification *within* the sciences, but not *between* 'conflicting' disciplinary groups such as the humanities and the sciences. Hence, some boundaries have gradually dissolved but others remain.¹⁹

¹³ J. Cummins and D. Burchell, 'Ways of Knowing: Conversations between Science, Literature, and Rhetoric', in Cummins, J. and Burchell, D. (eds.), *Science, Literature and Rhetoric in Early Modern England*, New York, Routledge, 2007, pp. 1-12.

¹⁴ B.R. Cohen, 'Science and Humanities: Across Two Cultures and Into Science Studies', *Endeavour*, vol. 25, no. 1, 2001, p. 10.

¹⁵ E.O. Wilson, 'How to Unify Knowledge. Keynote Address', *Annals of the New York Academy of Sciences*, New York Academy of Sciences, 2001, pp. 12-17.

¹⁶ Wilson, pp. 12, 15-16.

¹⁷ Snow, *The Two Cultures and the Scientific Revolution*, as cited in I. de Melo-Martín, 'The Two Cultures: An Introduction and Assessment', *Technology in Society*, vol. 32, no. 1, 2010, pp. 5-9.

¹⁸ D.P. Barash, 'CP Snow: Bridging the Two-Cultures Divide', *The Chronicle Review*, vol. 52, no. 14, 2005, p. B10.

¹⁹ Wilson, 'How to Unify Knowledge', pp. 12-13.

For the purposes of this article, the sciences and the humanities are postulated as two competing disciplinary clusters, in order to more easily examine the theoretical debate of their continuing division. By *sciences*, I refer to disciplines that are traditionally driven by verifying 'fact' and 'truth' through precise objective methods, observation, measurement, and quantification, followed by a detailed and precise analysis and discussion of the findings. By *humanities*, I refer to disciplines that are traditionally occupied with the observation of the world through subjective experience, qualitative methods, narrative, imagination, creativity, and the communication of these findings through more interactive and creative channels (for example, drama, image, poetry).

Given the roots of heroism both in stories of human greatness and human evolution, heroism was anticipated to be an ideal field of study to make an enquiry into the value of narrative across the knowledge cultures of the humanities and the sciences, and how contemporary heroism studies may facilitate the breakdown of the perceived boundaries between the two cultures.²⁰ As a means of examining the two cultures debate and its application to the study of heroism, interviews aimed to identify: (a) how participants viewed the broad psychological, spiritual, social, and biological impacts of heroism; (b) commonalities in the way different disciplines talk about heroism, science, story, and metaphor; and (c) how researchers today across different universities, settings, and disciplines view interdisciplinary research and its value, and if they are already undertaking such work.

The Hero's Journey, Story, Metaphor, and Human Evolution

This study revealed links between the way participants think about biology and culture, not only in their interpretation of heroism but the way they conduct research. The hero's journey as a narrative structure is discussed in relation to biological processes. Researchers interviewed in the study used story as a means of describing and understanding their own bodies at the cellular level.

This section will first consider the link between evolution, scientific discoveries, the hero's journey, and story more broadly, and then the use of metaphor and storytelling in scientists' practices more explicitly.

Culture, Storytelling, Biology, and the Hero's Journey

The hero archetype is firmly embedded in deep time.²¹ Popular constructions of heroism are being generated and shaped at a rapid pace across a range of media forms. This persistence of the hero archetype and its cultural tropes is obvious in oral and written hero traditions. Heroism is either explicitly or implicitly invoked in television cultural products such as

²⁰ S.T Allison and G.R. Goethals, ' "Now he Belongs to the Ages": The Heroic Leadership Dynamic and Deep Narratives of Greatness', in Goethals, G.R., Allison, S.T., Kramer, R.M., and Messick, D.M. (eds.), *Conceptions of Leadership: Enduring Ideas and Emerging Insights*, New York, Palgrave Macmillan, 2014, pp. 167-183; Campbell, *The Hero with a Thousand Faces*; S. Kafashan, A. Sparks, A. Rotella, and P. Barclay, 'Why Heroism Exists: Evolutionary Perspectives on Extreme Helping', in Allison, S.T., Goethals, G.R., and Kramer, R.M. (eds.), *Handbook of Heroism and Heroic Leadership*, New York, Routledge, 2017, pp. 36-57; H. Rusch, J.M. Leunissen and M. van Vugt, 'Historical and Experimental Evidence of Sexual Selection for War Heroism', *Evolution and Human Behavior*, vol. 36, no. 5, 2015, pp. 367-373; O. Smirnov et al., 'Ancestral War and the Evolutionary Origins of "Heroism" ', *The Journal of Politics*, vol. 69, no. 4, 2007, pp. 927-940.

²¹ Allison and Goethals, pp. 167-183.

reality shows, news commentaries, and documentaries. Popular current affair shows such as '60 Minutes', 'Sunday Night', and 'A Current Affair' frequently feature inspiring stories of men, women, and children who overcome adversity. For example, in the reality TV show 'The Hero' men and women compete against each other to be crowned a hero, in episodes aptly titled 'Courage', 'Endurance', 'Heart', and 'Sacrifice'. The media undeniably play a critical role in publicising and celebrating heroic acts, resulting in the production of a common cultural knowledge base of heroism and hero stories.

All participants interviewed were asked to consider how story is important to both the hero's journey and science, and why heroism and story are closely tied together with the history of human evolution. 'Nyles', an expert in heroism, argues that hero stories expand and transform our consciousness; 'the first stories are hero stories' which 'have retained their value over millennia'. They 'keep us all moving forward as a species', he adds. This is cited as being the case in Western epic tales such as the Bible and the Iliad. 'Nyles' observes that storytelling cannot be separated from the hero's journey, arguing that the hero's journey has a 'deep connection with evolution'.

The study revealed a link between culture and biology in the space of heroism. Participants were asked to share their thoughts on the ongoing impact of Campbell's legacy and the hero's journey in the emerging field of heroism science, and science more broadly. 'Nyles' comments: 'the hero's journey...is a *blueprint* for how life *could* be led and how it *should* be led. It's an all-encompassing paradigm for growth, for evolution, for transformation'. In this sense, the hero's journey is regarded as an evolutionary model of the cultural production of our knowledge and its communication through oral and written stories.

Similarly, 'Susan', an expert in digital humanities, offers a poetic description of the value of story by considering narrative and biology as equally vital to lived experience. 'Susan' views story as fundamental to humanity and embodied experience:

story is communication...from the moment that we're conceived and we have a heartbeat, and we have ears that are hearing our mother's heartbeat; so we have a story going on and being told to us...as a sensory being.

If 'story is told through our whole sensory being', according to 'Susan', we can argue that a 'bioepistemology' of story which draws on the fields of 'evolutionary psychology, the philosophy of science, and cognitive psychology' to illuminate its complexities is warranted.²² This approach suggests the investigation of a 'new humanism' based on a 'bioepistemological perspective, [that] reconnects literature with human life through scientific insight'.²³ Story thus becomes just as indispensable to science, as does science to story, promising new insights into the consilience program of the humanities and the sciences (at least the biological).

A story-based approach to science can refuel the imagination, and add creativity and clear theoretical frameworks to the process of enquiry. 'Eddie', an expert in global health genomics, supports the vital role that fiction plays and therefore the importance of establishing a multi-disciplinary team when conducting scientific research: 'fictions...drive

²² N. Easterlin, 'Making Knowledge: Bioepistemology and the Foundations of Literary Theory', *Mosaic: A Journal for the Interdisciplinary Study of Literature*, vol. 32, no. 1, 1999, p. 131.

²³ Easterlin, p. 131.

science somehow'. Barry Bickmore and David Grandy concur: 'the real essence of science is *storytelling*—creatively making up stories to *explain* what we observe in the natural world'.²⁴ Both 'Eddie' and 'Susan' agree that these fictions are usually ahead of their time, and ahead of the science. Evidence-based research in traditional science, 'Eddie' asserts, is 'somehow...too late'. A healthy imagination is cited as a critical forerunner to this process; as 'Eddie' states, 'without the imagination you do not have a breakthrough. That is the start of innovation'. This echoes Frank Kermode's view that the imagination is central to telling fresh stories of science.²⁵ As an example, 'Eddie' recalls the discovery of the ring structure of benzene in organic chemistry by German chemist Friedrich August Kekulé which appeared to him as a vision or daydream. On the other hand, traditional scientific methodologies can fill the gap of objective measures often neglected by a story-driven approach. The combined strengths of this approach can achieve the goal of a science that contributes to culture by providing stories that serve 'as a *supportive nexus* for human storytelling in general'.²⁶

This evolutionary link between science and story is further noted by 'Felicity', an expert in positive psychology: 'story helps explain our story of species...[and] human nature'; it is a cultural expression of our adaptiveness as a species. She refers to the most frequently used visual metaphor to represent resilience: a seedling growing out of inhospitable conditions, peering out of dry cracked earth. Another Eastern inspired metaphor similarly pictures a tree with its roots growing out of a rock. These visual metaphors mirror the capacity of a species and nature to 'survive, and thrive, and grow', according to 'Felicity'.

These simple metaphors and visual stories are equally a representation of the hero's journey and hero stories, as they are of evolution and adaptation, and knowledge-gaining itself.²⁷ Adaptiveness implies that there is something stopping growth and a fundamental obstacle present; this is a hallmark of both hero stories and the story of human evolution. Adversity, risk, sacrifice, and a resulting irreversible transformation are all as essential for heroism to take root and grow, as they are in these visual metaphors of the evolution of life.²⁸ Misia Landau illustrates how the hero's journey and its various stages as a narrative structure can be applied to the Darwinian and most influential post-Darwinian evolutionary theories.²⁹ Each translation of an evolutionary scientific theory into a hero narrative is a variation on the basic narrative structure. These metaphors are a reflection of the paradox of life, so central to hero stories and human understanding, that life exists despite all odds.³⁰

Metaphor in Science; Science as Metaphor

Participants were asked how important they think metaphor is to the heroic experience, and if they use metaphor in their own work. Metaphor features prominently as a core aspect of the work of our participants. Anne Dalke, Paul Grobstein, and Elizabeth McCormack argue

²⁴ B.R. Bickmore and D.A. Grandy, 'Science as Storytelling', http://blogs.evergreen.edu/cpat/files/2013/04/scienceAsStory4_2.pdf, 2007, p. 13 (accessed 25 March 2015).

²⁵ F. Kermode, *The Sense of an Ending*, Oxford, Oxford University Press, 1967.

²⁶ P. Grobstein, 'Revisiting Science in Culture: Science as Story Telling and Story Revising', *Journal of Research Practice*, vol. 1, no. 1, article M1, 2005, p. 14.

²⁷ Allison and Goethals, ' "Now he Belongs to the Ages" ', p. 171.

²⁸ S.T. Allison and G.R. Goethals, 'Hero Worship: The Elevation of the Human Spirit', *Journal for the Theory of Social Behaviour*, vol. 46, no. 2, 2016, pp. 187-210; Franco, Blau, and Zimbardo, 'Heroism', pp. 99-113.

²⁹ M. Landau, 'Human Evolution as Narrative: Have Hero Myths and Folktales Influenced our Interpretations of the Evolutionary Past?', *American Scientist*, vol. 72, no. 3, 1984, pp. 262-268.

³⁰ Allison and Goethals, ' "Now he Belongs to the Ages" ', p. 171.

that interdisciplinary exchanges are marked by a 'reciprocal loop between the metaphoric relations of one individual and the metonymic structures of another'.³¹ Interviews evidenced this dynamic exchange of metaphors between the interviewer and the interviewees, as we both grappled with an exchange of the meaning of concepts in the grey area between biology and story, resulting in an alteration of each other's metonymic awareness.

One conclusion from the study is that the more heightened one's awareness and knowledge of a subject is, the greater the frequency of the use of metaphors is employed in one's work. Participants use metaphor to communicate complex ideas, as well as inform and inspire their work, consistent with Scott Allison and George Goethals' epistemic and energising function of hero stories.³² Some participants, for example, share experiences of dreams or visions and associated metaphors that have influenced their work, denoting the non-rational aspect of hero stories which cannot be explained using conventional reasoning, due to their spiritual or metaphysical nature.³³ As a general rule, metaphors employed by participants draw on analogies from nature and its symbolism—one participant describes a vivid and detailed dream of an eagle being a harbinger of important information that leads to a realisation about their path as a heroism educator. Another describes the complexity of the concept of heroism by using the metaphor of peeling layers off a complex idea like peeling an onion.

In-depth interviews with scientists affirm the value of metaphor to communicate their work in various contexts. This use of metaphor is not only limited to communicating research to a non-scientific audience, but amongst scientists themselves. 'Eddie' confirms that metaphor is a common method of effective communication with his team, and to students when lecturing. He mentions an example of one of his most commonly used metaphors, 'sweet molecules', to describe glycans (biological substances attached to glycoproteins and proteoglycans). When asked what DNA means to him, beyond a scientific interpretation, he describes that reading our genetic structure as a story is the most basic metaphor in genomics:

I think it is just like *reading a book*. You read the letters, then, you've got different symbols...commas, full stop...and actually these letters give you a lot of information. When you read a book...all these letters have different meanings. When you put them together, they become a word. Then you put them together...they give you another meaning, phrase, sentence.

He extends this metaphor by describing a person's DNA book as comprising 23 'chapters' for each pair of chromosomes in a human cell. This narrative of the human genome as 'information' that can be read is also linked to the idea that it can be rewritten (i.e. DNA can be engineered). Interestingly, 'Eddie' refers to behaviour, the environment, and genes as the 'three kingdoms' of understanding the human experience, describing science in virtually fairy-tale like terms.

The use of metaphor is described as a means to effective dialogue, and science communication and education. 'Glen', another expert in global health genomics, also affirms

³¹ A. Dalke, P. Grobstein, and E. McCormack, 'Exploring Interdisciplinarity: The Significance of Metaphoric and Metonymic Exchange', *Journal of Research Practice*, vol. 2, no. 2, article M3, 2006, p. 5.

³² Allison and Goethals, "Now he Belongs to the Ages", p. 170.

³³ Allison and Goethals, pp. 170-171.

the use of metaphor as a common way of communicating scientific ideas and his own work. He notes the responsibility that comes with this aspect of science communication: 'you really got to think it through before you start using little examples, whether it's metaphors or whatever...that they are appropriate for the context'. He acknowledges the complexity of science communication in the presence of 'more than one interpretation' of a single concept, which might have dire consequences on one's reputation and credibility as a scientist if misappropriated. This is especially the case, he notes, when taking on a genetic counselling role for families from diverse religious, ethnic, and cultural backgrounds, in which attitudes can vary greatly on such matters as 'termination of pregnancy...the value placed upon life, [and] stem cell therapy'. A metaphor that is not relevant to the context in which it is used can result in the other party feeling offended and disrespected, not only personally, but about their deeply espoused religious and cultural education, and upbringing.

When asked to comment on the role of storytelling in modern science, 'James', an expert in evolutionary psychology and biology, observes: 'I think scientists have forgotten to tell stories...but it's coming back'. This is consistent with observations of the previously curious neglect but recent emphasis of story in science, reflecting a broader shift in academic culture toward storytelling.³⁴ 'James' describes all his lectures and published research as a story; 'that is the only way that it's gripping'. He notes, 'scientists have tried to separate themselves from that because there is this idea that it reduces objectivity', an enduring attitude in the more traditional scientific circles. However, he reflects that the importance, and indeed necessity from a funding and metrics perspective, to be able to produce work that is communicable and understandable by an audience, makes writing research as a story a task of practical urgency.

'Glen' also agrees that science communication in lecturing and public speaking is, in essence, storytelling. He recalls his mother's commonly used metaphor 'blood is thicker than water'; despite its simplicity and obvious meaning, he notes what a powerful metaphor this still is when communicating science as an example of an enduring story that is passed down through the generations. He stresses the centrality of the use of metaphor in 'science as story telling and story revising':³⁵

it reveals you as not just somebody who's locked away in an ivory tower somewhere...and that in running your programs and designing your studies, and in analysing your studies can draw on your conclusion, you're doing it from a much more widely based perspective than just coming up with some answers.

Thus a scientist who can communicate well and adapt their message accordingly to the needs of their audience is an effective storyteller; someone who is able to 'translate their findings from the laboratory to the general public, not just to other scientists in their own field, but in wider fields, and to the general population', in 'Glen's' words.

The coalescence of this theme of the importance of effectively communicating scientific concepts and discoveries to the public in these interviews aligns with emerging

³⁴ P. Fensham, 'Science as Story: Science Education by Story', *Asia-Pacific Forum on Science Learning and Teaching*, vol. 2, no. 1, 2001, pp. 1-5; L. Garcia-Lorenzo, S.M. Nolas, and G. de Zeeuw, 'Telling Stories and the Practice of Collaboration', *International Journal of Sociology and Social Policy*, vol. 28, no. 1/2, 2008, pp. 9-19.

³⁵ Grobstein, 'Revisiting Science in Culture', pp. 1-18.

literature describing a broader shift underway in the revision of the role of science as story. Influential late biologist and interdisciplinary theorist Paul Grobstein cites John Brockman's notion of a 'third culture' in which 'scientists are communicating directly with the general public'—this is a call for 'a less divisive and more widely engaging story of science' aptly mirrored for example by the 'citizen science' movement.³⁶ Peter Fensham asserts that 'behind every advance in science there is a human story'.³⁷ If story lies at the heart of both heroism and science, then this shared foundation reveals heroism and science as inherently consilient in their mode and method of communicating their narratives.

This section has offered examples of the centrality of metaphor and story in researchers' daily practices and interdisciplinary exchanges. Researchers based in both traditional biological fields and humanistic fields borrow metaphors and language from each other's knowledge cultures, and from broader collective knowledge about what it is to be human. This gives them a better understanding and ease of interpretation of the prevalence of heroism in human history and its continued relevance in our world today, as well as their objects of study outside of heroism. Conclusions drawn from this section include biology and culture as complex narratives we construct to grapple with our humanity, the personal importance of metaphor for researchers to effectively communicate their work and sustain its longevity, and the return of story in science practices accompanied by the recognition of science as metaphor itself and storytelling. These are particularly useful in deriving insights for the future of interdisciplinary work, consistent with emerging research that aims to advance interdisciplinary conversations and academic practices.³⁸

In the next section, the hero's journey model is explored as an evolutionary narrative. Interview data is presented to demonstrate the intersection of examples of biological processes and specific stages of the hero's journey.

The Hero's Journey as an Evolutionary Narrative

In order to see if the language used in the traditional hero's journey motif makes sense in a biological context, the scientists interviewed were asked to consider if there are any processes at the cellular and genetic level that they would describe as demonstrating any or all of the following:

- i. Initiation (being guided or trained).
- ii. Undergoing a 'trial', 'rite of passage', 'test' or 'ordeal'.
- iii. Successfully passing the test.
- iv. Returning to the original state but being different in form.
- v. 'Giving' something at the end of the 'journey'.

These stages are definitive aspects of the hero's journey, as posited by Campbell.³⁹

Specific examples offered by scientists interviewed suggest that the hero's journey narrative structure appears to be implicit in the way we understand and interpret biology. 'Eddie' provided the example of 'genetic drift' as an instance of genes being 'guided'; genes that are not needed are 'sent away'. These genes fail the test of nature and die out. However,

³⁶ Grobstein, p. 10.

³⁷ Fensham, 'Science as Story', p. 2.

³⁸ P. Grobstein, 'Interdisciplinarity, Transdisciplinarity, and Beyond: The Brain, Story Sharing, and Social Organization', *Journal of Research Practice*, vol. 3, no. 2, article M21, 2007, p. 9.

³⁹ Campbell, *The Hero with a Thousand Faces*.

the older, more stable genes serve as guides by retaining the stronger genes; Campbell noted the requirement of a 'supernatural aid' on the hero's journey.⁴⁰ In this case, the aid is firmly natural. This process is called 'equilibrium' to sustain the survival of the organism, according to 'Eddie', and ultimately the species. Restoring balance at the individual and collective level, therefore, appears to be a common theme in hero stories and biological interpretations.

In addition, this study highlighted the role of diversity in story and biology for sustaining life. These 'ancient' stable genes have a highly 'protective' and 'oxidative' function by producing multiple 'back-up' copies in case of a threat; 'some cells survive longer under stress', 'Eddie' notes. Elaine Kinsella, Timothy Ritchie, and Eric Igou support the protective function of heroism and its benefits for the optimal wellbeing of an individual psychologically, socially, and physically.⁴¹ 'Eddie' describes the ultimate gift of this protective process as 'life' itself; as an example, he notes the O blood group as the oldest and most effective ancestral gene, with the AB being the younger ones with their own distinct advantages. All must work together giving the diversity of life; 'if you just have a single copy, you die', he says. This statement is concomitant with 'Susan's' point that

all the way down, as far as we can go, we never get to just "one". And if we could ever get to just one, then I guess we could say 'there's no story', but as long as there's "two", there's story [because] there's some "dance" going on.

This aligns with the emphasis on diversity, cooperation, and duplication described by our scientists.

This diversity might seem as a contradiction to the uniform model of the hero's journey—but the presence of a persistent narrative structure does not cancel out the nuances of specific settings and cultures. In no other example is this perhaps demonstrated more aptly than the creation of human life. 'James' considers the hero's journey as an interpretation of one of the most basic biological examples: fertilisation and the race of the sperm to fertilise the ovum. All other sperm die, and in 90 percent of cases, only one sperm is successful in reaching the female egg. 'James' uses the hero's journey metaphor to explain how this sperm undergoes a rite of passage through a number of trials and obstacles, including fighting off millions of other sperm and surviving the 'acidity of the female reproductive tract' which can be deadly to incoming sperm. So difficult and treacherous is this journey that 'James' agrees it is a miracle that fertilisation occurs. Interestingly, he notes that there is training or 'initiation' involved, as is definitive of the hero's journey: 'there are sperm that can't swim, or swim backwards, or have two heads...and they somehow help the ones that are successful'. Once more, this is an example of *natural aid* (though no less miraculous than supernatural aid in narrative terms).

This interpretation further reveals the importance of diversity and cooperation in both hero stories and biology—the journey to fertilisation necessitates challenge and uncertainty. 'James' notes,

⁴⁰ Campbell, *The Hero with a Thousand Faces*, p. 57.

⁴¹ E.L. Kinsella, T.D. Ritchie, and E.R. Igou, 'Lay Perspectives on the Social and Psychological Functions of Heroes', *Frontiers in Psychology*, vol. 6, 2015, pp. 1-12.

you do actually need the millions of sperm...if you had one and you were sure it would get there, that would not be as successful as a million and you just did it by chance.

These serve a 'guiding' and 'supporting' function. The importance of diversity in the hero's journey is affirmed by 'Nyles':

life is full of multiplicity...Joseph Campbell was a champion of heroic diversity...the structure of the journey is set in place for us but how we define our place within that structure depends on what our unique gifts are.

This mirrors Grobstein's '*distributed interactive architectures*', that is, non-hierarchical forms of organising human and non-human activities which possess an almost self-conscious degree of innate cooperation and natural order; these are the most successful patterns of organisation evidenced in the social, and especially the biological domain, according to Grobstein.⁴² They are an 'an expression of coordinated collective behavior in the absence of a leader'.⁴³ Although it would be bold to claim that sperm make conscious decisions as to what role they take on in the unfolding of evolution and reproduction, the assumption of different central antagonist and supporting roles of sperm, eggs, genes, cells, and other biological characters that find their 'calling'—as would be observed at the social level—seems to be a key feature of how the story of the creation of life plays out at the biological level.

The end of our story completes the cycle of the hero's journey. As soon as successful fertilisation occurs, 'James' continues, the egg 'reacts' by developing a 'hard membrane...so no other sperm can get in'. Notably, 'the DNA from the egg and the DNA from the sperm...comes together and starts one new cell' with each of them having half of the DNA required and forming a whole when they come together—this is the 'return' stage in the hero's journey marking a transformation into something that is similar to the original state, yet at the same time different ('the same number of chromosomes but now they've changed', according to 'James'). It is also a representation of the meeting with the 'Goddess' and the joining of the female and the male as described by Campbell in the hero's journey.⁴⁴ Once again, the boon is the ultimate gift—the gift of life.

In this section, the application of the hero's journey as an interpretive tool for biological processes such as reproduction and genetic equilibrium indicates the shared foundation of culture and biology in lived story and the 'life-supporting nature' of story proposed by Campbell.⁴⁵ The hero's journey provides a narrative structure that informs the way we understand our bodies, culture, and selves across disciplines.

In the next section, I consider to what extent the hero's journey, as a metaphor and mode of enquiry, can facilitate the bridge-building exercise between story and science, and diverse knowledge systems.

⁴² Grobstein, 'Interdisciplinarity, Transdisciplinarity, and Beyond', p. 2.

⁴³ Grobstein, p. 4.

⁴⁴ Campbell, *The Hero with a Thousand Faces*, p. 91.

⁴⁵ J. Campbell, *Myths to Live By*, New York, Viking Press, Inc., 1972, p. 12.

Master of Two Worlds: Bridging Science and Story as a Hero's Journey

A notable outcome of the interviews was the underlying issue of competing methodologies and narrative perspectives in the sciences and the humanities, and how they can be reconciled in individuals' work and bring about a broader cultural transformation in academic work. Participants agree that this shift needs to be 'systemic and integral...[and] embodied in the society', in 'Susan's' words. The impact of Western culture in shaping and, in some ways, impeding heroism, as well as contributing to the devaluation of story as inferior to science was a concern for a number of participants. All heroism experts interviewed support that heroism is an inherently interdisciplinary concept. As 'Bob', an expert in transformative leadership and integral studies, notes, 'of course anything in the human domain has got to be...crossing boundaries' and thus truly interdisciplinary.

The story-based scientific method is a circular model for the observation of phenomena.⁴⁶ This dynamic approach to enquiry mirrors the paradoxical and cyclical nature of the hero's journey, described by 'Nyles' as 'counter-intuitive', especially from a Western cultural perspective that sees progress as ascending and linear. This helps to explain in part the difficulty in adopting not only a heroic mindset, but a story-driven science. 'Eddie' and 'Glen' affirm the value of a 'hypothesis-free' and story-driven approach to gathering data; qualitative research is cited as being indispensable to science. Surprisingly, 'Eddie' admits that he does *not* agree with the use of a traditional 'hypothesis-experiment-conclusion' linear model of conducting science.⁴⁷ He regards it as impractical. As an example, he cites the human genome project, which did not start out with a specific hypothesis. Both 'Eddie' and 'Glen' conclude that the two models should ideally work together. The story-driven scientific approach provides invaluable data through the repeated circular journey of observation and summation, which, once undertaken to a satisfactory end, can then *lead to* a hypothesis. In this reverse logic, the journey results in the scientific boon: *the research question* which can then be tested and validated through experimentation. 'James' agrees that 'science is definitely an iterative process'—the hero's journey and science are both story models that reflect inherently evolutionary and iterative processes that involve change, challenges, and the unknown.

We are at a critical point in the 21st century where we are revising the meaning of science and how science is conducted:

Like other human institutions, the academy both resists and generates the seeds of its own change. *Interdisciplinary conversations* are, we believe, not only already well on their way to becoming the "center of the academy," but have the potential to create a new, more productive, and more engaged relationship between the academy, broader intellectual activity, and human life in general.⁴⁸

'Bob' agrees: 'we are already in the domain of questioning the so-called classical scientific methodologies'. A revision of scientific enterprise must involve a rethinking of 'the way in which science is construed to include *narrative*, not just things that can be counted', he states.

⁴⁶ Grobstein, 'Revisiting Science in Culture', p. 5.

⁴⁷ Grobstein, p. 5.

⁴⁸ Dalke, Grobstein, and McCormack, 'Exploring Interdisciplinarity', p. 2.

Acknowledging, and redeeming the value of story and qualitative observations in the process of enquiry, 'Bob' argues, is vital, reflecting the emerging science-as-story school of thought: 'to brand qualitative research as unscientific is to relegate it to second-class status'.

One dominant theme, as discussed earlier, was the notion of *equilibrium*. Interviews suggest that the hero's journey as a mode of enquiry with its roots in both the humanistic and the scientific traditions could serve as a counter-weight to the perceived imbalance between story and science. Revealing and effectively managing paradox is a core aspect of the epistemic function of hero stories.⁴⁹ 'Graham', an expert in social psychology, comments on the unique ability of a hero to identify an alternate *third* path. In the hero's journey sense, as Campbell observed of the achievement of hero status in the final stages of the journey, the hero scholar who can integrate story and science is a 'master of the two worlds'.⁵⁰ As a bridge of worlds and boundaries the hero has the capacity to balance any aspect of the journey she or he undertakes, and any dualism—science/story, mind/body, East/West, masculine/feminine, and so forth.

Conclusion and Future Directions

This article has hopefully provided a lens into the practical and lived insights of the theoretical two cultures debate, and how new understandings can be reached from a phenomenological perspective in the 21st century. Story and metaphor are central aspects of researchers' and educators' practices interviewed. The compatibility of the hero's journey and human biology as narratives indicates optimism for the future of a story-based and iterative science, and the reconciliation of competing knowledge cultures. Consistent with emerging research, interviews suggest that 'we may be entering a period which demands a new discourse on the relationship between human knowledge, understanding, and culture'.⁵¹ Story is the heart of knowledge production. The indicative overlaps between humanistic and biological knowledge-making systems might provide a preliminary 'set of "procedures"' to assist with extending a more evolved form of knowledge production that is compassionate, human, and planetary centred.⁵² A story-based science must be founded on a sophisticated literacy and interpretative proficiency of diverse layers of narratives, and importantly, a consideration of the specific social settings, activities, and relationships that have *produced* these stories.

Heroism research can contribute to an open, dialogic, and interpretive science. Interviews conducted as part of the qualitative pilot study discussed in this article indicate that a science as story informed by the hero's journey is founded on the following key aspects: integrative language, collaborative dialogue, transformative enquiry, metaphor, diversity, and employing combined non-linear and linear research models (in succession or concurrently). This is science as a heroic storytelling process that is bound to the story of human evolution and lived experience, and the 'ongoing individual and collective process of story creation, sharing, and revising'.⁵³ In Grobstein's terms, it is an 'exemplary model' of

⁴⁹ Allison and Goethals, ' "Now he Belongs to the Ages" ', p. 172.

⁵⁰ Campbell, *The Hero with a Thousand Faces*, p. 196.

⁵¹ T. Weller, 'A Continuation of Paul Grobstein's Theory of Science as Story Telling and Story Revising: A Discussion of its Relevance to History', *Journal of Research Practice*, vol. 2, no. 1, article M3, 2006, p. 1.

⁵² Garcia-Lorenzo, Nolas, and de Zeeuw, 'Telling Stories and the Practice of Collaboration', p. 17.

⁵³ Grobstein, 'Interdisciplinarity, Transdisciplinarity, and Beyond', p. 1.

interdisciplinarity, organisation of human activity, and transformative collaborative storytelling.⁵⁴

Participants' responses indicate that the resurgence in the study of heroism serves as a protest against the progress narrative underpinning Western civilisation and many of our pre-suppositions about our superiority, as a culture and as a human species. Researchers working beyond the boundaries of knowledge cultures should expect a tension and unease both on a personal and professional level as they navigate their way through these boundaries—a process that is difficult, but stands to be fruitful. Commitment to bearing the uncertainty that accompanies interdisciplinary dialogue and cross-cultural academic work is essential. As Bickmore and Grandy note 'it is by trying to resolve contradictions between different stories, and between scientific stories and observations, that scientists make progress'.⁵⁵ But just beginning to engage in this dialogue is an important step forward. At the very least, a story-based science infuses researchers and individuals as knowers with a healthy 'skepticism' that makes us question the underlying assumptions of our practices and habits, and the facts we take for granted, pushing us to unknown ground and greater heights as is definitive of the hero's journey.⁵⁶

The hero's journey, and the study of heroism as an inherently interdisciplinary enterprise, can be an effective research model which can help break down already dissolving disciplinary boundaries even further. But the realities of enduring divisions between humanistic and scientific language and vocabularies must be recognised—not to further emphasise their differences, but to begin to dissect them carefully and develop novel distributed ways of knowing that do not lose their original meaning, yet achieve a new understanding of the object of study. Both the sciences and the humanities need to be cognizant of each other and work together moving forward. The recovery of the value of story for science is set to not only bring back balance in academia, but our culture. A heroic mode of enquiry is well poised to promote a science that is open, diverse, and preserves storytelling as a vital part of knowledge production.

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⁵⁴ Grobstein, p. 2.

⁵⁵ Bickmore and Grandy, 'Science as Storytelling', p. 13.

⁵⁶ Grobstein, 'Revisiting Science in Culture', p. 1.