

Bridging the Disciplines:
Reflections on Interdisciplinarity and the Unity of Knowledge

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Can we think of our universe as a coherent whole, capable of being represented by a single grand theory? Or is it so complex that the most we can hope for is fragmented insights that can only be partially integrated? Was David Bohm right in suggesting that there is a deeper, hidden ‘implicate order’ underlying the ‘explicate order’ of physical appearances?¹ These classic questions about the ‘wholeness’ of nature continue to be debated to this day.² Yet while the pursuit of a unified theory of knowledge remains attractive, one of the most noticeable features of modern academic life is a trend towards the fragmentation of previously unified disciplines, such as psychology.³ This is often accompanied by a more general sense of disciplinary isolation,

¹ David Bohm, *Wholeness and the Implicate Order*. London: Routledge, 2002, 1–24.

² For some representative contributions, see Henri Bortoft, *The Wholeness of Nature: Goethe’s Way of Science*. Edinburgh: Floris Books, 1996; David Davies, ‘Explanatory Disunities and the Unity of Science.’ *International Studies in the Philosophy of Science* 10, no. 1 (1996): 5–21; Margaret Morrison, *Unifying Scientific Theories: Physical Concepts and Mathematical Structures*. Cambridge: Cambridge University Press, 2000; Peter Galison, ‘Meanings of Scientific Unity: The Law, the Orchestra, the Pyramid, Quilt, and Ring,’ in Harmke Kamminga and Geert Somsen (eds.), *Pursuing the Unity of Science: Ideology and Scientific Practice from the Great War to the Cold War*. Burlington, VT: Ashgate Publishing, 2016, 12–29.

³ For a thoughtful exploration of the general issues, see Timothy A. Robinson, ‘Getting It All Together: The Fragmentation of the Disciplines and the Unity of Knowledge.’ *Headwaters* 25 (2008): 102–14; Harald A. Mieg and Julia Evetts, ‘Professionalism, Science, and Expert Roles: A Social Perspective,’ in K. A. Ericsson, R. R. Hoffman, A. Kozbelt, and A. M. Williams (eds.), *The Cambridge Handbook of Expertise and Expert Performance*.

in which scholars embedded in one specific field of studies find themselves feeling disengaged from a wider academic culture. Academic researchers often speak of a sense of working in a ‘disciplinary silo’ or ‘intellectual ghetto’ which is disconnected from other fields of academic endeavour. The causes of this unease are complex, including the emergence of epistemic diversity within previously unified disciplines,⁴ and the proliferation of substantial research literatures which are increasingly difficult to master, even within a single field of study.

Many nostalgically long to recover the notion of the *uomo universale*, the idealized polymath of the European Renaissance, who was able to master multiple disciplines and integrate them within a coherent worldview.⁵ Others, recognizing the limits of the intellectual capacities of any single individual, are drawn to the alternative Renaissance vision of communal interdisciplinarity, in which scholars, writers, and artists with diverse perspectives and interests would gather in the spacious and secluded gardens of their wealthy patrons to discuss the great questions of life,

Cambridge: Cambridge University Press, 2018, 127–48. Some disciplines (such as sociology and psychology) appear particularly prone to fragmentation. For an account of the issues facing the latter at the beginning of the present century, see the editorial ‘Introduction – The Fragmentation of Sociology.’ *Journal of Classical Sociology* 1, no. 1 (2001): 1–14. David Bohm’s anxieties about conceptual fragmentation may also be noted here: David Bohm, *Fragmentation and Wholeness*. Jerusalem: Van Leer Jerusalem Foundation, 1976.

⁴ Michael Weisberg and Ryan Muldoon, ‘Epistemic Landscapes and the Division of Cognitive Labor.’ *Philosophy of Science*, 76, no. 2 (2009): 225–52; Federico Gobbo and Federica Russo, ‘Epistemic Diversity and the Question of *Lingua Franca* in Science and Philosophy.’ *Foundations of Science* 25 (2020): 185–207. For the suggestion that such diversity could be an opportunity for conceptual enrichment, see Samuli Pöyhönen, ‘Value of Cognitive Diversity in Science.’ *Synthese*, 194, no. 11 (2017): 4519–40.

⁵ Peter Burke, *The Polymath: A Cultural History from Leonardo Da Vinci to Susan Sontag*. New Haven, CT: Yale University Press, 2020. It must be remembered that the development of what we now think of as ‘disciplinary boundaries’ did not really emerge until the modern period.

sharing wisdom across their disciplinary boundaries.⁶ The situation is, of course, made more complex by the loss of a common cultural and scholarly language, comparable to the cosmopolitan role of Latin during the Renaissance.⁷ Many have expressed concern over the intellectual and cultural blindness resulting from the limitations of any single modern language, such as English.⁸

This essay cannot resolve these concerns. It rather sets itself the more limited objectives of celebrating and encouraging interdisciplinary collaboration, while at the same time exploring how some of the challenges arising from this venture might be engaged, based on the belief that some form of unification (or at least coordination) of knowledge is a desirable outcome. There is growing interest in interdisciplinarity as an important strategy for engaging these concerns about disciplinary fragmentation, and encouraging a grand quest for unified knowledge.⁹ The interface

⁶ For a snapshot of this intellectual culture during the Renaissance, see Christopher S. Celenza, *The Lost Italian Renaissance: Humanists, Historians, and Latin's Legacy*. Baltimore, MD: Johns Hopkins University Press, 2004. For the more recent appeal of this vision of shared wisdom, see Paul Bennett, 'Renaissance Man.' *Landscape Architecture Magazine* 88, no. 8 (1998): 70–5, especially 72.

⁷ For the complex role of Latin in holding together the various strands of Renaissance culture, both scholarly and administrative, see Ronald G. Witt, *The Two Latin Cultures and the Foundation of Renaissance Humanism in Medieval Italy*. Cambridge, Cambridge University Press, 2012.

⁸ Gobbo and Russo, 'Epistemic Diversity and the Question of *Lingua Franca* in Science and Philosophy.' Note also the points made in Gregg Roberts, Jamie Leite, and Ofelia Wade, 'Monolingualism is the Illiteracy of the Twenty-First Century.' *Hispania* 100, no. 5 (2017): 116–18.

⁹ Lennard J. Davis, 'A Grand Unified Theory of Interdisciplinarity.' *Chronicle of Higher Education*, v53 n40 pB9 (June 2007): 'Interdisciplinarity is a powerful idea because it implies that different branches of knowledge can benefit from talking to one another: a grand, unified theory of knowledge in which each discipline contributes building blocks to a seamless edifice.' See also the comments of Moti Nissani, 'Ten Cheers for Interdisciplinarity: The Case for Interdisciplinary Knowledge and Research.' *Social Science Journal*, 34, no. 2 (1997): 201–16; Svend Erik Larsen, 'Interdisciplinarity, History and Cultural Encounters.' *European Review* 26 no. 2 (2018): 354–67.

of science and religion is an ideal case study to consider for these purposes, both in terms of the intellectual challenges that it raises, and the potential benefits that it offers.¹⁰

A Concern: The Fragmentation of Knowledge

In recent years, there has been growing interest in trying to find some intellectual framework that would respect disciplinary diversity on the one hand, while permitting some degree or form of integration or correlation of their insights on the other. Such a development might reduce a sense of isolation on the part of individual scholars, enable shared approaches to the fostering of wisdom,¹¹ and help regain a sense of coherence within the human quest for knowledge. Four recent integrative projects may be noted in this respect: Roy Bhaskar's critical realism, Ken Wilber's integral theory, Edgar Morin's *pensée complexe*, and E. O. Wilson's concept of consilience.¹²

¹⁰ For useful surveys of this field, see John Hedley Brooke, *Science and Religion: Some Historical Perspectives*. Cambridge: Cambridge University Press, 2015; Peter Harrison, *The Territories of Science and Religion*. Chicago: University of Chicago Press, 2015; Timothy L. O'Brien and Shiri Noy, 'Traditional, Modern, and Post-Secular Perspectives on Science and Religion in the United States.' *American Sociological Review* 80, no. 1 (2015): 92–115; Alister E. McGrath, *The Territories of Human Reason: Science and Theology in an Age of Multiple Rationalities*. Oxford: Oxford University Press, 2019.

¹¹ The rich concept of 'wisdom' itself can be helpfully explored through interdisciplinary reflection: see, for example, the very different approaches found in Benedict M. Ashley, *The Way toward Wisdom: An Interdisciplinary and Intercultural Introduction to Metaphysics*. Notre Dame, IN: University of Notre Dame Press, 2006; Ursula M Staudinger and Judith Glück, 'Psychological Wisdom Research: Commonalities and Differences in a Growing Field.' *Annual Review of Psychology* 62 (2011): 215–41.

¹² For a summary and critical assessment of such approaches, see Ullica Segerstrale, 'Wilson and the Unification of Science.' *Annals of the New York Academy of Sciences*, no. 1093 (2006): 46-73; Paul Marshall, 'Towards a Complex Critical Realism,' in Roy Bhaskar, Sean Esbjörn-Hargens, Nicholas Hedlund, and Mervyn Hartwig (eds), *Metatheory for the Twenty-First Century: Critical Realism and Integral Theory in Dialogue*. London: Routledge, 2016, 140–82.

None of these enterprises, however, has secured significant cultural or intellectual traction, partly because of the difficulties raised by their framing of the issues, and more fundamental suspicions of their aspirations to hegemony or privilege. Wilson's notion of consilience, for example, sets out an appealing vision of bringing together the outcomes and insights from different fields of knowledge, yet subordinates this to the Enlightenment's goal of creating a grand unified knowledge built upon a set of universal laws which offer a privileged place to the natural sciences.¹³ The eighteenth-century Enlightenment idea of a *mathesis universalis*, a single universal methodology for investigating everything, irrespective of discipline,¹⁴ is clearly contradicted by the multiple research methodologies deployed across the natural sciences in response to their specific objects of investigation. As Roy Bhaskar rightly points out, 'the nature of objects' determines 'their cognitive possibilities for us.'¹⁵

Anxieties about the fragmentation and compartmentalization of human knowledge are not new. A good example lies to hand in the establishment of the British Association for the Advancement of Science in 1831.¹⁶ At that time, a number of distinct scientific disciplines were in the process

¹³ Edward O. Wilson, *Consilience: The Unity of Knowledge*. New York: Vintage, 1999, 8–9.

¹⁴ For the origins of this idea in Descartes, see Luis Arenas, 'Matemáticas, método y *mathesis universalis* en las *Regulae* de Descartes.' *Revista de Filosofía* 8 (1996): 37–61. On the importance of this point for theology, see Alister E. McGrath, 'Theologie als Mathesis Universalis? Heinrich Scholze, Karl Barth, und der wissenschaftliche Status der christlichen Theologie.' *Theologische Zeitschrift* 62 (2007): 44–57.

¹⁵ Roy Bhaskar, *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences*. 3rd ed. London: Routledge, 1998, 3. For an elaboration of Bhaskar's approach, see Andrew Collier, *Critical Realism: An Introduction to Roy Bhaskar's Philosophy*. London: Verso, 1994.

¹⁶ For the historical context, see A. D. Orange, 'The Origins of the British Association for the Advancement of Science', *British Journal for the History of Science* 6, no. 3 (1972): 152–76. For the sociological significance of the British Association, see Louise Miskell, *Meeting Places: Scientific Congresses and Urban Identity in Victorian*

of emerging, giving rise to the possibility that these might be seen to be unrelated fields of studies, and hence diminish the social and cultural authority of ‘science’ in British culture. ‘The fragmentation of the field of scientific inquiry called forth a vision of its potential unification.’¹⁷ In its understandable desire to avoid the isolation of scientists arising from their association with specific individual sciences, the founders of the British Association chose to speak simply of ‘science’ *in the singular* – and in doing so, created the expectation that there was a singular method and outlook that was distinctive of all such natural sciences, namely, ‘*the scientific method.*’ This unfortunately created the false impression that every natural science uses a singular and identical ‘scientific method,’ thus failing to take account of the fact that individual sciences develop research methodologies which are specifically adapted to their own objects of study.¹⁸

There are many practical and theoretical problems associated with inter-disciplinary or cross-disciplinary research or conversations.¹⁹ Yet perhaps one of the most significant of those

Britain. Farnham, Surrey: Ashgate, 2013. The French and German equivalents – the Académie des Sciences, founded in 1666, and the Königlich Preussischen Akademie der Wissenschaften zu Berlin, founded in 1700 – used the term ‘science’ *in the plural*.

¹⁷ Jan Golinski, ‘Is It Time to Forget Science? Reflections on Singular Science and Its History.’ *Osiris* 27, no. 1 (2012): 19–36; quote at 20. On the issue of ‘scientific pluralism’, see the contributions to Stephen H. Kellert, Helen E. Longino, and C. Kenneth Waters (eds.), *Scientific Pluralism*. Minneapolis, MN: University of Minnesota Press, 2006.

¹⁸ For the issues, see Richard G. Olson, *Science and Scientism in Nineteenth-Century Europe*. Urbana, IL: University of Illinois Press, 2008; Andrew Cunningham and Perry Williams, ‘De-centring the “Big Picture”: The Origins of Modern Science and the Modern Origins of Science.’ *British Journal for the History of Science* 26, no. 4 (1993): 407–32; Golinski, ‘Is It Time to Forget Science?’; McGrath, *Territories of Human Reason*, 75–92.

¹⁹ A good starting point is Simone Brandstädter and Karlheinz Sonntag, ‘Interdisciplinary Collaboration: How to Foster the Dialogue across Disciplinary Borders?’, in Christopher M. Schlick et al. (eds.), *Advances in Ergonomic Design of Systems, Products and Processes*. Berlin, Germany: Springer, 2016, 395–409.

difficulties is theoretical: the problem of epistemic communities with their distinct defining views on methodology and rationality.²⁰ Any attempt to bridge disciplines – such as science and religion – has to begin from the explicit recognition of the role of discipline-specific research methodologies in knowledge production, which has strongly negative implications for universalizing accounts of human knowledge using a single principle of knowledge – a mis-step on the part of the eighteenth-century Enlightenment, which is now widely regarded as its Achilles Heel.²¹

One of the most interesting attempts to engage this point is due to the philosopher Mary Midgley, whose strongly anti-reductionist agenda leads her to affirm the integrity of individual disciplines, while nevertheless holding that their outcomes could somehow be combined or correlated.²² Midgley highlights the intellectual impoverishment and distortion which will inevitably result from attempting to limit our knowledge and understanding of the world to that resulting from a single disciplinary approach. ‘No one pattern of thought – not even in physics – is so “fundamental” that all others will eventually be reduced to it. Instead, for most important

²⁰ McGrath, *Territories of Human Reason*, 75–92.

²¹ Unsurprisingly, critical historical research has made it clear that the ‘Enlightenment’ actually consists of multiple ‘Enlightenments’, each based on somewhat different assumptions and methods. For discussion, see Peter Dear, ‘Reason and Common Culture in Early Modern Natural Philosophy: Variations on an Epistemic Theme,’ in Tamás Demeter, Kathryn Murphy and Claus Zittel (eds.), *Conflicting Values of Inquiry: Ideologies of Epistemology in Early Modern Europe*. Leiden: Brill, 2014, 10–38; Nathaniel Wolloch, ‘Natural Disasters and the Debate on the Unity or Plurality of Enlightenments.’ *The Eighteenth Century* 57, no. 3 (2016): 325–43.

²² For an assessment of Midgley’s importance for theology (and the related field of science and religion), see Alister E. McGrath, ‘The Owl of Minerva: Reflections on the Theological Significance of Mary Midgley.’ *Heythrop Journal* 61, no. 5 (2020): 852–64.

questions in human life, a number of different conceptual tool-boxes always have to be used together.’²³

These observations might suggest that human knowledge is to be likened to a patchwork quilt of disciplinary-specific zones, as in the kind of localized pockets of knowledge proposed by Nancy Cartwright.²⁴ Yet there are other ways of affirming and contextualizing disciplinary specificity without losing sight of a coherent view of a complex reality – a notion which is captured, for example, in the image of scientific knowledge as a web of distinct, yet interconnected ideas.²⁵ Midgley, while conceding the necessity of methodological pluralism to cope with the complexity of our world and human experience, holds that a way can (and should) be found to weave these insights together into a coherent whole.

On the one hand, I want to emphasize that there really *is* only one world, but also – on the other – that this world is so complex, so various that we need dozens of distinct thought-patterns to understand it. We can’t reduce all these ways of thinking to any single model. Instead, we have to use all our philosophical tools to bring these distinct kinds of thought together.²⁶

²³ Mary Midgley, ‘Dover Beach: Understanding the Pains of Bereavement’, *Philosophy* 81 (2006), pp. 209–30; quote at 219.

²⁴ See, for example, Nancy Cartwright, *The Dappled World: A Study of the Boundaries of Science*. Cambridge: Cambridge University Press, 1999.

²⁵ Philip W. Anderson, ‘Science: A “Dappled World” or a “Seamless Web”?’ *Studies in the History and Philosophy of Modern Physics* 32, no. 3 (2001): 487–94.

²⁶ Mary Midgley, *What is Philosophy for?* London: Bloomsbury Academic, 2018, 193. For a useful overview of Midgley’s general approach, see Gregory McElwain, *Mary Midgley: An Introduction*. London: Bloomsbury Academic, 2019.

So how might this be done? Later in this paper, we shall explore and assess some possible ways of transitioning from a methodological pluralism to a conceptual integration. Yet before outlining a potentially productive approach to interdisciplinary dialogue, it is important to note some objections that might be raised against this enterprise.

Interdisciplinary Dialogue: Two Objections

Two significant concerns about interdisciplinary dialogue have emerged since the Second World War, both reflecting a growing anxiety about how to ‘demarcate’ certain disciplines, especially within the field of the natural sciences, from their supposedly less scrupulous disciplinary rivals, and thus protect them from what some see as the risk of intellectual contamination.²⁷

1. *Dialogue is impossible or pointless.* This is an essentially pragmatic concern, encountered in multiple forms, sometimes reflecting a pragmatic judgement that such conversations are likely to be sterile. Stephen Jay Gould’s concept of ‘non-overlapping magisterial (NOMA),’ which he developed in the 1990s, is an example of such an approach, developed with debates concerning the field of science and religion in mind.²⁸ Although framed in terms of maintaining and respecting intellectual and professional integrity, Gould’s approach is conceptually sterile, in effect foreclosing some potentially significant conversations. While Gould’s affirmation of ‘mutual humility’ is to be welcomed, his conclusion that this is best achieved and expressed

²⁷ For the issues, see Sven O. Hansson, ‘Cutting the Gordian Knot of Demarcation.’ *International Studies in the Philosophy of Science* 23 (2009): 237–43; Massimo Pigliucci, ‘The Demarcation Problem: A (Belated) Response to Laudan,’ in Massimo Pigliucci and Maarten Boudry (eds.), *Philosophy of Pseudoscience: Reconsidering the Demarcation Problem*. Chicago: University of Chicago Press, 2013, 9–28.

²⁸ Stephen Jay Gould, ‘Nonoverlapping Magisteria.’ *Natural History* 106 (1997): 16–22.

through intellectual isolationism was clearly premature. Happily, Gould's views on interdisciplinarity in general, and in relation to science and religion in particular, changed as a result of his critical engagement with the trenchant form of scientific rationalism set out in Wilson's *Consilience* (1998). In a significant posthumous work of 2003, Gould argued for a "consilience of equal regard" between different intellectual domains that 'respects the inherent differences, acknowledges the comparable but distinct worthiness, understands the absolute necessity of both domains to any life deemed intellectually and spiritually "full"'.²⁹

2. *My own discipline can answer all meaningful questions.* A second objection to interdisciplinary conversations or collaborations takes the form of the intellectual colonialism evident in the belief that my discipline is superior to others, and is able to answer all of life's fundamental questions. There is therefore no point in consulting other disciplines on such matters. Such claims to epistemic privilege are widespread within scientific populism, which often involves the assertion that science has rendered philosophy redundant. For some popular scientific writers, philosophical questions are either meaningless, or can be answered far more effectively and reliably by science.³⁰ At a more academic level, this attitude is encountered within the movement now known as 'scientism', which can be defined as 'a totalizing attitude that regards science as the ultimate standard and arbiter of all interesting questions; or

²⁹ Stephen Jay Gould, *The Hedgehog, the Fox, and the Magister's Pox: Mending and Minding the Misconceived Gap between Science and the Humanities*. London: Jonathan Cape, 2003, 259. For Gould's mature views on this question, and his critique of Wilson's scientific rationalism, see Gould's mature views and his critique of Wilson, see Alister E. McGrath, 'A "Consilience of Equal Regard:" Stephen Jay Gould on the Relation of Science and Religion.' *Zygon: Journal of Religion and Science* 56, no. 3 (2021): 547–65.

³⁰ Stephen Hawking and Leonard Mlodinow, *The Grand Design*. New York: Bantam Books, 2010.

alternatively that seeks to expand the very definition and scope of science to encompass all aspects of human knowledge and understanding.’³¹

Scientism has become the undergirding philosophy of the ‘New Atheism’, a populist atheist movement that flourished from 2006 to about 2018, given intellectual leadership by Richard Dawkins and Sam Harris. This movement in effect weaponized science in its attempt to discredit and marginalize religion. The movement’s intellectual over-reach,³² which eventually led to its unravelling, was mainly due to its unwise embrace of an aggressive form of ‘scientism’, which turned out to be vulnerable to charges of superficiality and intellectual circularity. Yet such assumptions have secured traction elsewhere – as in Edward Wilson’s colonialist aspirations to ‘capture the moral realm and render it under scientific and material control.’³³

Yet while the most conspicuous examples of the colonization of other disciplines arise from within the natural sciences, assertions of disciplinary privilege and authority are widely encountered. This essay will assume that each discipline is to be treated with respect, while

³¹ Massimo Pigliucci, ‘New Atheism and the Scientific Turn in the Atheism Movement.’ *Midwest Studies in Philosophy* 37, no. 1 (2013): 142–53; quote at 144. For fuller exploration of this movement, see Richard N. Williams and Daniel N. Robinson (eds.), *Scientism: The New Orthodoxy*. London: Bloomsbury, 2015; Jeroen de Ridder, Rik Peels, and René van Woudenberg (eds.), *Scientism: Prospects and Problems*. New York: Oxford University Press, 2018; Midgley, *What is Philosophy for?*, 85–95.

³² For some recent criticism of this movement’s views, see Ian James Kidd, ‘Epistemic Vices in Public Debate: The Case of “New Atheism”,’ in Christopher Cotter, Philip Quadrio and Jonathan Tuckett (eds), *New Atheism: Critical Perspectives and Contemporary Debates*. Dordrecht: Springer Verlag, 2017, 51–68; John Gray, *Seven Types of Atheism*. London: Penguin Books, 2018, 9–23; Christian Smith, *Atheist Overreach: What Atheism Can’t Deliver*. New York, NY: Oxford University Press, 2019, 87–104.

³³ Segerstrale, ‘Wilson and the Unification of Science,’ 47. A similar criticism can be made of Sam Harris, *The Moral Landscape: How Science Can Determine Human Values*. New York: Free Press, 2010.

politely rejecting any disciplinary claims to supreme authority or special privilege. So what intellectual justification might be offered for such a strategy of encouraging disciplinary dialogue and attempting to correlate their outcomes? We shall explore this in the following section.

Disciplinary Correlation: Bringing together Multiple Insights

It is often assumed that recognizing the specificity of disciplinary research methods entails abandoning any wider aspirations to developing a view of the world that is both coherent and multi-faceted. This, however, seems a premature judgement. To illustrate this point, we may consider an interesting analogy developed by the biologist Steven Rose to affirm his core belief that our world is an ‘ontological unity,’ yet is nevertheless so complicated that its investigation demands an ‘epistemological pluralism.’³⁴ To lend imaginative plausibility to his suggestion, Rose sets out what he describes as a ‘fable’ of five biologists, representing different subdivisions of his own discipline of biology, each of whom watch the same frog jump into a pond, yet offer differing (yet ultimately complementary) explanations for this observation.

The physiologist explains this observation in terms of the frog’s leg muscles being stimulated by impulses from its brain. This, of course, is true. But it is only part of a larger explanatory framework. The biochemist supplements this explanation by noting that the frog is only able to jump because of the properties of fibrous proteins, which enabled them to slide past each other when they are stimulated by ATP. Once more, this is true; but it remains only part of a wider explanatory nexus. The developmental biologist adds that the frog’s capacity to jump in the first

³⁴ Steven Rose, ‘The Biology of the Future and the Future of Biology,’ in John Cornwell (ed.), *Explanations: Styles of Explanation in Science*. Oxford: Oxford University Press, 2004, 125–42, especially 128–9.

place is the result of the ontogenetic process which gave rise to its nervous system and muscles. The animal behaviorist adds another level of explanation by pointing out that the frog jumped in an attempt to escape from a lurking predatory snake, while the evolutionary biologist sets a wider explanatory context by observing that the process of natural selection ensures that only those ancestors of frogs which could detect and evade snakes would be able to survive and pass on their genes. Rose's point is simple: all of these five explanations have merit in their own right, while being part of a bigger picture. They may be different, but they are not inconsistent for that reason.³⁵ The explanations are thus conjunctive, not competitive.³⁶

Rose's 'fable' is a useful illustration of how multiple explanatory threads need to be woven together to account for a single event. Each of these explanatory threads may be considered to be true; none of them, however, provides in itself a *total* explanation. Each explanation illuminates part of a larger picture. It illustrates neatly the importance of finding a plausible and visualizable framework to help collate and integrate complex information.³⁷ So what other visibly plausible analogies might be used to help correlate and integrate insights gained from different disciplines?

³⁵ Rose, 'The Biology of the Future and the Future of Biology,' 128.

³⁶ For the notion of a 'conjunctive' explanation and a critique of the notion of a single 'best' explanation, see Jonah N. Schupbach, 'Conjunctive Explanations and Inference to the Best Explanation,' *Teorema* 38, no. 3 (2019): 143–62.

³⁷ On the importance of this point, see Sara I. Fabrikant and André Skupin, 'Cognitively Plausible Information Visualization,' in Jason Dykes, Alan M. MacEachren and Menno-Jan Kraak (eds.), *Exploring Geovisualization*. Amsterdam: Elsevier, 2005, 667–90.

Perhaps the most helpful of these is Mary Midgley's notion of using multiple maps to make sense of a complex reality.³⁸ Midgley credits the British quantum physicist John Ziman with arousing her interest in conceptual maps in building bridges between the 'Two Cultures' of the natural sciences and the humanities. Ziman was open about the diversity of the natural sciences, and its need to engage seriously with the humanities. Midgley came to the view that science and the humanities were like two banks of a river; and that river needed to be bridged. She summarizes her debt to Ziman at this point as follows:

Science was not just a single, isolated, monolithic juggernaut but a highly varied set of studies, all of them connected with the rest of our thought, not a bastion raised against it. There was ([Ziman] said) no one of these studies (not even physics) that was 'fundamental' in the sense that all the others ought to be reduced to it. And these many sciences differed from one another in much the same way in which they differed from studies such as history, which were being pursued on the other bank. Science, in fact, was not an isolated monarchy. It was a republic, doing constant business with the other republics around it.³⁹

Midgley's critique of the *monarchia* of the natural sciences is a culturally elegant way of reframing the colonial outlook of scientism, and a reminder that the natural sciences must take their place within a wider federal framework of human knowledge production.⁴⁰

³⁸ For further discussion, see McGrath, 'The Owl of Minerva,' 853–6. For a fuller presentation of this idea, see Mary Midgley, *Science and Poetry*. London: Routledge, 2001, 170–213.

³⁹ Mary Midgley, 'Mapping Science: In Memory of John Ziman.' *Interdisciplinary Science Reviews* 30, no. 3 (2005): 195–7; quote at 195.

⁴⁰ Mary Midgley, *Science as Salvation: A Modern Myth and Its Meaning*. London: Routledge, 1992, 108.

The highly accessible and plausible metaphor of knowledge as a map enabled Midgley to find a way of bringing together and holding together different perspectives or angles of approach to a complex reality. Midgley realized she could affirm the ontological unity of reality: there is only ‘one world, but a big one.’⁴¹ Yet alongside this, she could use the image of multiple mappings of this big world to allow it to be more faithfully rendered. Ziman helped her to grasp the

... metaphor of knowledge as the use of maps – not of one map but of a collection of maps, all of them incomplete, which together gradually shape our understanding of a new piece of country. By bringing those maps together and constantly improving them (he said), in time we build up a composite picture which brings us closer and closer to what the outside world is actually telling us. Instead of ambitiously seeking that hotline to final objectivity which our ancestors dreamed of, we work steadily to increase our knowledge by ‘intersubjectivity’ – by supplementing and correcting each other in an endless process of cooperation.⁴²

Midgley thus suggests that we should use multiple maps, each of which is incomplete in itself, in our attempts to make as much sense as we can of our world, and live meaningfully within it.⁴³ Consider an atlas, which provides us with many maps of a region – for example, North America or Europe. But why do we need multiple maps of such landscapes in the first place? Midgley, in dealing with this objection, points out that different maps provide different information about the

⁴¹ Mary Midgley, ‘One World but a Big One’, *Journal of Consciousness Studies* 3 (1996): 500–14.

⁴² Midgley, ‘Mapping Science,’ 196. Note also Dupré’s concerns about a ‘scientific imperialism’ based on a ‘tendency to push a good scientific idea far beyond the domain in which it was originally introduced and often far beyond the domain in which it can provide much illumination.’ John Dupré, *Human Nature and the Limits of Science*. Oxford: Clarendon Press, 2001, 74.

⁴³ Mary Midgley, ‘Pluralism: The Many Maps Model’, *Philosophy Now* 35 (2002): 10–11.

same reality. We need multiple mappings of reality because each such mapping is incomplete, and focusses on some specific question that is being asked.

No map shows everything. Each map concentrates on answering a particular set of questions. Each map ‘explains’ the whole only in the sense of answering certain given questions about it – not others. Each set of questions arises out of its own particular background in life – out of its own specific set of problems, and needs answers relevant to those problems.⁴⁴

Midgley’s point is that there is only ‘one world, but a big one.’⁴⁵ It needs many maps to do justice to its vast scope and range, and to the multiple interests and concerns of those who use those maps. A physical map of Europe, for example, shows us the features of its landscapes. A political map shows the borders of its nation states. The first might be useful to a tourist interested in exploring some scenic mountains and lakes, the second to a refugee seeking asylum.

Each map makes sense of the whole landscape only by answering certain questions about it – and not others. To get an overall view of this complex reality, we refuse to depend solely on any single map, which is necessarily incomplete in itself. Instead, we try to find some way of bringing such maps together, so that their information can be harvested and used. A physical map of North America does not make a political map of that same region irrelevant, in that we need to map both physical and social realities. Each map answers different questions – and each of those questions is important to different groups of users. And perhaps most importantly, these

⁴⁴ Midgley, ‘Pluralism: The Many Maps Model’, 11.

⁴⁵ I here allude to the title of the paper in which she most fully developed this point: Mary Midgley, ‘One World but a Big One.’ *Journal of Consciousness Studies* 3 (1996), 500–14.

maps can be laid over each other, so that they cumulatively disclose more information than they can individually.

So how does Midgley's approach help us to bridge the disciplines? There are two main points. First, this way of thinking about disciplines – or, more accurately, of *visualizing* their relationships – respects the individual integrity of each discipline. It does not require that we see one discipline or conversation partner as having a dominant or privileged role, nor does it demand that we accommodate one discipline to fit the needs of another. Politically, Midgley has displaced an authoritarian intellectual monarchy ruled by a single discipline with a confederation of distinct yet coordinated disciplines. The map generated by each of these disciplines is to be taken with the greatest respect, and treated with integrity; it is, however, assumed to be incomplete. It is part of a greater picture of reality, and does not define that larger picture in itself. It can, however, be laid over other discipline-specific maps, which result from different questions being asked, and different information being provided.

Midgley thus offers us an intellectual framework which informs and encourages interdisciplinary conversations. But what outcomes are to be expected from such discussions? In the final section of this reflection, we shall consider the benefits that arise from such interdisciplinarity, focusing especially on the relation of science and religion.

The Benefits of InterDisciplinarity: The Case of Science and Religion

The natural sciences and religion use quite different methods in their production of knowledge. While this has often been asserted by dogmatic rationalists to demonstrate that they are

incompatible, they are in fact merely *different*.⁴⁶ Every intellectual discipline develops its own distinct method of engagement and criteria of evaluation, developed specifically to deal with its own area of research.⁴⁷ Yet these disciplines may subsequently be brought into conversation with each other, on the working assumption that their insights, though derived in different manners and relating to different aspects of our world, might lead to an enriched understanding of our world life as a whole.⁴⁸

In bringing this paper to a conclusion, I propose to explore the intellectual and cultural value of a dialogue between science and religion. While I have offered a theoretical model which can undergird and inform such interdisciplinary conversations, it is important to appreciate that some scholars believe they can bring together different disciplinary insights without resolving the issue of the ultimate grounds of this process of correlation. A good example of such a pragmatic approach can be found in the writings of Albert Einstein, who affirms the importance of science, religion, ethics and politics to human existence – but does not develop a theoretical model by which these may be correlated.⁴⁹ Einstein thus affirms the importance of science, while noting its inability to engage ethical and existential matters.

⁴⁶ John H. Evans, and Michael S. Evans, 'Religion and Science: Beyond the Epistemological Conflict Narrative.' *Annual Review of Sociology* 34 (2008): 87–105.

⁴⁷ See the extensive discussion in McGrath, *Territories of Human Reason*, 19–74.

⁴⁸ For a variety of approaches to this relationship, see the essays in Fraser Watts and Kevin Dutton (eds.), *Why the Science and Religion Dialogue Matters*. Philadelphia: Templeton Foundation Press, 2006; Alister E. McGrath, *Enriching our Vision of Reality: Theology and the Natural Sciences in Dialogue*. London: SPCK, 2016.

⁴⁹ For discussion, see Max Jammer, *Einstein and Religion: Physics and Theology*. Princeton, NJ: Princeton University Press, 1999. For Einstein's emphasis on conceptual unification, see Jeroen van Dongen, *Einstein's Unification*. Cambridge: Cambridge University Press, 2010.

The scientific method can teach us nothing beyond how facts are related to, and conditioned by, each other. ... The knowledge of what *is* does not open the door directly to what *should be*. One can have the clearest and most complete knowledge of what *is*, and yet not be able to deduce from that what should be the *goal* of our human aspirations.⁵⁰

Einstein's remarks here help us to articulate the importance of interdisciplinarity in allowing us to develop the 'big picture' of life which many psychologists consider to be important to human wellbeing and proper functionality.⁵¹ Yet while empirical sciences may show us the importance of developing an integrated view of life, they cannot determine what specific form this may take.

A 'big picture' approach seeks to do justice to the complexity and interconnectedness of our world, without being overwhelmed by its details. It is about discerning patterns and structures, allowing the underlying coherence and order of our world to be grasped. It is about the integration, not simply the accumulation, of multiple insights. The French mathematician and philosopher of science Henri Poincaré helps us grasp this distinction through his remark that 'science is made with facts, like a house is made with stones, but an accumulation of facts is no more a science than a pile of stones is a house.'⁵² It is not enough to pile up observations and ideas; they need to be held together in a coherent whole. A 'big picture' gathers, coordinates, and synthesizes multiple aspects of life, so that we can see the wholeness of our world, without losing sight of its individual details.

⁵⁰ Albert Einstein, *Ideas and Opinions*. New York: Crown Publishers, 1954, 41–2.

⁵¹ See, for example, Joshua A. Hicks, and Laura A. King, 'Meaning in Life and Seeing the Big Picture: Positive Affect and Global Focus.' *Cognition and Emotion* 21, no. 7 (2007): 1577–84.

⁵² Henri Poincaré, *Science and Hypothesis*. London: Bloomsbury Academic, 2018, 103.

So what needs to be integrated in this way? And how does this help us appreciate the importance of the field of science and religion? A full response to this question lies beyond the scope of this article. However, a representative group of factors will be considered to illustrate the importance of this point. I shall consider the questions of *functionality* (how do things work?), of *moral values* (how should I lead my life?), and *meaning* (what is life all about, and how do I fit in?).⁵³

Most would argue that these questions cannot be answered using a single disciplinary perspective or research method. It is certainly true that writers such as Sam Harris and Richard Dawkins argue that science can provide meaningful and reliable answers to ethical and existential questions; these, however, have faced considerable criticism, not least on account of the circularity of their arguments and their reductive agendas.⁵⁴ The position I shall take is that the questions are properly answered by the natural sciences, moral philosophy, and theology,⁵⁵ while allowing for some degree of interaction across disciplinary boundaries. This highlights the importance, not merely of the *correlation* of disciplinary insights, but of developing a conceptual framework that underlies and gives legitimacy to this process.

⁵³ For such issues, see Roy Baumeister, *Meanings of Life*. New York: Guilford Press, 1991; Michael J. MacKenzie and Roy F. Baumeister, 'Meaning in Life: Nature, Needs, and Myth,' in Alexander Batthyany and Pninit Russo-Netze (eds), *Meaning in Positive and Existential Psychology*. New York: Springer, 2014, 25–38; Roy F. Baumeister and Mark J. Landau. 'Finding the Meaning of Meaning: Emerging Insights on Four Grand Questions.' *Review of General Psychology* 22, no. 1 (2018): 1–10.

⁵⁴ William FitzPatrick, 'Cognitive Science and Moral Philosophy: Challenging Scientistic Overreach,' in de Ridder, Peels, and van Woudenberg (eds.), *Scientism: Prospects and Problems*, 233–57.

⁵⁵ For my own views on how Christian theology shapes issues of meaning, see Alister E. McGrath, 'Christianity,' in Massimo Pigliucci, Skye Cleary, and Daniel A. Kaufman (eds.), *How to Live a Good Life*. New York: Vintage, 2019, 166–82. For a more philosophical perspective, see T. J. Mawson, *God and the Meanings of Life: What God Could and Couldn't Do to Make Our Lives More Meaningful*. London: Bloomsbury Academic, 2016.

In bringing this essay to a close, we shall briefly consider four frameworks that have found wide use, and assess their merits. Science and religion can be seen as offering different maps of reality; as providing different perspectives on reality; as engaging reality at different levels; and as representing distinct ‘books’ that can be read alongside one another.⁵⁶ Each of these assumes that we are encountering and seeking to represent a single reality, but recognizes both the complexity of that reality, and the need for representations that mirror that complexity, rather than selectively reduce and simplify it. Ontological economy may have some virtues; it unquestionably has its vices.

This process of grasping the complex interconnected structure of our scientific and spiritual worlds clearly lies beyond the capacity of any one discipline. It involves the creation of a mental map of reality which enables us to *imagine* such a complex yet coordinated reality, and thus explore the nature and implications of its interconnections. We need to generate a ‘big picture’ of reality, which is capable of coordinating its multiple aspects. My own understanding of how we can correlate science and religion rests partly on a classical ontology, such as that set out in the second chapter of Aristotle’s *Categories*, and more recently defended by Jonathan Lowe:

Reality is one and truth indivisible. Each special science aims at truth, seeking to portray accurately some part of reality. But the various portrayals of different parts of reality must, if they are all to be true, fit together to make a portrait which can be true of reality as a whole. No special science can arrogate to itself the task of rendering mutually

⁵⁶ For further reflections on such approaches, see Alister E. McGrath, ‘Multiple Perspectives, Levels, and Narratives: Three Models for Correlating Science and Religion,’ in Louise Hickman and Neil Spurway (eds.), *Forty Years of Science and Religion*. Newcastle: Cambridge Scholars, 2016, 10–29.

consistent the various partial portraits: that task can alone belong to an overarching science of being, that is to ontology.⁵⁷

No single ‘portrayal’ of reality is adequate in itself; it is rather a snapshot that is only part of a panoramic vision of reality, incorporating multiple portrayals.

The four imaginative frameworks I shall explore in what follows are best seen not as precise accounts of this relationship, but rather ways of envisaging it, allowing possible modes of interaction and correlation to be grasped and pursued. None is ‘right’, in that these are imaginative frameworks that are developed and deployed to better envisage and enfold a complex intellectual landscape. Each has its merits; they are all compatible, so that there is no obligation to choose only one of these approaches, and discard or disregard the others. From a religious standpoint, each allows the natural sciences to be treated as a potential dialogue partner, without becoming ensnared in the reductionist and colonialist agendas of scientism.

1. *Different Perspectives*. This approach invites us to imagine how a complex structure appears from different angles. Charles A. Coulson, for example, invited his readers to imagine walking round the Scottish mountain Ben Nevis, which looks very different when seen from different angles.⁵⁸ A total account of the structure requires the integration of multiple perspectives, in that

⁵⁷ E. J. Lowe, *The Four-Category Ontology: A Metaphysical Foundation for Natural Science*. Oxford: Clarendon Press, 2006, 4. Following Aristotle, Lowe here sets out a four-category ontology which recognizes two fundamental categorial distinctions: the particular and the universal on the one hand, and the substantial and the non-substantial on the other. The approach I follow in this chapter does not depend on Lowe’s specific ontological formulation, which is based on Aristotle’s. For a critique of Lowe’s approach, see Ludger Jansen, ‘Dispositions, Laws, and Categories: A Critical Study of E. J. Lowe’s *The Four-Category Ontology*.’ *Metaphysica* 8, no. 2 (2007): 211–20.

⁵⁸ Charles A. Coulson, *Christianity in an Age of Science*. London: Oxford University Press, 1953, 20–1.

all are significant elements of the greater whole. This approach stresses the importance of offering a comprehensive account of reality, and notes the danger of reductive elimination by focusing only on one perspective.

2. *Different Levels*. A second approach recognizes that both the natural sciences and religion are stratified – that is, that they are multilayered, and can be engaged at different levels.⁵⁹ In recent years, much attention has been paid to the different ‘levels’ at which scientific explanation functions. This approach treats both scientific and religious realities as multi-levelled, with each layer or stratum requiring its own distinct form of investigation,⁶⁰ and encouraging reflection on how these insights might be correlated to give a larger overall account of reality.⁶¹

3. *Different Maps*. As noted earlier in this essay, Mary Midgley developed the notion of ‘mapping’ reality as a means of confronting a tendency towards inappropriate reductionism. Science and religion can both be thought of as mapping their distinct territories,⁶² and allowing their key ideas and themes to be identified and correlated. Just as the superimposition of maps can allow the correlation of physical and political realities, mapping the domains of science and religion both preserves their essential features, while facilitating their colligation.

⁵⁹ On the specific case of religion, see Aku Visala, ‘Explaining Religion at Different Levels: From Fundamentalism to Pluralism,’ in Roger Trigg and Justin L. Barrett (eds.), *The Roots of Religion: Exploring the Cognitive Science of Religion*. London: Routledge, 2016, 55–74.

⁶⁰ E.g., see Angela Potochnik, ‘Levels of Explanation Reconceived.’ *Philosophy of Science* 77, no. 1 (2010): 59–72; Peter Fazekas and Gergely Kertész, ‘Causation at Different Levels: Tracking the Commitments of Mechanistic Explanations.’ *Biology and Philosophy* 26 (2011): 365–83.

⁶¹ For an excellent example of this approach, see George Ellis, *How Can Physics Underlie the Mind? Top-Down Causation in the Human Context*. Heidelberg: Springer, 2016.

⁶² See especially Harrison, *The Territories of Science and Religion*.

4. *The Two Books*. Finally, we should note the great Renaissance metaphor of the natural world and the Christian Bible as ‘God’s Two Books’ – distinct in character, yet sharing the same author, and capable of being read side by side to yield mutual illumination.⁶³ The metaphor of the ‘Two Books of God’ is grounded in the belief that the God who created the world is also the God who is disclosed in and through the Christian Bible, thus encouraging the idea that the scientific study of nature would enrich the believer’s appreciation of the beauty and wisdom of God as creator.

Each of these imaginative frameworks can be amplified to take account of various specific concerns of the individual natural sciences and of theologians. While each has its distinct identity and strengths, they are to be seen as ways of achieving a broad visualization of a relationship, rather than a precise account of its multiple aspects. For example, the boundary between ‘perspectives’ and ‘levels’ is more fluid than is sometimes appreciated.⁶⁴ It should be recalled

⁶³ Kenneth J. Howell, *God’s Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science*. Notre Dame, IN: University of Notre Dame Press, 2002; Giuseppe Tanzella-Nitti, ‘The Two Books Prior to the Scientific Revolution.’ *Annales Theologici* 18 (2004): 51–83; Constant J. Mews, ‘The World as Text: The Bible and the Book of Nature in Twelfth-Century Theology,’ in Thomas J. Heffernan and Thomas E. Burman (eds.), *Scripture and Pluralism: Reading the Bible in the Religiously Plural Worlds of the Middle Ages and Renaissance*. Leiden: Brill, 2005, 95–122; Rob Iliffe, ‘Newton, God, and the Mathematics of the Two Books,’ in Snezana Lawrence and Mark McCartney (eds.), *Mathematicians and Their Gods: Interactions between Mathematics and Religious Beliefs*. Oxford: Oxford University Press, 2015, 121–44; Alister E. McGrath, *Re-Imagining Nature: The Promise of a Christian Natural Theology*. Oxford: Wiley-Blackwell, 2016, 78–87.

⁶⁴ Note the discussion in Alexander Rueger, ‘Perspectival Models and Theory Unification.’ *British Journal for the Philosophy of Science* 56 (2005): 579–94. Note also the points made by Margaret Morrison, ‘One Phenomenon, Many Models: Inconsistency and Complementarity.’ *Studies in History and Philosophy of Science Part A* 42, no. 2 (2011): 342–51.

that the origins of linear perspective at the time of the Renaissance arose from an artistic desire to be able to convey depth in drawings, thus enabling two-dimensional representation of a three-dimensional reality.⁶⁵

Conclusion

This essay has mapped out some issues and approaches relating to interdisciplinary dialogue and discussion, focusing on the field of science and religion. There is no doubt of the importance of such a dialogue. Although I have been critical of Edward O. Wilson's approach in his *Consilience*, he has clearly identified the problem which makes such a dialogue so important – namely, the need to be able to make connections across disciplines in the quest for meaning and a proper understanding of the human situation. 'We are drowning in information, while starving for wisdom.'⁶⁶ As Wilson rightly points out, science and religion remain major elements of our culture; they need to talk meaningfully to each other in our shared quest for wisdom. Careful studies of the nature of wisdom suggests that one of its core capacities is to hold potentially conflicting ways of thinking together in a creative tension, welcoming the virtues that this brings.⁶⁷ This paper has aimed to provide a modest yet workable intellectual framework to enable and encourage such a productive conversation.

⁶⁵ Rudolf Arnheim, *Art and Visual Perception: A Psychology of the Creative Eye*. Berkeley CA: University of California Press, 2004.

⁶⁶ Wilson, *Consilience*, 294.

⁶⁷ For a useful introduction to this field, see Dilip V. Jeste and Ellen E. Lee, 'The Emerging Empirical Science of Wisdom: Definition, Measurement, Neurobiology, Longevity, and Interventions.' *Harvard Review of Psychiatry* 27, no. 3 (2019): 127–40.