Part I

READING THE FOURTH DIMENSION

Chapter One

IMAGINING 'SOMETHING PERFECTLY NEW': PROBLEMS OF LANGUAGE, CONCEPTION AND PERCEPTION

Ezra Pound's call to his contemporaries to 'make it new', although suggesting avant-garde intent, was actually part of a concentrated interest in 'the new' in Anglo-American culture and is traceable as far back as at least the 1880s.[1] As Holbrook Jackson observed in 1913, the popularity of the adjective new grew during the fin de siècle.[2] Writing of the New Realism in 1897, H. D. Traill claimed that 'not to be new is, in these days, to be nothing'.[3] Other notable examples of the vogue of the new are the New Spirit, the New Drama of Ibsen and, of course, the New Woman. It is not surprising then that a 'new geometry' would appeal to this generation of writers and thinkers.[4] It is in this context that we should consider Charles Howard Hinton's hyperspace philosophy, which was first fully expressed in *A New Era of Thought* (1888). In this book he promised to 'bring forward a complete system of four-dimensional thought – mechanics, science, and art'.[5] While Hinton did not live to complete this system, his belief in the applicability of 'four-dimensional thought' across multiple discourses was appropriate: the history of the concept of the spatial fourth dimension is a history of movement. It is also part of the shared history of modernism.

The rise of non-Euclidean geometry in the second half of the nineteenth century served to emphasize the contingency of even mathematical knowledge, pushing debates about the relativity of knowledge to the forefront in a way that must have been particularly distressing for conservative thinkers. Euclid's axioms, which had remained largely uncontested for nearly two thousand years, were no longer sacrosanct. 'The argument concerning the relativity of knowledge is absolutely necessary to the emergence of modernism,' Gillian Beer correctly explains, finding 'the cognate confusion between method and findings' in late Victorian mathematics and physics particularly suited for uncovering

1 Pound first used this phrase in *The Cantos*. However, he borrowed this slogan from Cheng Tang, the founder of the Shang dynasty. Thus, while this phrase is associated with an earlier 'break' with the past, it is also a call for renewal, or recurrence with variation. See Sun, 'Pound's Quest for Confucian Ideals', 96–119.

2 Jackson, *The Eighteen Nineties*, 23.

3 Traill, *The New Fiction*, 1.

4 Non-Euclidean geometry is described as the 'new geometry' as early as 1865; German mathematician Julius Plücker lectured 'On the New Geometry of Space' to the London Royal Society in February of that year. However, the term was not used frequently until the 1890s.

5 Hinton, *A New Era*, 86.

connections with 'proto-modernist texts'.[6] The first part of the present chapter traces the movement of the concept of the fourth dimension from its origins in analytical geometry to its leap to narrativization via the dimensional analogy; in the second part I consider Hinton's particular interpretation of the fourth dimension in light of his early intellectual influences, including James Hinton, Ruskin and Kant.

The New Geometries

In *The Fourth Dimension and Non-Euclidean Geometry in Modern Art*, Linda Dalrymple Henderson connects the shift from high Victorian realism to more abstract forms of art, generally described as modernist, to a similar shift in late nineteenth-century geometry.[7] However, more was at stake in the challenge the new geometries presented to Euclid than aesthetics or mathematics. Alice Jenkins has uncovered the hidden dimension of class politics in Euclidean geometry, noting how in the early nineteenth century 'mathematics held an immensely privileged status in the European concept of education, and at the root of its status lay the classical study of geometry'.[8] Knowledge of classical languages and higher mathematics was the hallmark of the Oxbridge-educated male, and debates around the utility of Euclidean geometry in education and the applied sciences were necessarily underpinned by questions of class. At the polar ends of this debate were the classicists, who argued that the study of geometry was fundamental for developing the faculty of reason, and those who argued that the importance of higher mathematics in education and culture was greatly overemphasized by the privileged classes. 'In between these two positions', Jenkins observes,

> were more moderate views which broadly supported the study of geometry but sought to divest it of its aura of privilege and inaccessibility by teaching in such a way as to emphasize practical rather than abstract reasoning (and thus, to the adherents of the Euclidean method, denuding it of most of its benefit to the learner).[9]

Educational reform debates continued into the second half of the century, and it was clear which side was winning when T. H. Huxley began to emphasize the importance of early education in the physical sciences over abstract mathematics. In his address to the Liverpool Philomathic Society in 1868 (later published in *Macmillan's Magazine*), Huxley lamented the lack of practical scientific training in primary and secondary education. According to Huxley, the wealth and health of the nation depend on early scientific training, and this training must be practical, not abstract, 'bringing […] the mind directly into contact with fact, and practising the intellect in the completest form of induction; that is to say, in drawing conclusions from particular facts made known by immediate observation of nature'.[10] The study of mathematics would not offer the same kind of

6 Beer, *Open Fields*, 303.
7 Henderson, *The Fourth Dimension*, 98.
8 Jenkins, *Space*, 166.
9 Ibid., 167.
10 Huxley, 'Scientific Education', 182.

discipline: 'mathematical training is almost purely deductive. […] There is no getting into direct contact with natural fact by this road'.[11]

With the tide turning in favour of practical scientific training, mathematicians such as James Joseph Sylvester sought to defend mathematical training by adapting and subverting Huxley's argument. The classicist Euclideans were losing the battle: in his 1869 address to the Mathematical and Physical Section of the British Association for the Advancement of Science (BAAS), even Sylvester claimed he would like to see 'Euclid honourably shelved or buried […] out of the schoolboy's reach'.[12] Nevertheless, he directly challenged Huxley's claim that 'mathematical training is almost purely deductive':

> Mathematical analysis is constantly invoking the aid of new principles, new ideas, and new methods, not capable of being defined by any form of words, but springing direct from the inherent powers and activity of the human mind, and from continually renewed introspection of that inner world of thought of which the phenomena are as varied and require as close attention to discern as those of the outer physical world […]: that it is unceasingly calling forth the faculties of observation and comparison, that one of its principal weapons is induction, that it has frequent recourse to experimental trial and verification, and that it affords a boundless scope for the exercise of the highest efforts of imagination and invention.[13]

The shift in tone is subtle but important: within this plea for the recognition of the value of introspection in scientific education, Sylvester adopts the very terms of Huxley's argument that inductive reasoning is superior to deduction. Its place no longer assured in the highest reaches of intellectual respectability (or the foundations of educational training), mathematics is legitimized here as an analogue to the natural sciences: Sylvester even went so far as to describe Arthur Cayley as 'the central luminary, the Darwin of the English school of mathematicians'.[14]

We should consider Hinton as an inheritor of this shifting debate: although the fourth spatial dimension was accepted by most reputable mathematicians and scientists as purely theoretical, Hinton argued for the discernment of higher space through practical training. His hyperspace philosophy, although dealing with what many would call abstract space, was the product of these attempts to emphasize the practical applications of geometry and confusions arising from the increasingly specialized and abstract nature of mathematical, particularly algebraic, discourse. Sylvester's address demonstrates how the climate was ripe for the confusion of abstract terms with practical applications. After lamenting that even 'authorized' English writers such as William Whewell, G. H. Lewes and Herbert Spencer conflate the terms 'reason' and 'understanding', or 'Vernunft' and

11 Ibid.

12 Sylvester, 'A Plea', 2: 261. Sylvester clarifies that 'I have used the word mathematics in the plural; but I think it would be desirable that this form of word should be reserved for the applications of the science, and that we should use mathematic in the singular number to denote the science itself' (262).

13 Sylvester, 'A Plea', 1: 237.

14 Ibid., 238.

'Verstand', Sylvester celebrated the unification of the 'matter and mind' of the various branches of mathematics:

> Time was when all the parts of the subject were dissevered, when algebra, geometry, and arithmetic either lived apart or kept up cold relations […]; but that is now at an end; they are drawn together and are constantly becoming more and more intimately related and connected by a thousand fresh ties, and we may confidently look forward to a time when they shall form but one body with one soul.[15]

Hinton's fourth dimension arose from the conflation of algebraic terminology and descriptive geometry. For example, in seeking to find the geometric figure corresponding to x^4, Hinton coined the term 'tesseract', indicating a four-dimensional analogue to the cube, or x^3.

When Hinton came of age, non-Euclidean geometry was just reaching popular scientific discourse. Although non-Euclidean geometry was simultaneously and independently 'discovered' by Johannes Bólyai and Nicholai Lobachevskii in the 1820s, it did not enter mainstream mathematics in Britain until 40 years later. At this time in curriculum reform debates, the classicist Euclidean method was under attack. Jonathan Smith observes:

> In a country where a staple of education from the lower forms to the universities was the study of Euclid's *Elements*, the development of different geometries and the contention that space may not be Euclidean and three-dimensional could not help but capture public attention.[16]

Smith's grouping of Euclidean and three-dimensional geometry also illustrates the way the public conflated non-Euclidean geometries with the theory of the fourth dimension. From the 1870s onward, a growing body of specialist and popular literature that addressed the new geometries often combined the concepts of the fourth dimension and *n*-dimensional spaces with non-Euclidean geometry. Although the possibility of *n*-dimensional spaces was only one idea raised within specialist discussions of non-Euclidean geometry, it soon became representative of these new geometries to popular audiences. For many, the concept of *n* dimensions itself was understood as the theory of the fourth dimension of space. While most specialists understood the difference, as K. G. Valente has shown, these mathematicians often unintentionally implied a relationship between non-Euclidean, curved models of space and the fourth dimension. Hermann von Helmholtz, W. K. Clifford and other mathematicians,

> as part of their mission to disseminate radically new geometric epistemologies to a wider audience […] often asked their readers to contemplate the limited understanding that beings living on the two-dimensional surface of a sphere would have of the curved geometry of their world […]. This illustrative scenario was meant in part to show how one could understandably mistake our space as Euclidean […] based on small-scale experiences or observations. It gave rise, however, to a commonly held misconception […]. Consequently, promoting

15 Ibid., and Sylvester, 'A Plea', 2: 262.
16 Smith, *Fact and Feeling*, 180.

> non-Euclidean or Riemannian models of space in the 1870s simultaneously, if unintentionally, served to draw attention to the fourth dimension.[17]

In this way, the fourth dimension came to be associated with both non-Euclidean geometries and *n*-dimensional geometries.

N-dimensional (or sometimes, '*p*-dimensional') spaces had more or less than three dimensions and were considered to be purely analytical and abstract by most mathematicians and scientists. The potential for reification of these terms occurred in the shift from the analytical language of algebra to the more descriptive language of geometry. In her study of Victorian geometry, Joan Richards explains this difference: 'Geometrical arguments are clearly more descriptive than analytical [algebraic] ones. To argue that a proof involving circles requires a conception of space is much easier than arguing that an analytical demonstration involving *a* and *b* requires an understanding of number.'[18] The concept of the fourth dimension of space grew out of a slippage between these discourses; it was the result of a hypostasization of abstract symbols such as x^4.

The potential for such slippage was present in the writings of Victorian geometers, as Richards shows in an example taken from an 1866 essay by the mathematician George Salmon, 'On Some Points in the Theory of Elimination':

> The question now before us may be stated as the corresponding problem in space of *p* dimensions. But *we consider it as a purely algebraical question, apart from any geometrical considerations.* We shall however retain a little of the geometrical language, both because we can thus avoid circumlocutions, and also because we can more readily see how to apply to a system of *p* equations, processes analogous to those which we have employed in a system of three.[19]

In this passage, Salmon was specific that he was not referring to an actual space of *p* dimensions; rather, he was considering a purely formal problem. For him, the language of descriptive geometry was simply a matter of convenience. However, Richards observes, although Salmon was clear that 'he was just using a figure of speech […] Cayley was less explicit on this point'.[20] This ambiguity on Cayley's part did not pass unnoticed by other British mathematicians. In his 1869 address to the BAAS cited above, Sylvester actually made the jump from an abstract treatment of *n* dimensions to a suggestion of the 'reality of transcendental space' of four or more dimensions.[21]

As Richards notes, Sylvester's support for the reality of higher spatial dimensions was 'rather circuitous'.[22] Rather than attempt to illustrate his own conception of four or more dimensions, Sylvester cited Gauss and Cayley as key supporters. Additionally, in a

17 Valente, 'Who Will Explain the Explanation?', 130.
18 Richards, *Mathematical Visions*, 39.
19 Salmon, quoted in *Mathematical Visions*, 54, emphasis added. The essay originally appeared in an 1866 issue of the *Quarterly Journal of Pure and Applied Mathematics*. Salmon's choice of the variable *p* is arbitrary and interchangeable with *n*.
20 Richards, *Mathematical Visions*, 55.
21 Sylvester, 'A Plea', 1: 238.
22 Richards, *Mathematical Visions*, 56.

footnote he mentioned Clifford in conjunction with speculations about the fourth dimension, suggestively remarking:

> If an Aristotle or Descartes, or Kant assures me that he recognises God in the conscience, I accuse my own blindness if I fail to see him. If Gauss, Cayley, Riemann, Schalfi, Salmon, Clifford, Krönecker, [*sic*] have an inner assurance of the reality of transcendental space, I strive to bring my faculties of mental vision into accordance with theirs.[23]

Embedded within this gratuitous name-dropping is a circular sort of logic, a finessing of the absence of origin in line with Baudrillard's simulacrum, 'the generation by models of a real without origin or reality' that results in 'a hyperreal'.[24] To understand how the fourth dimension moved from being a figure of speech in analytical geometry to hyperreal hyperspace, we must consider flatland narratives of lower-dimensional spaces, or, what is more appropriately called the dimensional analogy.

The Dimensional Analogy

The dimensional analogy begins as a thought experiment, where the writer asks the reader to imagine a flat or two-dimensional world complete with living, intelligent, two-dimensional beings, in order to then imagine the relationship between our world and a four-dimensional one. The most famous of dimensional analogies is the one expressed by Edwin Abbott in his 1884 novella, *Flatland: A Romance of Many Dimensions*. *Flatland* serves as a useful point of reference – although the first example of a dimensional analogy in print was Gustav Theodor Fechner's semi-comical essay 'Der Raum Hat Vier Dimensionen' in 1846, Abbott's is the most popular (and detailed) treatment of the dimensional analogy within an individual text.

Flatland is divided evenly into two parts. The first part of this text, titled 'This World', develops and represents this two-dimensional world; the second part, titled 'Other Worlds', completes the analogy by exploring the relationship between Flatland and worlds of other dimensions, such as Spaceland, Lineland and Pointland. Thus, the entire text of *Flatland* is dedicated to working out the dimensional analogy. The dimensional analogy is important for two reasons: firstly, because it is a recurring trope in all hyperspace philosophy and popular four-dimensional fiction I have encountered. Indeed, the trope is so familiar to the subject that by 1910, Paul Bold, in his short story 'The Professor's Experiments', had refined it down to a brief explanation from the titular professor:

> Well then, in the first place we exist in a land of three dimensions – length, breadth, height – and we can ordinarily conceive of no extra or fourth dimension. But we can conceive of beings in the *lower* dimensions, and a being in two dimensions would know of length and breadth, and would have no conception of height; planes or plane surfaces would be the limit of his knowledge, and the third dimension would be as unthinkable to him as the fourth

23 Sylvester, 'A Plea', 1: 238.
24 Baudrillard, *Simulations*, 2.

> dimension is to us. Again, a being in one dimension would only know of length; both breadth and height would be unthinkable. Do you follow?[25]

That the professor is able to relay the dimensional analogy so briefly is a testament to the familiarity of this device by the early years of the twentieth century.[26]

Second, the dimensional analogy is important because for hyperspace philosophers such as Hinton, it is the device through which the spatial fourth dimension is actually *created*. For those who did believe in the material existence of a higher dimension, the dimensional analogy was not only the means by which this idea was communicated; it was an important tool in locating, describing and even experiencing hyperspace. This is why, although it deployed the dimensional analogy and addressed the fourth dimension, *Flatland* is most accurately situated outside of hyperspace philosophy. As was recognized by some of his contemporaries – and more recently by literary critics – Abbott was not as concerned with popularizing the fourth dimension here as he was with satirizing contemporary English culture.[27]

Additionally, some critics have read *Flatland* as a result of the Reverend Abbott's 'opportunistic desire to reconcile science and theology', in utilizing the challenge to scientific materialism offered by the new geometries.[28] As Hinton wrote in 1885, he would have liked to recommend the dimensional analogy of *Flatland* to his readers as an instructive example, but

> turning over its pages again, I find that the author has used his rare talent for a purpose foreign to the intent of our work. For evidently the physical conditions of life on the plane have not been his main object. He has used them as a setting wherein to place his satire and his lessons. But we wish, in the first place, to know the physical facts.[29]

Here Hinton underlined the key difference that he saw between his work and Abbott's: Abbott deployed the analogy of a two-dimensional world to direct the reader's attention to the social conditions of our own, three-dimensional world. Hinton, by contrast, wanted to us to consider 'the physical conditions of life on the plane' as a means to finding a strategy for perceiving, 'perchance a help to the comprehension of a higher life' in 'the mysterious minute actions by which [we are] surrounded' in our three-dimensional world.[30] Hinton used analogy to hypothesize and make observations about

25 Bold, 'The Professor's Experiments', 257, original emphasis.

26 See also Manning, ed., *The Fourth Dimension Simply Explained*. The majority of these essays rely – explicitly or not – on Hinton's work. In fact, Einstein used a refined version of the dimensional analogy to explain his own theories the nonscientific reader in 1938. See Einstein and Infeld, *The Evolution of Physics*.

27 For nineteenth-century critics see Tucker, 'Review of "Flatland"'; and Hinton, below; for recent literary criticism that addresses Abbott's use of satire, see Jann's introduction to *Flatland*, vii–xxxiii; and Smith, Berkove and Baker, 'A Grammar of Dissent', 129–50.

28 Valente, 'Transgression', 74. See also Jann, 'Abbott's "Flatland", 473–90.

29 Hinton, 'A Plane World', *Scientific Romances*, 129.

30 Ibid., 156.

nature and the act of perception. Perhaps rather paradoxically, by positioning himself as a scientist and speculative philosopher rather than an author, Hinton used the dimensional analogy as means of experimentation and creation, instead of treating it simply as a tool of description.[31]

This difference is one I will continue to highlight throughout this study: in writing a work of satire, Abbott self-consciously used the dimensional analogy as the foundation for a fiction that is ultimately designed to deflect the reader's attention back outward to the social and cultural struggles of the lived, three-dimensional world. In this sense, *Flatland* relies on 'science' as a foundation for its fiction, performing a function similar to that of much traditional science fiction. As a scientific romancer, Hinton used analogy to create the fiction of the fourth dimension; this is a space that is literally engendered by the manipulation of mathematical symbols. Hinton's fourth dimension is the result of accidental and partial movements of terms across the discourses of algebra, geometry and physics.

We see a similar movement in the 'new' psychology of the second half of the Victorian period: Alexander Bain and Herbert Spencer based their explanations of the functions of the nervous system on an analogy with physical theories of force. These theories were attacked on the grounds that they mistook analogy for fact, and 'refused to accept force as merely a mathematical function devised by physicists to aid understanding of matter in motion'.[32] As Rick Rylance notes, theories supported solely by analogy, such as Bain's, 'have a cogency in principle, but are difficult to sustain in detail'.[33] It is in the attempt to flesh out the details of the dimensional analogy that Hinton's version of the fourth dimension is created. At work here is 'the speculative, argumentatively-extended character of analogy' in which, as Beer observes, 'the arc of desire seeks to transform the conditional into the actual'.[34] In the hands of hyperspace philosophers such as Hinton, the dimensional analogy became a transformational and revelatory device.

However, before we explore Hinton's use of this device, it is necessary to examine the development of the dimensional analogy over the forty years preceding his work. In exploring the development of the dimensional analogy from Gustav Fechner onward, I highlight the hypostasization of the terms of analytic algebra into descriptive geometry, which then led to what Hinton called 'scientific romance'.[35]

Before Hinton: The Fourth Dimension 1846–1880

In his 1846 essay, Fechner wrote: 'One imagines a small, colourful little man who walks around in a camera obscura on the paper; here one has a being that exists in two

31 For just a few examples, see Beer, *Darwin's Plots*, 73–96; Bohm and Peat, *Science, Order and Creativity*; Papin, 'This Is Not a Universe'; and Arbib and Hesse, *The Construction of Reality*, 147–71.

32 Smith, 'Physiological Psychology and the Philosophy of Nature', quoted in Rylance, 179.

33 Rylance, *Victorian Psychology*, 180.

34 Beer, *Darwin's Plots*, 79.

35 See also Throesch, 'Nonsense in the Fourth Dimension'.

dimensions'. This two-dimensional being has no comprehension of the extra dimension of space, depth, that extends upward and downward from his photosensitive paper. If the philosophical possibility of a third dimension of space even occurred to this 'little man', he would decide that its material existence was impossible. 'Nevertheless', Fechner remarked, 'there exists this third dimension'.[36] Fechner continued, arguing that this little man is in fact representative of humanity with its three-dimensional prejudices: 'We are only little colourful men and little shadow men in three dimensions instead of two'.[37] As the two-dimensional being in the camera is oblivious to the three-dimensional world that human beings inhabit, Fechner argued, so are humans oblivious to the fourth dimension of space.

Strikingly, as Alexander L. Taylor observed in 1952, Fechner's version of the dimensional analogy anticipates animated film: 'At each moment we have a cross-section of this larger [four-dimensional] reality of which we know nothing, any more than, shall we say, Donald Duck, were he conscious, would know of the world beyond his screen'.[38] Taylor's language here exemplifies how the dimensional analogy functions; replacing the two-dimensional camera manikin with a Disney character, he directly implicates his audience in the analogy, referring to the reader as 'we', the three-dimensional beings, are now part of the fiction. Disturbingly, this analogy also implies the possibility that we, too, are being watched by hyper-beings, something Hinton explicitly addressed in the first series of his *Scientific Romances*.

Fechner was not the only one interested in imagining two-dimensional worlds during the decades before Hinton began writing; in fact, he may have borrowed this idea from fellow German mathematician, Carl Friedrich Gauss.[39] In Gauss's biography, published shortly after his death, Sartorius von Waltershausen recalled that Gauss frequently employed a similar analogy in lectures and conversations. Writing in an 1869 issue of *Nature*, Sylvester noted that Gauss often remarked that 'as we can conceive beings (like infinitely attenuated book-worms in an infinitely thin sheet of paper) which possess only the notion of space of two dimensions, so we may imagine beings capable of realising space of four or a greater number of dimensions'.[40] Henderson identifies Sylvester's article as 'a more direct impetus to the rise of English speculation on the number of

36 Fechner, *Vier Paradoxa*, 24, my translation. I do not offer a direct translation here; literally, Fechner asks the reader to imagine 'ein kleines buntes Männchen [a little, coloured man]'. In deviating from the original text, I am trying to clarify Fechner's intentions. He is asking the reader to imagine a 'real', living, two-dimensional character whose total realm of experience consists of the light-sensitive plate within the camera. I speculate he describes the manikin as 'coloured' is in order to render it more lifelike, as opposed to the black-and-white negative image of the contemporary calotype.

37 Ibid., 25.

38 Taylor, *The White Knight*, 90.

39 In a manner similar to the independent, concurrent formulations of the theory of evolution by natural selection developed by Charles Darwin and Alfred Russell Wallace, Gauss, along with Johannes Bólyai and Nicholai Lobachevski, 'discovered' non-Euclidean geometry.

40 Sylvester, 'A Plea', 1: 238.

dimensions of space' than Fechner's; indeed, the dimensional analogy began to appear frequently in British scientific journals during the 1870s.[41]

The dimensional analogy became entangled in debates between empiricists and idealists concerning the psychology of space perception. In 1870, Helmholtz first employed the dimensional analogy in an attempt to clarify the slippage in terminology that was already occurring. Updating this discussion of curved and *n*-dimensional spaces six years later, he reiterated:

> To prevent misunderstanding I will once more observe that this so-called measure of space-curvature is a quantity obtained by purely analytical calculation and that its introduction involves no suggestion of relations that would have a meaning only for sense-perception.[42]

The language here carefully notes that Helmholtz was speaking only in analytical terms and did not intend to attribute any kind of descriptive value to this example. However, in this same article he challenged Kant's claim that the axioms of Euclidean geometry 'are necessary consequences of an *a priori* transcendental form of intuition', arguing that Kant was incorrect because we are able to represent other coherent and non-Euclidean systems of geometry for various curved spaces, as he had just demonstrated.[43] In this, Helmholtz was clearly attacking the idealists, because – as a result of the new geometries – 'it cannot be allowed that the axioms of our geometry depend on the native form of our perceptive faculty, or are in any way connected with it'.[44]

For Hinton and other proponents of the fourth dimension, the path lay somewhere between Helmholtz's empiricism and Kantian idealism. Rather than discard the Kantian a priori wholesale, Hinton retained the framework: recognition of the fourth dimension was, for him, a means of developing and expanding human consciousness. His hyperspace philosophy was founded on Kant's claim that space is the means by which the mind encounters the real; if true, then conceiving and perceiving higher dimensions would allow the mind to develop higher aesthetic and ethical sensibilities.

However, Hinton challenged Kant's claim

> that complete space […] has three dimensions, and that space in general cannot have more is built on the proposition that […] cannot be shown from concepts, but rests immediately on intuition, and indeed, because it is apodictically certain, on pure intuition *a priori*.[45]

Not only did Hinton propose four dimensions, but in his second series of *Scientific Romances*, he raised the possibility of an unlimited number of dimensions.[46]

The complex challenge to the Kantian a priori posited by proponents of the new geometries was aptly described by F. C. S. Schiller in 1896:

41 See also Blacklock, 'Analogy and the Dimensional Menagerie'.
42 Helmholz, 'The Origin and Meaning', 308. See also Helmholtz, 'The Axioms of Geometry'.
43 Helmholz, 'The Origin and Meaning', 314.
44 Ibid., 318.
45 Kant, *Prolegomena*, 40–41.
46 See Hinton, 'Many Dimensions', *Scientific Romances*, 27–44.

> At a cursory glance it might indeed seem as though the new geometry afforded a welcome support to the Kantian position. If Euclidean geometry alone could prove the possibility of synthetic judgements *a priori*, […] surely now that it is reinforced by two or more sister sciences, a boundless extension of our *a priori* knowledge might reasonably be anticipated. Unfortunately it proves a case of 'too many cooks' […]. Just as the *de facto* existence of geometry seemed to Kant to prove the possibility of an *a priori* intuition of Space, so the *de facto* existence of metageometry [i.e., non-Euclidean geometries] indicates the derivative nature of an intuition Kant had considered ultimate.[47]

The introduction of geometries based on non-Euclidean spaces causes the Kantian a priori to deconstruct itself, revealing its derivative nature and status as artefact. Schiller wondered whether the outcome of this deconstruction was still too 'inchoate and chaotic for its full significance to be determined'.[48] One way of resolving the chaos would be to replace Kant's three-dimensional apodictic certainty with a four-dimensional analogue. A superficial reading of Hinton, particularly his early writings, might allow one to conclude that he is doing just this.

It would be easy to read Hinton's fourth dimension as simply a tweaking of Kantian idealism, perhaps in response to the threat posed by the new geometries. However, in exploring Hinton's œuvre, we will find something more complex at the heart of his hyperspace philosophy, a – to borrow Rick Rylance's phrase – 'gradual conceptual consolidation of multiple sources'.[49] These sources included not only the new geometries and Hinton's immediate personal acquaintances, but current debates in physics, aesthetics and ethics. These sources and discourses are consolidated and expressed within Hinton's hyperspace philosophy as a particular concern with the gap between external reality and internal experience and the role of the creative will in bridging this gap.

For Hinton the gap between external and internal was intimately intertwined with the question of the relationship between experience and intuition, of – in William James's terminology – 'percepts and concepts'.[50] Like William James, Hinton worked on the assumption that 'percepts and concepts interpenetrate and melt together, impregnate and fertilize each other. Neither, taken alone, knows reality in its completeness'.[51] Concepts, though they may become increasingly abstract, originate in perception, and in order to be truthful (in James's pragmatic sense), they must in turn impact perception in a manner that modifies both. Thus, Hinton treated his fourth dimension as a concept. The problem, of course, was the apparent lack of evidence for the origin of this concept in perception. George Henry Lewes voiced the opinion of many sceptics when he argued that while non-Euclidean geometry (including the fourth dimension) 'may be thoroughly consistent, and ideally true', the manipulation of abstract mathematical symbols, though done logically and consistently, does not support 'the legitimacy of extending any of its conclusions beyond that [abstract] sphere'.[52]

47 Schiller, 'Non-Euclidean Geometry', 178–79.
48 Ibid., 174.
49 Rylance, *Victorian Psychology*, 169.
50 W. James, *Writings, 1902–1910*, particularly 1007–39.
51 Ibid., 1010.
52 Lewes, 'Imaginary Geometry', 197–98.

Lewes also disagreed with the claims of Helmholtz and others 'that because we can conceive a Space in which its axioms would not be truths, the Euclidean Geometry is not […] necessarily true'.[53] Those mathematicians and scientists – such as Helmholtz – who did utilize the new geometries while maintaining the distinction between analytical and descriptive discourses argued it was possible to conceive of and represent the perceptions of beings confined to a two-dimensional plane because to do so we must simply subtract one of our existing sensations. However, it would be impossible to imagine a fourth dimension in addition to our own, because

> as all our means of sense-perception extend only to space of three dimensions, and a fourth is not merely a modification of what we have but something perfectly new, we find ourselves by reason of our bodily organisation quite unable to represent a fourth dimension.[54]

Hinton did not disagree with the empiricism of Helmholtz as expressed here; rather, he sought to prove that humans can *experience* sensations of higher dimensions. He was not the only thinker to do so.

Physicist and spiritualist Johann Carl Friedrich Zöllner used Helmholtz's work to support his own claims for the existence of four-dimensional space.[55] Zöllner, colleague and friend of Fechner, was also fascinated with the fourth dimension. Influenced by the American medium Henry Slade, Zöllner was convinced that he had found experimental proof of the existence of the fourth dimension of space. Slade, most famous for slate-writing, also performed a series of tricks, one of which involved untying the knots of a cord with fused endings. Slade's ability to untie the knots – seemingly without touching the cord or disturbing the fused endings – convinced Zöllner that he was able to access the fourth dimension of space.[56] Although an English court convicted Slade of fraud in 1876, Zöllner continued to support him and rely upon him for empirical evidence of the existence of the fourth dimension: he published in the British *Quarterly Journal of Science* to this effect in 1878, and his book on the subject, *Transcendental Physics*, was translated into English in 1880.[57]

Although he, too, sought proof of a fourth spatial dimension, Hinton eschewed involvement in Spiritualist and Theosophist debates. He also attempted to give his dimensional analogy more solid scientific grounding as opposed to the anthropomorphic narratives of Fechner, Helmholtz, Abbott and others. While not entirely averse to the fictive potential of speculative analogy (as clearly indicated by the chosen title *Scientific Romances* for much of his work), Hinton wanted to emphasize the scientific nature of his speculative analogies. In his first scientific romance, 'What Is the Fourth Dimension?' (1880), we see a variation on the anthropomorphic dimensional analogy:

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53 Ibid., 193.

54 Helmholtz, 'The Origin and Meaning', 318–19. Conversely, while making a similar distinction between discussing two-dimensional and four-dimensional worlds, Lewes argued that it is only possible to 'symbolically construct a space of two dimensions'. See 'Imaginary Geometry', 200.

55 See Stromberg, 'Helmholtz and Zoellner'.

56 Staubermann, 'Tying the Knot'.

57 See Zöllner, 'On Space of Four Dimensions' and *Transcendental Physics*.

> If there is a straight line before us two inches long, its length is expressed by the number 2. Suppose a square to be described on the line, the number of square inches in this figure is expressed by the number 4, *i.e.*, 2×2. This 2×2 is generally written 2^2, and named '2 square.'
>
> Now, of course, the arithmetical process of multiplication is in no sense identical with that process by which a square is generated from the motion of a straight line, or a cube from the motion of a square. But it has been observed that the units resulting in each case, though different in kind, are the same in number.[…]
>
> We have now a straight line two inches long. On this a square has been constructed containing four square inches. If on the same line a cube be constructed, the number of cubic inches in the figure so made is 8, *i.e.*, $2 \times 2 \times 2$ or 2^3. Here, corresponding to the numbers 2, 2^2, 2^3, we have a series of figures. Each figure contains more units than the last, and in each the unit is of a different kind. […] The straight line is said to be of one dimension because it can be measured only in one way. Its length can be taken, but it has no breadth or thickness. The square is said to be of two dimensions because it has both length and breadth. The cube is said to have three dimensions, because it can be measured in three ways.
>
> The question naturally occurs, looking at these numbers 2, 2^2, 2^3, by what figure shall we represent 2^4, or $2 \times 2 \times 2 \times 2$[?] We know that in the figure there must be sixteen units, or twice as many units as in the cube.[58]

Hinton's decision to use algebraic symbols to represent lower-dimensional entities rather than flatland creatures is indicative of an attempt to respond to recent scientific debates about the possibility of a spatial fourth dimension. As we will see, he constructed practical mental and physical exercises he hoped would open the human consciousness to the perception of a figure that corresponds to 2^4. He also proposed – though never rigorously developed – ways of detecting the fourth dimension on the micro and macro levels through examining the movements of molecules and stellar bodies. Before he could justify attempts to obtain experimental proof of the fourth dimension, however, he needed to prove that it was possible to imagine it.

Helmholtz had argued that the problem with imagining the fourth dimension was that it was 'not merely a modification of what we have but something perfectly new [and] we find ourselves by reasons of our bodily organisation quite unable to represent a fourth dimension'. Hinton addressed this problem in the first scientific romance, explaining that, when trying to represent 2^4,

> instead of trying to find something already known, to which the idea of a figure corresponding to the fourth power can be affixed, let us simply reason out what the properties of such a figure must be. In this attempt we have to rely, not on a process of touching or vision, such as informs us of the properties of bodies in the space we know, but on a process of thought.[59]

Hinton wanted to use the mind to imagine something entirely new – a possibility denied even to Ruskin's highest imaginative artist. To do this, it was necessary to engage with

58 Hinton, 'What Is the Fourth Dimension?', *Scientific Romances*, 9–10.
59 Ibid., 10.

problems of representation, and the relativity of knowledge. This was the first step in Hinton's lifelong project of perceiving the 'new' space of the fourth dimension.

Hinton's Early Influences

Above, I have outlined the debates concerning the new geometries and the growing use of the dimensional analogy to demonstrate the possibility of four-dimensional space in the 1870s; this was the intellectual climate in which Hinton came of age. It is important to consider even more specifically the cultural milieu of Oxford in the 1870s, and growing debates concerning the role of science and aesthetics in education. Two key figures of influence for Hinton during this time were his father, James Hinton, and John Ruskin.

Ruskin knew James Hinton personally, and both men were members of the Metaphysical Society in the early 1870s. James Hinton, who was well known in his own time for his philosophical writings, died unexpectedly when his reputation was at its peak. After his death late in 1875, a contributor to the journal *Mind* lamented:

> His death at a critical period of his life, when he had just attained his long-desired speculative freedom, was a painful shock to his friends; nor could any country least of all our own, well afford to lose so earnest, unencumbered and well-equipped a pioneer in the search for the truth.[60]

Similarly, Ruskin mourned the loss of James Hinton in *Fors Clavigera*, writing of a 'dead friend, […] who could have taught us much'.[61] Like James Hinton's writings in mysticism and social philosophy, Hinton's lifelong project of perceiving the fourth dimension was a 'search for truth'. Hinton edited his father's posthumous collection of writings, *Chapters on the Art of Thinking*, published in 1879, and there is some overlap between their philosophies. Two themes from James Hinton's philosophical writings emerge as especially important for the younger Hinton: 'lawbreaking' and 'service'. While lawbreaking is perhaps most relevant in understanding Hinton's fascination with the fourth dimension, James Hinton's concept of service was most influential in the hyperspace philosophy that his son developed as a result of his interest in higher space. For now, I focus on lawbreaking, but I return to James Hinton's concept of service later in this chapter.

James Hinton argued that true genius lies in lawbreaking, or in removing artificial limitations that are placed on human beings. In his last writings, he argued: 'Man's worst evil is the false laws he puts on himself; and what he makes them regarding himself. What Christ did for him was to show him how to escape'.[62] Drawing on Romantic individualism and anticipating Nietzsche's revaluation of values, James Hinton's lawbreaking underpinned the free-love philosophy for which he became notorious.[63] Very much a

60 Payne, 'James Hinton', 252.
61 Ruskin, *Works*, 29: 67.
62 J. Hinton, *The Law-Breaker*, 24.
63 Edith Ellis goes so far as to cite James Hinton as a precursor to Nietzsche; see her *Three Modern Seers*.

product of late-Victorian culture, James Hinton's lawbreaking was clearly a direct influence on Hinton's desire to move past the 'apodictic certainty' of the three-dimensional limitations of space.

Hinton's challenge to Kant's argument that the three-dimensional nature of space is a necessary absolute truth founded on unmediated human intuition shared similarities with – but was not identical to – Helmholtz and others' attempts to undermine the Kantian transcendental intuition. Taking a strictly empiricist approach, Helmholtz was careful to note that there is no evidence to support a theory of four-dimensional physical space. However, by challenging Kant's apodictic certainties about space perception, empiricists like Helmholtz opened the door for the hyperspace philosophy of Hinton.

At issue again is the migration of ideas from context to context, and the unexpected and unintended meanings which can arise from the fluidity of certain terms. The question, as Jonathan Smith has noted, was one of 'conceivability', and what exactly was meant by that term.[64] Proponents of classical geometry such as Whewell took the idealist position that the axioms of geometry were necessarily true because it was impossible to conceive of their contradiction.[65] When Helmholtz challenged the idealist position by arguing that it was possible to 'represent to ourselves the look of a pseudospherical world in all directions just as we can develop the conception of it', he was aware of the innate difficulties of the vocabulary.[66] 'By the much abused expression "to represent" or "to be able to think how something happens" ', Helmholtz explained, 'I understand […] the power of imagining the whole series of sensible impressions that would be had in such a case'.[67] In spite of this attempt at clarification, however, Helmholtz still confused these terms: to think about 'how something happens' is different from 'imagining' or representing sensible impressions. Lilianne Papin observes that 'in Western languages in particular, the process of thinking is linked to seeing', and this is what makes modern physics so difficult to understand.[68] Hinton's fourth dimension – as a transitional concept developed in the gap between Newtonian and Einsteinian physics – encountered some of the same difficulties. Helmholtz struggled not only with the slippage between thinking and seeing, but also the growing differences between how scientists and philosophers used language.

Idealist philosopher Jan Pieter Nicholas Land took Helmholtz to task for creeping across 'the fatal border' between the discourses of science and philosophy. Land's overall argument against empiricist challenges to the intuitive origins of the axioms of geometry was somewhat tautological; he claimed that

> to demand logical proof for genuine geometrical axioms is a mistake, because every proof must proceed from some ultimate premises, which in this case must concern space. There are no data about space either in logic or arithmetic, but only in our sense-intuition, and precisely the data expressed.[69]

64 J. Smith, *Fact and Feeling*, 186.
65 Whewell, *The Philosophy of the Inductive Sciences*, 1: 665.
66 Helmholtz, 'The Origin and Meaning', 318.
67 Ibid., 304.
68 Papin, 'This Is Not a Universe', 1256.
69 Land, 'Kant's Space', 39.

However, what interests me in Land's response to Helmholtz is not his rebuttal of the challenge to Kant's transcendental a priori, but rather his discussion of the slippage between the terms of science and the terms of philosophy:

> We are told of spherical and pseudospherical space, and non-Euclideans exert all their powers to legitimate these as space by making them imaginable. We do not find that they succeed in this, unless the notion of imaginability be stretched far beyond what Kantians and others understand by the word. To be sure, it is easy to imagine a spherical surface as a construction in Euclid's space; but we vainly attempt to get an intuition of a solid standing in the same relation to that surface as our own solids stand to the plane. […] We may cloak our perplexity by special phrases, saying that only limited strips of the surface can be 'connectedly represented in our space,' while it may yet be 'thought of as infinitely continued in all directions'. The former is just what is commonly understood by being 'imagined,' whereas being 'thought of' does not imply imagination any more than in the case of, say, √-1.[70]

The distinction between being 'thought of' on one side and being imagined or represented on the other, is one that Land extended to further his idealist stance. We must learn to distinguish between notions of 'reality' and 'objectivity', Land argued: while these concepts are identical for the scientist (or natural philosopher), they are not so to the idealist philosopher. 'Reality' is the term used to denote that which exists outside of the mind of the perceiver, while the 'object' is the impression that is received by the mind of the reality outside of it. The question that a philosopher must address, Land claimed, is how much the object differs from the real. 'If', he continued, 'it were established beyond all doubt that the "object" and the "real" are one and the same, all examination of such questions and theories would become empty ceremony, and the paradoxes of Idealism absurdities unworthy of our notice'.[71]

Land, like Kant, was not a pure idealist in that he acknowledged that there is *something* outside of mind. The philosopher's interest, he argued, lies in the gap between the perceived object and the real. The scientist, in order to be able to formulate and test hypotheses, must assume that these are one and the same. The empirical method is not applicable to Kant's discussion of space intuition because, Land argued, our experience of space is necessarily filtered through our space intuition, which is a priori. What is interesting here is how Land left open the possibility for the actual existence of a fourth spatial dimension. Since scientists and mathematicians are able to theorize about the properties of four-dimensional space, Land continued,

> there is no reason to deny the same faculty to our imaginary surface-men. […] Some genius among them might conceive the bold hypothesis of a third dimension, and demonstrate that actual observations are perfectly explained by it. Henceforth there would be a double set of geometrical axioms; one the same as ours, belonging to science, and another resulting from experience in a spherical surface only, belonging to daily life. The latter would express the 'object' of sense-intuition; the former, 'reality,' incapable of being represented in empirical

70 Ibid., 41.
71 Ibid., 40.

> space, but perfectly capable of being thought of and admitted by the learned as real, albeit different from the space inhabited.[72]

Thus, Land employed his own dimensional analogy, with the implication that four-dimensional space might exist, albeit as form of the real that is not accessible to human intuition. It is therefore unimaginable and unrepresentable, even it if is possible to think and talk about its existence. Here again, is the distinction between Vernunft and Verstand, which Sylvester feared was being blurred by English philosophers.

Such debates about the nature of space were part of a larger cultural divide between idealist and empiricist philosophers; similarly, debates concerning Euclidean and the new geometries were invested with underlying class allegiances. The theory of the fourth dimension became a focal point for these debates during the 1870s. These underlying issues shaped Hinton's hyperspace philosophy, which was undoubtedly informed by his own experiences as an Oxford undergraduate. Hinton began his career at Oxford as an unaffiliated student in 1871, and later joined Balliol College in 1873. Balliol at this time was known for its modern liberalism, as well as its philosophical idealism. Thomas Hill Green, who later became the first professor of philosophy at the University, was a tutor at Balliol while Hinton was a student. Green's lectures on Kant likely influenced Hinton, as there are clear echoes of Green's ideas in Hinton's hyperspace philosophy. During the time that the dimensional analogy was appearing with increasing frequency in British periodicals, Green was lecturing his students on Kant's *Critique of Pure Reason*. In Green's interpretation of Kant:

> The primariness or *a priori* character of the ideas which constitute space and time […] means that it is the condition, without which no feelings would become outward things, so that all other conditions of 'phænomena' may be supposed absent, but not that. […] In this lies the explanation of Kant's distinction between the idea of space as an *intuition* and other ideas as *conceptions*.[73]

What is implied here – at least in Hinton's later interpretation of Kant via Green – is that the intuition of space is the condition of all perception. To somehow expand this intuition would therefore be to expand the perceptual capabilities of the mind, and this idea became the foundation of Hinton's hyperspace philosophy, which is itself a project of consciousness expansion founded on a strange blend of constructivism and positivism.

Green was not Hinton's only influence at Oxford. While at Balliol, he was acquainted with Arnold Toynbee, who later became an influential figure for social reformers in the 1880s and 1890s.[74] Hinton was also a member of Ruskin's inner circle of undergraduate followers, working as a captain on the Hinksey road project.[75] In a diary entry for 10 December 1874, Ruskin recorded looking at Turner paintings with Hinton, breakfasting

72 Ibid., 40.
73 Green, *Works*, 2: 10–11, original emphasis.
74 See Toynbee, ed. *Reminiscences and Letters*, 177.
75 See Hilton, *John Ruskin*, 252–67 and 287–304.

with his 'Balliol men' and going for walks with various students around this time.[76] In fact, a character in Hinton's 1895 novella, *Stella*, appears to be have been modelled on Ruskin, the elder Victorian sage whom the younger male characters of the novel visit and idolize. Hinton likely attended some of Ruskin's lectures in the early 1870s, and would have certainly been familiar with his earlier work. At this stage in his life, Ruskin was concerned in part with social works, as evinced by his sponsorship of the Hinksey project and his series of pamphlets, *Fors Clavigera*, begun in 1871. In addition to his early interest in drawing, Hinton had expressed an interest in 'studying geometry as a direct act of perception' as early as 1869, and he would have been particularly interested in Ruskin's lectures on the relationship between the arts and sciences in early 1872, in which he claimed 'the sciences of light and form (optics and geometry)' to be in 'true fellowship with art'.[77]

Hinton's later desire to instruct others towards a new way of seeing – as expressed through his hyperspace philosophy – is not dissimilar from Ruskin's work as a critic and teacher. Elizabeth K. Helsinger has noted how 'reading Ruskin can become learning to see with Ruskin', and more recently Francis O'Gorman observed that *Fors Clavigera* 'requires its readers to perceive, to discern truths in a manner of the great artists', as Ruskin originally outlined in the third volume of *Modern Painters*.[78] In his informal tutorials with Ruskin, as well as in more formal lectures and by reading, Hinton would have been introduced to Ruskin's idea of the great artist who is able simultaneously to perceive and keep separate objective and subjective accounts of the outside world.

Although he was to influence a number of second-generation British idealists and Balliol men, Ruskin mocked the English proponents of German idealism in his famous discussion of the pathetic fallacy: 'German dullness, and English affectation', he wrote, have caused the 'objectionable' terms, *objectivity* and *subjectivity*, to be too much in vogue. Ruskin offered his own interpretation of British idealists' use of these terms:

> The qualities of things which thus depend upon our perception of them, and upon human nature as affected by them, shall be called Subjective; and the qualities of things which they always have, irrespective of any other nature, as roundness or squareness, shall be called Objective.[79]

Ruskin proposed simplifying these terms to the 'plain old English' phrases of 'It seems so to me' and 'It *is* so',[80] which elides the empirical gap that fascinated the British idealists: he aligns the objective, or 'It *is* so', with 'the ordinary, proper, and true appearances of things to us', and the subjective to the pathetic fallacy.[81] The conflation of the objective and subjective is obvious here; in simplifying the terms, the appearance of things

76 *The Diaries of John Ruskin: 1874–1889*, 830. Ruskin refers simply to 'Hinton' in the diary entry, and Evans and Whitehouse speculate that this is James Hinton. However, given the date and his relationship with Ruskin at the time, I believe this refers to Charles Howard Hinton.

77 See J. Hinton, *Life and Letters*, 251–52. Ruskin, *Works*, 4: 193–94.

78 Helsinger, *Ruskin and the Art of the Beholder*, 3; and O'Gorman, 'Ruskin and Particularity', 130.

79 Ruskin, *Works*, 5: 201–2.

80 Ibid., 203, original emphasis.

81 Ibid., 204.

irrespective of a perceiver collapses into 'true appearances of things *to us*', the subjective perceivers.

The objective and subjective are just the first two classes in Ruskin's hierarchy of perception: the third encompasses both photographic/objective realism and subjective pathos, while managing to distinguish between the two. Ruskin identified this third class as belonging to the 'first order of poets'. Above all three of these modes of perception, however, is a fourth, a sort of passive hyper-perception where

> men who, strong as human creatures can be, are yet submitted to influences stronger than they, and see in a sort untruly, because what they see is inconceivably above them. This last is the usual condition of prophetic inspiration.[82]

It is this fourth way of seeing that Hinton wanted to activate in his readers by training them to 'see' hyperspace. However, in order to not be overcome by such a vision, these hyper-perceivers would need to transcend Ruskin's highest order of poet. This involved a sort of evolution of aesthetic sensibility whereby the perceiver would be able to maintain the clear vision of the first order of poets when presented with something that 'is inconceivably above them'. To instigate this evolution, the inconceivable must become conceivable and the intuition must be prepared through the education of the imagination.

The Ruskinian Imagination

It is instructive here to turn to Ruskin's early writings on the imagination. In the second volume of *Modern Painters*, he wrote that the greatest works of art are not those that mimetically transcribe the real world, but those that 'invariably receive the reflection of the mind' of the artist and 'are modified or coloured by its image'. 'This modification', Ruskin explained, 'is the Work of Imagination'.[83] Ruskin devoted an entire section of this volume to defining and describing the imagination, which he distinguished from conception. Ruskin's definition of conception is important for our understanding of debates between geometers and philosophers regarding the conceivability of the fourth dimension.

Ruskin distinguished between two ways of knowing a material object: one is verbal, whereby certain facts are stored in the brain 'as known, but not conceived', which 'we may recollect without any conception of the object at all'. The other is visual, whereby facts about the object exist in the brain as images, 'which […] would be difficult to express verbally', or to represent.[84] According to Ruskin, the latter way of knowing an object is conception, but it is still *not* imagination. To say that something is conceivable therefore means one is able to visualize an object but cannot represent it to another person. Only the artist, who possesses the imaginative faculties, is able to conceive of

82 Ibid., 209.
83 Ruskin, *Works*, 4: 223.
84 Ibid., 229.

something *and* represent it accurately, to put it out into the world as something to be perceived by another.

The artist in possession of the associative imaginative faculty is able to create a harmonized whole:

> If […] the combination made is to be harmonious, the artist must induce in each of its component parts (suppose two only, for simplicity's sake), such imperfection as that the other shall put it right. If one of them be perfect by itself, the other will be an excrescence. Both must be faulty when separate, and each corrected by the presence of the other. […] The two imperfections must be correlatively and simultaneously conceived. This is imagination […] two ideas which are separately wrong, which together shall be right, and of whose unity, therefore, the idea must be formed at the instant they are seized, as it is only in that unity that either are good, and therefore on the conception of that unity can prompt the preference.[85]

Hinton echoed Ruskin in his second series of *Scientific Romances* when he wrote that 'imagination, acting on perception of the outer world, enables the artist to see exactly how his picture would look if a strip of colour or a new form were introduced'.[86] To perceive such a unity and translate it into a work of art is to be 'an inventor', to enact a 'prophetic action of mind'.[87] Like the scientist, the imaginative artist hypothesizes a potential synthesis of incomplete fragments and proceeds to test that hypothesis. The unseen possibility of this synthesis is the same proposed by non-Euclideans and hyperspace philosophers, whom Land derides as claiming reality for something of which 'only limited strips of the surface can be "connectedly represented in our space" '.[88] An imaginative, 'great' artist is needed to translate the thought into reality, to unify the limited conceivable strips into a perceivable harmonious whole. It is the imagination that allows the artist to reveal the invisible harmony from existing visible fragments. This movement from seen to unseen shares the creative potential of the analogy.

There is a second faculty of the imagination according to Ruskin, which is just as important as the associative: this is a 'penetrating, possession-taking faculty', which clearly presupposes a subjective ego. This faculty allows the imagination to see 'the heart and inner nature' of things.[89] Here we see the desire to obliterate the subjective ego while simultaneously protecting it. The imaginative subject is needed to penetrate the superficial appearances of the material world, while at the same time it must not be led astray by its subjectivity. Jay Fellows observes this paradox in Ruskin when he notes that 'to lose sight of oneself is to become an invisible man. And only the invisible man is worthy of self-portraiture', according to Ruskin.[90] Lindsay Smith, who examines Ruskin's early

85 Ibid., 233–34.
86 Hinton, 'On the Education of the Imagination', *Scientific Romances*, 5.
87 Ruskin, *Works*, 4: 233–34.
88 Land, 'Kant's Space', 41.
89 Ibid., 251 and 253.
90 Fellows, *The Failing Distance*, 71. For a discussion of this paradoxical ideal in relation to scientific epistemology in the nineteenth century, see Levine, *Dying*.

writings in relation to contemporary developments in optical technologies and the resultant physiological debates, claims that what Ruskin wanted was

> an observing subject that retains the prerogative of the Romantic wanderer, […] while incorporating contemporary Victorian developments in visual theory. The result is an inevitably strange hybrid: a desire for an invisible man, a poetic identity who is newly aware visually, but whose intelligence absents itself and whose educated eye avoids self-assertion.[91]

Hinton's fourth dimension similarly functioned as a paradoxical space of self-transcendence and self-possession, as we will see in the next two chapters. While his hyperspace philosophy was no doubt informed directly by Ruskin, both men were participants in what George Levine has identified as 'the epistemological ventures of modernity [which] are thick with paradox – materiality entails the incorporeal, the self gains its power by annihilating itself'.[92]

Such paradoxes preclude simple contrasts between Ruskin, the anti-sensualist on the one hand, and Walter Pater and the Aesthetes on the other. As Nicholas Shrimpton and others have demonstrated, there is no clear-cut opposition possible here. Although in the 1880s Ruskin took care to differentiate between the what he saw as the crass sensualist perception of beauty championed by the Aesthetes ('aesthesis') and his own moral perception of beauty ('theoria'), Shrimpton rightly notes that the difference here was one of degree, not kind.[93] Anticipating the quarrel between H. G. Wells and Henry James over the art of fiction, 'Ruskin's argument with the Aesthetes had the bitterness and intensity often associated with internecine quarrels, and an internecine quarrel is precisely what it was'.[94] Kenneth Daley's work is useful here in his examination of Pater's refiguration of Ruskin's pathetic fallacy, which he claims 'converts what Ruskin judges to be intemperate passion into a heightened sense of sympathy and pity, thereby rescuing what Ruskin condemns in romantic practice'.[95] As I demonstrate in the next chapter, rather than attempt to avoid the pathetic fallacy, in his early *Scientific Romances*, Hinton also attempted to push *through* it toward a heightened, four-dimensional consciousness.

Hinton's hyperspace philosophy can be read in part as a response to Ruskin's influence over Victorian aesthetic debates; his push to develop a higher, four-dimensional consciousness was an attempt to address Ruskin's ideal of the creative power of the associative imagination, which 'seizes and combines at the same instant, not only two, but all the important ideas of a poem or picture, and while it works with any one of them, it is at the same instant working with modifying all in their relations to it, never losing sight of their bearings on each other'.[96] This creative agent, which seems to be made 'after the image of God', is decidedly male, but it must encompass the 'powers' that Ruskin elsewhere attributes to the female: ordering, arrangement, sympathy and

91 L. Smith, *Victorian Photography*, 25–26.
92 Levine, *Dying*, 2.
93 Shrimpton, 'Ruskin and the Aesthetes', 138.
94 Ibid., 147.
95 Daley, *The Rescue of Romanticism*, 134.
96 Ruskin, *Works*, 4: 236.

passivity.[97] The manly aesthetic ideal of the penetrative imagination, of the poet who is strong enough to experience passion while maintaining constant self-control, resulted in strains and stresses that manifested themselves in interesting (and tragic) ways in the lives and writings of both Ruskin and Hinton. Hinton's hyperspace philosophy, like Pater's reclamation of the Italian Renaissance, can be read as an attempt to engage with (and re-envision) Ruskin's ideal creative agent.

Hinton's Hyperspace Philosophy

In his hyperspace philosophy, Hinton strove to do something more than simply popularize the theory of the fourth dimension. He proclaimed his interest in geometry at a time when discussions of the new geometries were reaching the British press, and it is clear that from the beginning he was drawn to explore the aesthetic implications of the new trend in geometry. In 1869, James Hinton wrote to his son:

> I am glad you like the idea of studying geometry as an exercise of direct perception. I think it must be specially valuable so; and I am very pleased that you think it practicable and useful. The habit of looking thoroughly and minutely into things, alike with the eyes and with the reason, so as to cultivate the power of *seeing* their qualities and relations, and not merely trying to infer them, must be a most excellent one. It will be most valuable to you.[98]

Apparently, in recent correspondence Hinton had indicated his interest in geometry. In celebrating the importance of looking 'alike with the eyes and with the reason', James Hinton proposed a relationship between percepts and concepts similar to that of William James and, before him, Ruskin. In fact, Hinton's later sympathy with William James may be in part due to the fact that James's philosophy was 'somewhat eccentric in its attempt to combine logical realism with an otherwise empiricist mode of thought'.[99] 'Logical realism' here means 'the platonic [*sic*] doctrine […] that physical realities are constituted by the various concept-stuffs of which they "partake" '.[100] Hinton's willingness to pursue 'eccentric' combinations of philosophical schools echoes the work of his father as well as Ruskin, and would have appealed to William James.

In the same letter, James Hinton urged his son to consider 'the knowledge of phenomena, that is, of what the senses can perceive, [as] the best basis you can lay' for future studies.[101] Aside from his original transubstantiation of the spatial fourth dimension via analogy, Hinton followed this advice throughout his career. His hyperspace philosophy

97 See, for example, Ruskin's lecture 'On Queens' Gardens', in *Works*, 18: 122. Certainly, the difference in aesthetic views of Ruskin and Pater can be read as in some measure informed by sexual orientation and identity. See, for example, Daley, *The Rescue of Romanticism*; and Brake, 'Degrees of Darkness'.

98 Hopkins, ed., *Life and Letters*, 251.

99 W. James, *Writings, 1902–1910*, 1037.

100 Ibid., 1036–37.

101 Hopkins, ed., *Life and Letters*, 251.

was also an eccentric combination that Mark McGurl has aptly described as 'transcendental materialism':

> The particular appeal of the fourth dimension was as a potential means of reintegrating the two sides of […] the 'Omnipresent Debate' in the nineteenth century between empiricism and transcendentalism, or, more roughly, between the competing cultural authority of science and religion. […] More broadly, non-Euclidean geometry suggested in its own way the possibility of a 'transcendental materialism' similar in some respects to that being developed by figures such as Walter Pater, whose aestheticism merged the traditions of British empiricism and German idealism.[102]

Indeed, Hinton's hyperspace philosophy should be read as an attempt to provide a new basis for considering matter and spirit; at its foundation it is a celebration of mediation, of the technology of representation. For him, 'space conditions' are the fundamental mediator, as he explained in the opening pages of his first book-length philosophical treatment of the fourth dimension:

> It is generally said that the mind cannot perceive things in themselves, but can only apprehend them subject to space conditions. And in this way the space conditions are as it were considered somewhat in the light of hindrances, whereby we are prevented from seeing what the objects in themselves truly are. […] There is in so many books in which the subject is treated an air of despondency – as if this space apprehension were a kind of veil which shut us off from nature. But there is no need to adopt this feeling. The first postulate of this book is the full recognition of the fact, that it is by means of space that we apprehend what is. Space is the instrument of the mind.[103]

While Hinton accepted the assumption that space apprehension is 'a kind of veil' between the perceiving mind and reality, he disagreed with the idealist philosopher's interpretation of this 'fact'. It is not a limitation to despair of, he argued. Identifying space as 'the instrument of the mind' opens up new possibilities for the mind; accepting space 'as the instrument of the mind' allows the possibility that – by tuning the instrument – humans can embark on 'a new era of thought'.

Hinton's hyperspace philosophy is aptly described as a kind of materialism because he emphasized the textual nature of his project: for him, there was nothing outside of space perception. Nevertheless, hyperspace philosophy can also be described as transcendental because it proclaims a 'higher' form of mediation out there to be discovered and developed. His was not an absolutist project: as we will see, Hinton was open to the possibility that there were 'many dimensions' beyond four. What was important for Hinton and many modernists who were interested in the fourth dimension was the *process* of realizing the fourth dimension. As Bell and Lland have observed, for Hinton and twentieth-century hyperspace philosophers such as Claude Bragdon, 'the Fourth Dimension means

102 McGurl, *The Novel Art*, 62.
103 Hinton, *A New Era*, 2.

not so much an attainable place, but a matter of developed consciousness, a process of exploration'.[104]

Hinton believed that undergoing this process of development would result in an aesthetic and social revolution. Here James Hinton's thoughts on 'service' are particularly important. As a young man, Hinton was encouraged to consider the broader implications of his work and to treat the coming era as portentous. In 1870, James Hinton wrote to his son to congratulate him on his decision to refuse confirmation into the Church of England, which he regarded as a positive step toward making 'all your life transparent' and 'banish[ing] all the false pretences which fill our present life with evil'. James Hinton saw the organized Church as hypocritical and many of its members cynically political. Although in one sense Hinton was being groomed for worldly success (he was at the time a student at Rugby and soon to be an Oxford undergraduate), his real mission, according to his father, was to enable himself 'to take up what we [James Hinton's generation] leave unfinished, and perfect what we do incompletely': to, in a sense, become Ruskin's paradoxical invisible man. This task was of the utmost importance because, according to James Hinton,

> it is a great age of the world for which you are preparing – an age in which the great question of true significance of human life will, at least, begin to decide itself. […] This is one question men will have to answer, Is it our nature to take the best care of ourselves or to live in giving up? I know how your heart would answer this, and I think the time is coming when all men will give the same.[105]

James Hinton's concept of altruistic 'service', like Ruskin's invisible man, was full of contradictions that Hinton attempted to reconcile within his hyperspace philosophy.

Concerned with the relationship between the material and spiritual, particularly with reference to morality, James Hinton argued that morality needed to be approached in a more 'scientific' manner; while the sciences had embraced inductive reasoning, moral philosophers and theologians were still struggling 'to find a "right" for […] feelings and […] actions without having laid the basis of a true response to facts'.[106] Contemporary morality was currently centred on the self, James Hinton argued, citing the frequent opposition of desire for pleasure against the 'goodness' of duty as support for his case. He wrote:

> The thought of goodness in diminished pleasure betrays its origin: it arose from putting self first; which perverts the thought of goodness into that of self-restraint: – into goodness *about* self and for its sake.[107]

According to James Hinton, the basis for morality should be altruism, and by this word he meant 'Myself in and for others'.[108] Here he proposed a kind of self-fulfilment

104 Bell and Lland, 'Silence and Solidity', 2: 124.
105 Hopkins, ed., *Life and Letters*, 254.
106 J. Hinton, 'On the Basis of Morals', 782.
107 J. Hinton, *Chapters on the Art of Thinkin*g, 71.
108 Hopkins, ed., *Life and Letters*, 260.

through surrendering oneself to the needs of others. There was no need to waste intellectual and moral 'strength in efforts to rise above sense'.[109] Rather, James Hinton argued that the perfect moral condition would consist of an alignment of desire with serving others. What drew Havelock Ellis and other progressives to James Hinton's writings was the implication that if personal pleasure was sometimes the outcome of fulfilling others' needs, then pleasure was to be embraced as well.

Hinton saw the study of space as a means of obtaining James Hinton's perfected state of altruistic desire. For the four-dimensional consciousness, the difference between duty and desire dissolves. In the dimensional analogy, we who live in three dimensions are able to see the inner workings of two-dimensional creatures; we can observe underlying unities to which they remain blind. Similarly, Hinton explained that, 'to our ordinary [three-dimensional] space-thought, men are isolated, distinct, in great measure antagonistic'. However, after undergoing the process of realizing a four-dimensional perspective, 'it is easily seen that all men may really be members of one body, their isolation may be but an affair of limited consciousness'.[110] The higher viewpoint is expressed in numerous ways, from the penetrating light of X-rays, to the mystical 'mother-sea of consciousness' of Fechner and William James.[111] It is not surprising that many fin-de-siècle progressives were drawn to Hinton's fourth dimension. Boundaries of class and gender were dissolved under the levelling gaze from the fourth dimension.

The surrender of the self's desires to others' needs is paradoxically self-centred: there is no longer an absolute standard of 'right' and 'wrong'; rather, moral judgement must be made on a case-by-case basis, to be determined by the internal condition of the individual in question. Taking issue with moral philosopher and acquaintance Henry Sidgwick, James Hinton made the case for moral relativism. In his 1874 *Methods of Ethics*, Sidgwick had argued for the 'fundamental assumption' of an absolute standard of right and wrong. However, James Hinton wrote that

> reflection shows us not only that right and wrong are qualities incapable of pertaining to things, inasmuch as the same external deed will be, by universal consent, right or wrong, not only under different circumstances, but according to the feelings prompting it. Thus a father rightly chastises a son for a fault for the son's good; but the same blow given in selfish anger would be a crime. […]
>
> That which is wrong if done for oneself may become right when the claims of 'good' demand it. And the reason of the paramount importance of this response or non-response of the emotions to facts is obvious; it is a question of truth or falsity, of accord or discord between our consciousness and the world.[112]

Hinton was well aware of the revolutionary implications of his father's reliance on service as a basis for morality. In her testimony at his bigamy trial, Hinton's second wife,

109 J. Hinton, 'On the Basis', 785.
110 Hinton, *A New Era*, 97.
111 See W. James, *Writings, 1878–1899*, 1100–27.
112 J. Hinton, 'On the Basis', 782.

Maude Florence, explained that 'he did not marry [her] to hurt anyone else, but simply in order that she might have a certificate for her children'.[113] Of course, these children were (presumably) Hinton's children as well, conceived after his marriage to his first wife, so Hinton's moral justification rings somewhat hollow.

However, the fact that Hinton viewed his bigamous marriage in the light of his father's philosophy of service is supported by his oblique reference to the incident in *A New Era of Thought*, a text which was published in 1888 with a cryptic preface by the editors noting that Hinton had left the manuscript in an unfinished state 'on his leaving England for a distant foreign appointment'.[114] This was in reference to Hinton's flight from Britain after his bigamy conviction. Later, within this book, Hinton highlighted the 'dangerous' nature of his claim that it is necessary to 'cast out the self' in order to access hyperspace.

> The problem as it comes to me, is this: it is clearly demonstrated that self-regard is to be put on one side – and self-regard in every respect – not only should things painful and arduous be done, but things degrading and vile, so that they serve.
>
> I am to sign any list of any number of deeds which the most foul imagination can suggest, as things which I would do did the occasion come when I could benefit another by doing them; and, in fact, there is to be no characteristic in any action which I would shrink from did the occasion come when it presented itself to be done for another's sake. And I believe that the soul is absolutely unstained by the action, provided the regard is for another.[115]

Given the stilted language here, the grammatical awkwardness and obscure referent, it is only comprehensible as an allusion to Hinton's bigamy conviction. In the following chapters we will see how the moral relativity of 'service' played itself out in Hinton's hyperspace philosophy. For the present, it is important to observe Hinton's vision of hyperspace philosophy as a moral endeavour.

Writing of Hinton's hyperspace philosophy, Bruce Clarke identifies it as 'a specific and significant response to the evolutionistic vogue for superhuman types' at the turn of the century.[116] Certainly, in Part Two of this book, I read Hinton's work as part of such a response, alongside Wells, Nietzsche and the James brothers, all of whom were concerned with accessing, developing and liberating a higher aesthetic will. However, it is important to acknowledge the roots of Hinton's project as well: his striving to develop the hyperconscious self is also an attempt to transcend Ruskin's artist of the highest order and to engender the 'lawbreaker', of whom James Hinton wrote. Recuperating Hinton's hyperspace philosophy allows us to better understand its context; his work stands as yet another link between the periods and movements traditionally associated with either the nineteenth or the twentieth centuries, Victorians or moderns.

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113 'Extraordinary Confession of Bigamy', n.p.

114 A. Boole and Falk, 'Preface', in *A New Era of Thought*, v–vii, v. Alicia Boole, a mathematician in her own right, was also Hinton's sister-in-law.

115 Hinton, *A New Era*, 90.

116 Clarke, *Energy Forms*, 185–86.