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Art, Science and Flatland

Denis R. Alexander

When Edwin Abbott published his *Flatland: A Romance of Many Dimensions* in 1884, he probably had little idea of the myriad ways in which his parable would be applied in subsequent years, and might have been even more amazed to know that his book was still in print in 2008.[1]

Abbott described his flat world, constrained to two dimensions, partly as a satire on the hierarchical structures of Victorian society. Told by a lowly square, the tale portrays men as polygons with different numbers of sides, ranging from the triangle right at the bottom of the social ladder, up to the priests who have so many sides they are effectively circular. The novella recounts the visit to Flatland of a nameless three-dimensional Sphere, which of course is perceived as a circle in Flatland, only comprehended by the

narrator when he himself is taken into Spaceland. The square's narrative revolves round the impossibility of explaining a multi-dimensional world to an inhabitant of Flatland, and he is mocked by his fellow Flatlanders when he attempts to describe his own experiences of Spaceland. The square ends up languishing in prison, remarking that "Prometheus up in Spaceland was bound for bringing down fire for mortals, but I – poor Flatland Prometheus – lie here in prison for bringing down nothing to my countrymen."

Abbott's book has inspired filmmakers, mathematicians, novelists and artists ever since. Thinking about space and its dimensions provides a conceptual meeting place of ideas in which the arts and sciences can happily mingle. It is therefore ironic that the past decade has seen a revived commitment to Flatland on the part of a vocal minority within the scientific community, insistent that the scientific account of reality is the only one that matters, and that only scientific explanations can be rationally justified. Spheres, complementary narratives, multi-dimensional perspectives and Spaceland itself are all treated with suspicion. The reductionist understanding of life's complexities becomes the standard by which all else is judged, and in the process the sciences are impoverished as much as the arts.

For it is in their shared critical realist stance towards the world that the scientist and the artist often find themselves speaking a similar kind of language. Both are seeking to tell the truth about the world. Science as much as art is shaped in the final analysis by the way the world is, hence the 'realist' tag, but most scientists are only too aware that their understanding of the world is provisional, moulded and interpreted through the multiple lenses provided by their theories, methods and instruments, hence the qualifying adjective 'critical'. All data are theory-laden and no scientist sees reality in its pure essence, any more than does the artist, but ultimately it is reality itself that has the final say. Even at the outer edges of speculative cosmology, where the 11 dimensions proposed by String Theory are put forward first of all for their mathematical elegance, making the Sphere look very flat indeed by comparison, there is an understanding that the day of reckoning must come, in which ways must be found of testing the Theory.

But scientific Flatlanders are suspicious of the word ‘critical’, suggesting that scientific accounts of reality are narratives that are simply ‘read off’ from the text of nature, in which the role of the interpreter is downplayed, and any wider meanings of the narrative are restricted to the two-dimensional account. Some years ago Richard Dawkins, Professor of the Public Understanding of Science at Oxford, assured a lecture-hall full of children that “We are machines built by DNA whose purpose is to make more copies of the same DNA...That is EXACTLY what we are for. We are machines for propagating DNA, and the propagation of DNA is a self-sustaining process. It is every living objects’ sole reason for living.”[2] The problem of course lies not with the science, but with that little word ‘sole’, a characteristic marker of two-dimensional space. As Whitehead put it in *The Function of Reason*, “Scientists animated by the purpose of proving that they are purposeless constitute an interesting subject for study.”[3]

Beyond Flatland

The sciences and the arts meet most fruitfully in a multi-dimensional world in which many different types of narrative play their role in shaping our understanding of reality. These are not narratives randomly plucked from the air according to the whim of the investigator, but accounts that are informed by what is touched, smelt, measured, visualised, experienced and argued over. They are complementary, not rival accounts. The aesthetic level of description provides insight into notions of beauty and ugliness. The ethical level of understanding addresses the question as to what we ought to do in the world. The scientific level of explanation deals with questions of how things work the way they do and where they come from. Personal descriptions provide biographical insights into our role and place in the historical narratives of our lives. Art mirrors society but also shapes it, the consequent dialectic subverting, challenging and inspiring. Religious explanations address the big metaphysical questions: Why is there something rather than nothing? Is there

any ultimate meaning or purpose in the world? What breathes life into the equations that describe the properties of the Universe? Does God exist? We can picture these and many other explanatory layers like slices across a cube, which in turn represents the sum total of the reality that we call ‘life’. No one is up to the Herculean task of grasping that totality in all its fullness all at once, so we need all the various levels of explanation to perform their complementary functions. Works of art, novels and music can all provide powerful exemplars of such insights, in which multiple meanings can be discerned at different levels, each level requiring a different type of explanatory discourse.

This year we celebrate the centenary of the birth of Jacob Bronowski, one of the great intellectuals of the twentieth century. In her introduction to *Ingenious Pursuits*, his daughter Professor Lisa Jardine describes her upbringing in the Bronowski family:

> I grew up in a harmonious household in which the ‘two cultures’ coexisted peacefully. My mother's hands shaped figures out of clay, my father's described for us the primitive movements of flint on stone by which 'man the tool-maker' struck fire. At mealtimes, Newton's theory of gravitational pull and the poetry of William Blake were discussed in the same breath...In that environment I gained the conviction that imaginative problem-solving is at the root of all human inventiveness, both in the sciences and the humanities.[4]

This was a household in which complementary levels of understanding flourished, each being treated with respect. We are reminded of Bronowski’s own comment that “the hand is the cutting edge of the mind.”[5]

Explanations at different levels generate a world of beliefs. Curiously, some of the scientists who inhabit Flatland do not think they possess beliefs. Beliefs, in their view, belong to the world of morality, politics, religion and art, but not to the world of science, where we find facts and theories, but no beliefs. Yet an afternoon in any laboratory will quickly persuade the casual visitor that the scientific enterprise involves the holding of beliefs, though there seems no good reason to think that scientific beliefs need be in any kind of intrinsic rivalry to moral beliefs, or aesthetic beliefs, or religious beliefs. All make up the rich composition of the multi-layered cube, each type of belief requiring its own form of justification depending on the norms and traditions of those working at a particular explanatory level.

The shared quest for coherence

How may different sets of beliefs be justified, and can the beliefs arising from different explanatory levels happily cohere or at least coexist under a single roof? One powerful tool, common to both the arts and the sciences, is the common quest for coherence. Scientists remain in awe at the underlying order of the Universe that renders the search for such coherence feasible. Eugene Wigner, a Nobel Prize winner in physics, once remarked, “the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift that we neither understand nor deserve.”[6] An unexpected coherence seems built into the fabric of the Universe.

So good scientific theories are expected to reflect that coherence. What makes best sense of the data? Like a hungry amoeba gobbling up morsels of food that then become part of its single-celled body, so successful scientific theories go around absorbing new pieces of data and rendering them coherent. But if sufficient counter-evidence accumulates, eventually the theory will collapse, to be replaced by a better version that includes the new data as well.

The Humanities tend to be wary of the grand narratives that are such a feature of contemporary science. But here, too, the quest for coherence becomes a valuable motivation in the creative enterprise. The artist working in the critical realist tradition will channel their creativity in a way that is shaped and informed by the properties of the world. Indeed, there is no other option, since we are all creatures of time and space, light and darkness, with our 100 billion neurons with their 100 trillion synaptic connections, operating for the most part in that tiny space within 10 metres of a small planet, a minute speck in a vast universe with its 100 billion galaxies each with their 100 billion stars. We are not gods but creatures of dust who have no other choice than to inhabit our tiny space. The imagination may soar into outer space, but both artistic and scientific creativity are highly constrained by the realities of our finitude.

Map-making in the arts and the sciences

Map-making provides a powerful metaphor for theory construction in both science and the arts in which disparate data are linked up to tell a coherent story. In the cartographic process, empirical reality meets creative insight. The mapmaker tells a story about what they think is important to display about a particular geographical area. The naturalist's map is full of flora and fauna, animal population distribution, and the locations of different habitats. The motorist's map is crammed with roads, towns and distances. The historian's map has dates, battles, boundaries and archaeological sites. They are all valid perspectives on the same geography, the same reality.

Much can be conveyed by two-dimensional maps, but how much more with an extra dimension. Flat tightly packed contour lines now become soaring peaks. City maps are transformed from street names into identifiable buildings with height, colour and perspective. Circles become spheres.

In the metaphorical map of the scientific theory, the scientist looks for an account that will connect a body of data and render it coherent. For years isolated pieces of data may litter a scientific field, ignored because they do not

fit into any current theory, but then the day comes when a new map is constructed in which the neglected data become the star performers, now endowed with weighty significance because they fit so well. In the process the old scientific map is not completely discarded, but instead its key features are absorbed into the new map. Really elegant theories use new insights to link the new data with the old to make the new map of reality truly compelling.

Part of the great attraction of an elegant new scientific theory is its inherent beauty. Functionally the theory may explain much and make powerful predictions that launch a whole new research field, generating a new research community in the process. But the reception of the novel theory will be that much quicker if, in addition, it displays those qualities of explanatory power, elegance and frugal simplicity that attract the coveted epithet of a 'beautiful theory' within the scientific community. In this respect the theory is only reflecting the orderly properties of matter itself. As the physicist Steven Weinberg comments, "There is reason to believe that in elementary particle physics we are learning something about the logical structure of the Universe...the rules that we have discovered become increasingly coherent and universal...there is simplicity, a beauty, that we are finding in the rules that govern matter that mirrors something that is built into the logical structure of the Universe at a very deep level."[7]

The arts and the sciences can mingle productively in the multi-dimensional world in which there is a constant recognition that many types of map are necessary to do justice to the 'logical structure of the Universe'. There will no doubt always be Flatlanders who will claim that their scientific account of reality is the only one that counts, sticking to circles and denying the existence of Spheres. But hopefully most people will see that there can be many valid, complementary descriptions of the same reality that generate well-justified beliefs that not merely coexist, but flourish together in their diversity. This is no slide into an amorphous post-modern relativism in which anything goes, but a recognition that different types of belief about the same reality are

absolutely necessary to do it justice. An account that highlights mechanism at the expense of meaning, or particles without considering purpose, is severely deficient, as if the mechanic's description of a car engine was the only one that mattered, and not the question as to where the car was going.

The arts and the sciences may be looking through different windows, so their perspectives on the view will be different, but both windows open on to the same reality. Providing that we are willing to let our minds soar beyond Flatland, opening ourselves to notions of ultimate purpose, meaning and value, then the images and ideas gained from both types of perspective will resonate in important ways, enriching our understanding of the world.

[1] Edwin Abbott, *Flatland: A Romance of Many Dimensions*, Oxford University Press, 2006

[2] Richard Dawkins, *Royal Institution Christmas Lecture No 4: The Ultraviolet Garden*, 1991

[3] Alfred North Whitehead, *The Function of Reason*, Princeton University Press, 1929

[4] Lisa Jardine, *Ingenious Pursuits*, Abacus, 2000

[5] Jacob Bronowski, *The Ascent of Man*, Little, Brown and Co., 1975

[6] Eugene Wigner cited in Edward O Wilson, *Consilience: The Unity of Knowledge*, Abacus, 1998, p. 52

[7] Steven Weinberg, *Nature* 330 (1987): 433-437

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