Circles: Science, Sense and Symbol

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Circles, Science, Sense and Symbol by Nicholas Wade is truly an inspiring book. The author, a leader in the field of visual psychology and a professor of the subject at the University of Dundee, seamlessly blends historical commentary, graphic design, perceptual research, symbolic references, and artistic projects that have effectively incorporated the circle (e.g., Marcel Duchamp's rotoreliefs). At the beginning, Wade tells us that our perception of the circle will emerge from the sequence of the designs he presents. Beginning with simpler circles and then moving to complex patterns, this is indeed the case. Multiple drawings (on practically every page) provide ample visual evidence of circular patterns, and the variety establishes that design variations play with our eyes and sensibilities. Whether an abstract image, an illustration that triggers illusions of rotation or an "embedded picture" that does not physically exist anywhere in an objective sense, it was apparent that the eye reacts to stimuli and contrasts. Wade also fully examines the symbolic ideas associated with this form.

Perhaps the most useful feature of the book is its demonstration of the range of perceptual, aesthetic and symbolic possibilities. Particularly valuable in this regard is the author's use of the symbolic circle as a counterpoint to the perceptual frame of reference. Young children, for example, often use the circle to symbolize the sun, a logical correlation given the similarity in shape. Older cultures offer an interesting contrast. Like young children, ancient people were apt to use circles to symbolize the sun. Yet their symbolism included broader references and a measure of complexity generally absent in the circles of children. For example, the groups of dots on Lascaux cave paintings (and those of other regions containing groups) are believed to have had cosmological implications. This type of symbolic language underscores that circles have (and still carry) multifaceted and abstract meanings that signify eternity, infinity and other ideas.

Wade's visual portraits are the most original aspect of the book. Depicting people whose ideas and work he includes, the faces offer another frame of reference for the substantive ideas. Some of the artwork is impressively on target, such as Yin-Jung (the integration of Carl Jung with the yin/yang symbol he classified as archetypal), a kaleidoscopic rendering of David Brewster and Thomas Young's Interference, (a depiction of Young superimposed on a diagram of circular interference patterns). A few of the less-formal drawings, such as his Archimedes, which is made of loosely intersecting circles, offer a nice reprieve from the formal visuals that predominate. Other portraits, while ingenious, are more difficult to distinguish. Wade recognizes this and explains that many of his portraits work better if seen from a distance. I would have liked to receive the less discernable portraits as loose pages, in a pocket inside the back cover, so that I could put them on the wall and ponder them as I read. I did not want to break the spine of my book, and since it was hard to flatten, distant viewing was somewhat challenging. Fortunately, many of the portraits are included on the web, and this format helps the reader to view them. A good place to find examples is in Wade's presentation titled Scientific Art or Artistic Science (see <www.smil.fi/SAT2006/presentations/1A/Wade SAT2006.pdf>).

All in all, Wade captures the circle's magic and our fascination with this form. The drawings convey the circle's abstractness and suggest that this aspect of the form is one that stimulates our imaginations. He also reminds us that children draw circles endlessly, and that this form is found on human artifacts such as coins and crockery. Equally intriguing, as he points out, is that our fascination with this geometry endures although there are few natural circles. To be sure, we can identify some (e.g., throwing a spherical stone into a pond can result in a circular ripple forming on the surface of the water). Yet, our phenomenal experience is spherical rather than circular. Moreover, as the author notes, circular forms are seldom projected onto our eyes because we rarely view these straight on. Even a circular drawing will only project a circle to the eye if it is straight ahead and lies in a frontoparallel plane. Thus, we interpret many objects we perceive as circular even though the images projected on the retina are elliptical.
In terms of the larger picture, I wish more had been said about the relationship between the circle and the ellipse. I believe Wade missed an opportunity to offer some thoughts about how the circle relates to the ellipse and how both are integrated into our living history. For example, Wade explains that an exact circle is a mathematical abstraction, precisely defined so that all of the points on its circumference are the same distance from the center. Our use of a 360° circle extends back to the Babylonian astronomers, who derived this form for their studies of celestial spheres. Their mathematical system was sexagesimal (base-60) and as a result, they divided the circular form into 360 segments to measure angles (perhaps finding that a division by 60 did not sufficiently distinguish locations). Later, Greek astronomers—Claudius Ptolemy (ca. AD 100-170) in particular—adopted the 360° configuration. The Greeks and Ptolemy adopted a view of the circle that was imbued with Platonic ideas. As is well known, Plato conflated the solid and the flat geometries and proposed that we never experience objects in their perfect form, but that they are represented mentally in their idealized mathematical state. Thus, the "Platonic Forms" are simple shapes like the circle, square and triangle.

Wade points out that the Ptolemaic cosmology, like many ancient theories related to the mathematical perfection of the circle, was not sustainable as scientific knowledge increased. While a number of philosophical tenets remain intact with the overthrow of the circular cosmology, history also shows that a larger view emerged to challenge this geometrical form's supremacy. In the cosmological case, eventually, Copernicus' heliocentric theory superseded the Ptolemaic view. We frequently overlook that Copernicus's model, too, was initially built upon the circular ideal, as was Galileo's. Revisions that countered the circularity model only came about with Kepler. What I find ironic about this long historical episode is that the human imagination was so wedded to the circular view that even Kepler initially rejected his discovery that the planets had elliptical rotations because the orbits were not circular. Only once it became clear that his data did indeed point to an elliptical model, and that only elliptical rotations would resolve many of the anomalies within the circular models, did Kepler (and eventually the scientific community) come to accept this conclusion. Thus, as Wade points out, it is not just that the geocentric (earth-centered) model was replaced, it is also noteworthy that it was superseded by a system where the circle was no longer the geometry used to model rotations.

Since Kepler's elliptical solution has the symmetry of the circle embedded within it, and it is justly regarded as one of the triumphs of astronomy, physics and mathematics, it seems to offer a fuller vision. Commentary by the author on the reconfiguration of the circular "image" into the elliptical relationships would have provided a nice balance to his remarks that humans felt as if they lost their central position when the heliocentric picture removed the earth from its central position. This failure to include some commentary on the three-dimensional perspective of heliocentric cosmology brings to mind some of the challenges of the Flatland society created by E.A. Abbot. In Flatland, people could not conceptualize a 3D world from their 2D perspective. How we interpret the world we know is a tension we grapple with as individuals and have grappled with historically as we endeavor to translate (or make sense of) the reality we know. Moreover, the issue of perceptual vantage point is not simply based in some distant past. When we see the sun and the moon from our earthly position, these spherical objects appear as circles to us because of their distance from our planet. Similarly, from our vantage point, it does appear as if the sun does circle the earth.

All in all, what sets Circles apart from other efforts to relate the circle "story" is Wade's ability to present a prismatic overview of this shape. Pairing carefully rendered graphics (many of which were done by hand) with perceptual information results in an unusually clear visual commentary, one that adds tremendously to the textual discussion he provides. I repeatedly found myself so intrigued by the fluid, intricate designs that I tried to replicate their form, only to discover that their subtle elegance was much more complicated than I initially recognized. I also found myself thinking that, although I see myself as a student of the circle, my fund of circular information grew significantly as I read the book. Even in the few instances when the images seemed a bit jarring, they were educational. The one or two "busy" graphics provided insight into the critical commentary I have read on op art that claims the work cannot be character-ized as "real" art because it "tortures" the eyes.

Finally, as an artist as well as a scientist, Wade is well positioned to write a cross-disciplinary text that links the graphic circle to the history, theory and scientific principles of perceptual organization. His easy-to-read book captures how the form has charmed artists, scientists and thinkers throughout time. In a larger sense, the relation of the beautiful forms to the text is a part of how the academic (textual) tradition is merging with the more visual culture of today. Wade tells us that the text was drawn before it was written. In the writing, he found gaps in the graphical forms he had created to use as his outline for the textual commentary. Responding to these "holes," he added visuals, no doubt learning more about his subject in the process. While the words and images complement each other nicely, the superb graphics can also stand on their own terms. It is refreshing to see a book that offers a detailed, visual story about circular possibilities, one that covers significant territory even when separated from the textual discussion. Indeed, given how many perspectives Wade uses to weave the threads together, it was difficult to choose what to highlight in this short review. Suffice it to say, this is a tantalizing, fun and informative book. It will appeal to artists, scientists and general readers.