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Squaring the Circle

JESSICA HELFAND

The circle has no beginning and no ending. It is unbiased, solid and unwavering in its geometric simplicity, denoting unity and eternity, totality and infinity. It represents the cosmos, the cycle of the seasons, the life of man and the orbits of planets around the sun. In astronomy it indicates a full moon; in meteorology, a clear sky; in cartography it represents a village, town or community. Over time and across many cultures, the circle has come to represent an ideal of unsurpassable perfection, yet it eludes mathematical exactness. It is thus the essence of all that is natural, primordial and inescapably human.

The circle's sustained presence throughout the Middle Ages and the Renaissance is evident from thirteenth-century wheel windows to sixteenth-century condos, from studies on human proportion to treatises on architectural construction. The circle draws its rich symbolism from such sources as Christian theology (St Augustine described God as a circle whose centre was everywhere, and whose circumference nowhere), Babylonian legend (it is said that the ancient Babylonians developed the 360-degree circle as well as the 60-minute hour), Buddhist mandalas (a picture-tool for contemplation and meditation) and Byzantine rotundas (like halos in the Renaissance, a celebration of geometric purity gesturing upward to the heavens).

The circle is present in hieroglyphs and ideograms dating as far back as 3000 B.C. Its shape has formed the basis for numerous astronomical instruments, including the armillary sphere (used in the seventeenth century to teach the concepts of spherical astronomy) and the astrolabe (an ancient astro-

nomical "computer" for solving problems relating to time and the position of the sun and stars in the sky); the orrery (an eighteenth-century mechanical model of the solar system in which the planets rotate about the sun at correct scale speeds) and the observatory (a circular, dome-like structure typically positioned at high altitude for maximum star and sky visibility). In the south of England, the circle has informed the design not only of the massive monuments at Stonehenge, but also of the "crop circles" that have appeared in cornfields each summer for the past 21 years. In more practical terms, the circle has also defined the urban plans of such cities as Washington DC, designed by Pierre L'Enfant in 1791 according to the radial arrangement of Paris, where streets stretch from a common centre like the spokes of a wheel.

Conceptually, the circle has intrigued thinkers from Plato to Pythagoras, Husserl to Hobbes, Einstein to Emerson. ("The eye," wrote Emerson, "is the first circle.") Philosophers ponder something called a "hermeneutic" circle, which refers to the inherent circularity of all understanding. Indeed, the idea of the circle as a self-fulfilling loop—a trap, or a set of recurring, cyclical limitations—presents a darker side of its hitherto pristine character. In literature, the circle is frequently seen as threatening or intractable. Dante's *Inferno* invokes seven circles to depict the inescapable nature of hell. Alexander Solzhenitsyn's *The First Circle* (1968) adapts the circle as a metaphor for government repression and crimes against humanity. In *La Ronde* (1900), Arthur Schnitzler portrays a circular pattern of sexual deceit in turn-of-the-century Vienna, while William

The *Kitchenette Wheel*. Roman Press Publishers New York, 1940s. From "Creamed Oysters with Celery" to "Schnitzel Holstein," users can concoct recipes by ("dialling" the ingredients. This early example of an interactive kitchen tool offers a progressive search option flow to create menus by combining what you already have at home) through a simple rotary interface. Its culinary content betrays its age: most recipes are unusually saucy, nutritionally questionable, or both.



Somerset Maugham's 1921 satire *The Circle* illuminates the vicissitudes of bourgeois life between the wars. Across cultures, disciplines and multiple media the circle has endured, from a symbol for cosmic revelation to a model of human behaviour, a captivating emblem at once mystical, metaphorical and moral.

And mathematical. Older graphic designers may recall the proportional wheel, designed to determine the sizing of photographs for reproduction. While circular calculation devices were first introduced in the mid-seventeenth century it was not until the nineteenth century that advances in scientific thinking combined with discoveries in technology to produce what are, in retrospect, some of our earliest computers. Circular form is strikingly evident in their design: Charles Babbage's steam-powered Analytical Engine of 1833, widely considered the first computer, was based on circular logarithmic tables. Early calculation machines were sometimes called "arithmometers" and "comptometers" and, like Babbage's, were predicated on a data-entry system that used punch cards. By the end of the nineteenth century, calculation devices were designed to facilitate everything from data tabulation and physical measurement to the mechanical representation of logic. Many relied on concentric wheels: even father-of-

hypertext Vannevar Bush's first automatic computer of 1933 (he called it a "differential analyser") gave its initial solutions in the form of curves.

Circular design conceits thus have ample precedent in the technologies of the last two centuries, yet in contemporary culture we expect our information to be framed by rectangular, Cartesian coordinates. We digest our data in bytes and bits via squared-up monitors and drill/pull-down menus in a tyranny of rigorous alignment that mirrors the rational substrate of modern civilisation where text squares up, buildings stand up and the world, by and large, follows an orderly, axial progression of straight lines and right angles. Conversely, the notion of the circle-meets-technology instantly conjures images of the most archaic of appliances: oversized television sets and cumbersome radio consoles, telephone switchboards and analogue synthesizers, all "navigated" by clumsy dials and knobs. It is hardly the stuff of modern convenience, let alone a model for progressive interaction design.

The process of mediating the tension between rational (square) and rotational (circle)—that of imposed order versus natural order—is hardly new. One of the earliest problems in Greek mathematics was something called "squaring the circle"—the attempt to construct geometrically a square equal in area to a given circle. But does "squaring" the circle also reflect our subconscious attempt to impose upon it a forced logic? If roundness is "the suitable shape for objects that belong nowhere and everywhere," as Rudolph Arnheim put it, then what better working metaphor for the digital denizens of the Internet, whose "everywhere and nowhere" pere-

grinations so perfectly characterise the nomadic nature of modern telecommunications—wireless, global and intangible? According to this view, circular form presents an intriguing case study: it is a vessel at once adaptable, flexible and pure, simple and streamlined, culturally and categorically neutral.

The images of wheel charts that accompany this piece show circles in use not only as conduits of information but, more importantly, as two-dimensional precursors to interface design. At their core they are all about eye/hand co-ordination, much as we navigate on screen through the delicate balancing act of eye/hand and mouse/cursor. In formal terms they subdivide the circle's circumference into segments that address complex yet navigable details—some numerical, some informational, some trivial. Included here are data-discs and fact-finders, at-a-glance charts and quiz wheels, trouble shooters, mileage converters and geographic locators. There are wheels to preview weather patterns, to predict nuclear fallout and to plan the period of gestation; there are perrigraphs (diving planners), planispheres (star maps) and wheels that quantify some of the finer statistical points of presidential trivia. Yet while these specimens of paper ephemera represent a broad categorical sweep of social history, they are radical in their articulation of space, time and user-driven functionality. Consider, too, their graphic complexity—not to mention the pre-desktop publishing manual labour required to achieve it—and the function they perform: turn, point, find; a paper version of "point and click."

The Wheel of Life, Natural Foods Institute, Olmsted Falls, Ohio, 1941. Here is a perfect example of the two basic compositional concerns in wheel chart design: the outer wheel displays its content through a peripheral plan (data organized along the outer edge, leading horizontally) while the inner wheel displays its content through a radial plan (data organized from the center point, reading vertically). In this example, the major food groups, including meats, seafood, cereals, and vegetables are listed on the outer wheel, while the vitamins (A, B, C, D, E, and G) and minerals (including sodium, potassium, magnesium, and iron) are listed on the inner wheel. The back features a health chart with recommended food combinations.

