I rarely see a definition of creativity that captures its mystery, magic and promise. More commonly, I find myself puzzling over the morass of definitions that conclude creativity, while transformative, is indefinable. This is not to say that interested parties have not tried to add more substance to the puzzle. Some fill this vacuum with analogies. One I have always found appealing is found in Lewis Carroll’s classic Alice in Wonderland, where he both reminds us of the need to think creatively and pokes fun at how we approach this need. The episode that comes to mind has Alice, who recognizes that she has become too small, derive an excellent plan to remedy the situation. She then admits to herself that although her plan is very neatly and simply arranged, she has no idea how to set it in place. In the book, after creatively solving problem after problem, Alice continues onward, addressing a litany of events she can neither control nor understand, and the process is presented over and over again. Alice’s adventures are not only fun but also bring to mind why some people dislike the correlation of creativity and problem solving, feeling that problem solving misses the spontaneity, emotional attachment and passion we bring to successful, creative projects. It should be noted that Alice’s challenges in Wonderland allowed Lewis Carroll, an English author, mathematician, logician and photographer, to poke fun at British education.

Many academics and interested parties continue to weigh in on the creativity conundrum. I would guess that even non-specialists who are drawn to the subject have encountered popular psychological studies like Csikszentmihalyi’s “flow” or Gardner’s idea of multiple intelligences. Those who have looked for in-depth research, perhaps in cognitive neuroscience, have no doubt wrestled with how researchers who design studies that test a subject’s ability to solve problems the investigators have already answered can purport to address the kind of innovation a genu-
inely creative person expresses when bringing something no one thought of before into being. There are also thinkers in related fields (such as education and philosophy) who wrestle with the tension between theory and application. Then, of course, there are the many artists and scientists who offer no theories of creativity; they are instead predisposed to explore experientially, which means that creativity is implicit in their work even if never explicitly defined.

Working with this complicated matrix over the years, I have concluded that case studies of actual creative development offer the best approaches for navigating the amorphous creativity terrain. This preference drew me to David Edwards's new book *Artsience: Creativity in the Post-Googol Generation*, wherein he introduces a number of people to walk us through idea translation (how those who use the art/science combination put their ideas together in cultural institutions, academia, humanitarian causes, and industry). The cast of characters includes Diana Dabby, who wanted to pioneer in music composition, started as a pianist and then returned to get a degree in electrical engineering as she translated her ideas into innovative theories of music composition. She is currently a music professor at Obin College, a new liberal arts and engineering college outside of Boston. Julio Ottino, a chemical engineer, developed a new theory of fluid mixing that benefited from his experience with creative painting and a doctoral degree in chemical engineering. Wolf Peter Fehlhammer, a German chemist, became the director of the Deutsches Museum, the largest and oldest museum in Germany devoted to the history of science and technology. This museum ranks with the great technical museums of the world: the Science Museum in London, the Conservatoire national des arts et métiers in Paris and the Smithsonian Institution in Washington. According to Edwards, Fehlhammer was concerned with how to engage artists so that the museum would provide an environment that could disrupt the way the public viewed science. He wanted to both empower artists within the museum and have them challenge and disturb the minds of visitors in ways that would generate dialogue and encourage people to think more deeply about science, technology, and art.

Edwards himself is the founder of Le Laboratoire, a new arts science center in Paris, and the Gordon McKay Professor of the Practice of Biomedical Engineering at Harvard University. In Edwards's view, institutional environments are notorious for limiting interdisciplinary thinking due to the way departments and requirements are structured. He turned to what he calls *artsience* to convey that, in using a combination of the processes we conventionally characterize as either art or science, we can allow creators to more easily propel ideas over traditional disciplinary and institutional obstacles. Encouraging interdisciplinary intertwining, Edwards believes, will provide a catalyst for innovation, particularly if artsience laboratories are able to give the power to control and design projects back to the creators. In the artsience laboratory, as discussed below, creative people can accelerate idea development for cultural, educational, social and industrial projects. Thus, such a lab serves as an idea accelerator and a kind of experimental art center that puts industry, society and research and education partners in dialogue with the public through continual artsience experimentation.

Four kinds of programming foster participant creativity and bolster the lab's value as a resource. One kind of programming moves ideas between cultural and social quadrants of activity, one between educational and cultural quadrants, and one between industrial and cultural quadrants. The fourth program moves ideas from the lab to the public—and back. Since culture is the quadrant of creative activity common to all lab programming, this fourth lab program, in Edwards's view, is not only cultural, it also reflects the other three areas of focus. It is easy to understand his case when he talks about idea translation as a key component of artsience because it requires some commonality of process and why the intertwining of the art and science methodologies is the backbone of artsience. More difficult to grasp is why Edwards offers what he sees as a paradigmatic methodology, given that he acknowledges that creators rarely follow it. In any case, the paradigm proposes that proponents: (1) passionately espouse some idea that they aim to realize in the arts or sciences; (2) study deeply and open themselves to invigorating new experience in science (if trained in the arts) or the arts (if trained in the sciences); (3) struggle against stiff resistance from colleagues and sometimes even their intended audience; (4) repeatedly test and frequently see their original idea evolve in unexpected ways in this new environment; and (5) throughout it all maintain a determination to arrive at an original artistic or scientific expression.

Although an enjoyable read, *Artsience* is not a scholarly work. Rather, it is a long, passionate essay; loosely researched, lacking in-depth scholarship, and at times misleading. For example, one case study introduces us to Maurice Bernard, a scientist who became the director of the research laboratory at the Louvre. Edwards says that Bernard's X-ray studies were initially treated as an auxiliary to the work of art historians. This changed after his X-ray work on Rubens's *Descente de Croix* in the 1980s exposed details of Rubens's construction of the piece that art-historical analyses could not have discovered without the technological tools that revealed what was beneath the painted surface. Edwards's presentation gives the impression that Bernard's work was transformative because it allowed scientists to have more input into the analyses of works of art. While this story is no doubt true, it is not an accurate depiction of the field at large. Art conservation laboratories have been using X-ray analysis for decades. The National Gallery in London (NGL), for example, appointed a scientific adviser in 1934. This individual was charged with carrying out pioneering work in X-ray photography of pictures and establishing a physics laboratory at the Gallery.

Similarly, when Edwards applauds the entry of art into scientific institutions, one gets the impression that this is a new thing, which is not the case. To be sure, fashion change, and the contemporary models are more interactive, but public education and disciplinary mixtures have a long history in museum environments. Art and science have been living under the same roof at least since this was the primary impetus of the Renaissance. In the Western hemisphere, for example, a key moment was when the resourceful, versatile and passionate artist and showman Charles Willson Peale (1741–1827) opened his Peale Museum, also known as the American Museum or simply The Museum, in 1785. This institution took hold during a period when people were so eager to see his mastodon fossil illustrations that he founded the museum to make this work more available to the public. His museum initially brought art and natural history together, a reflection of his individual inclinations. Although Peale's emphasis was more a product
of his time than ours, it is now seen as a product of the Enlightenment; it did serve as a home for his art while also serving the then new American republic as an instrument of scientific discourse and of public education. Another notable historical example, this one more an individual case study, was that of Samuel Morse, the inventor of Morse code and one of the most notable portraitists of the Revolutionary era.

Some aspects of *Artscience* limit its value. For example, when historical examples are mentioned, they are presented in a somewhat superficial fashion. Jan van Eyck’s “invention” of oil paint comes to mind. Edwards asserts that van Eyck invented the technology. This is a popular myth that grew out of van Eyck’s mastery of the technology. Research has shown, however, that oil paint technology was actually developed over several centuries of experimentation. (Giotto to Diver: Early Renaissance Painting in the National Gallery [1991] by Jill Dunkerton et al. includes some discussion of the history of oil painting. X-ray research from the NGL is also contained in this book.) The brevity of the historical presentation, for example, the omission of indices, bibliographies and notes, makes it clear that *Artscience* is intended more for generalists than scholars. I mention this because, since there was no index, I am unable to easily confirm that Edwards never mentions the journal *Leonardo* (or the Leonardo community) in his discussion of organizations and venues that encourage dialogue among art and science. Suffice it to say that I cannot recall a single mention. (He does mention places such as the MIT Media Lab, organizations such as ASCI, Inc., etc.) Also, the book’s title, *Creativity in the Post-Googol Generation*, is a misnomer.

At the beginning of the book Edwards explains that the title comes from an argument put forth in Richard Florida’s 2002 book *Rise of the Creative Class*. Florida argues that idea generation, development and realization depend on a particular mix of art and science that is a familiar feature of the post-Googol era. There is little in Edwards’s book to suggest that it offers a “post-Googol” perspective. Many of the people presented have had long careers, and the robust chronologies used to outline individual stories suggest that these individuals began their creative pursuits long before Google was born on 7 September 1998.

Easy to read and clearly a repository for David Edwards’s passion for creativity, *Artscience* has more promise than punch. All in all, the stories Edwards presents are well told and evoke a passion that recommends the volume. I enjoyed reading the text and even found it refreshing at times, although the sum total was disappointing. The title led me to infer that there would be more discussion of Leonardo types, who increasingly see the conjunction of art, science and technology as an approach whose time has come; rather than one still struggling for recognition. Also, the laboratory chapter does not include success stories from Edwards’s own lab, an omission that is accentuated by a comment on the last page: “Artscience does not need a laboratory to thrive... . I would not create a laboratory for any of the artscientists whose stories I have told in this book” [p. 194]. I would add that creative people do not necessarily need a laboratory, although I suspect that organizational support can help transform an idea into something viable and/or wonderful. I further believe that Edwards, like many of the people who read *Leonardo*, and interdisciplinary people in general, understands the need and desire to break out of formulaic responses. How we best speak across boundaries and attract others to take roads less traveled is a part of the creative equation addressed by the *Artscience* book. The spirit Edwards brings to the question outweighs many of the limitations of this book. While I would keep in mind that *Artscience* is not exemplary on all counts, I believe that anyone interested in creativity will find much to chew on in this volume.