

► better reflect the range and dynamics of patients' experiences. In another echo of *DSM-I*, special attention will be paid to context, in no small part caused by intense scientific and public interest in the mental-health problems associated with military personnel deployed in wars.

The number of possible diagnoses may contract in *DSM-5*. In the case of schizophrenia, the APA proposes removing all previous subtypes. The major debate is whether to add a category for psychosis risk syndrome, not unlike the 'latent type' within *DSM-II*. Some argue that because schizophrenia is a developmental disorder, with attenuated symptoms that can appear before psychotic episodes, a risk designation might aid early treatment and improve prognosis. Others note that most 'at-risk' individuals ultimately do not develop psychosis, and fear that the designation might turn normal human differences into pathologies or be motivated by pharmaceutical interests.

Each new edition of the DSM is considered a marker of progress, but we should be careful not to assume that psychiatric classification today is better than it was. Social scientists have widely criticized all releases of the DSM for making arbitrary distinctions between health and disease. They challenge the manual's power to dictate how the human mind is viewed across the public arena, in schools, hospitals and courts of law. Clinicians note that mental disorders are more heterogeneous than the DSM suggests, and question whether changes in classification have yielded better outcomes for patients.

Shifts in classification occur for many reasons — such as the influence of war, changes in the insurance industry or public attitudes towards mental illness — that have little to do with scientific progress and much to do with society and history. A disorder, even one with a clear cause or biomarker, is only a disorder when a society construes it as such. For example, Asperger's disorder is scheduled for elimination from the DSM, but this does not mean the category was wrong. It was useful when a non-stigmatizing term was needed for people with the disorder, but is becoming obsolete now that autism is accepted as a broad-spectrum illness without clear-cut subtypes. The possible collapse of schizophrenia classifications similarly reflects a more nuanced and connected picture of mental illness.

Nearly six decades after breaking ground with *DSM-I*, and three decades after *DSM-III* was radically reappraised, psychiatrists are braced for another diagnostic revolution. ■

**Roy Richard Grinker** is professor of anthropology and human sciences at George Washington University, Washington DC 20052, USA, and author of *Unstrange Minds*. e-mail: rgrink@gwu.edu



Linked minds in a non-commercial setting can lead to ideas such as the Clifton Suspension Bridge, UK.

#### INNOVATION

## Lighting the creative spark

Ingenuity combines individual skill with shared ideas, explains **Robert J. Sternberg**.

**T**wo new books ask how we seed new ideas: Andrew Robinson examines the personal side of great breakthroughs in *Sudden Genius*, and Steven Johnson explores the collective basis of innovation in *Where Good Ideas Come From*. Both books highlight social and environmental factors in fostering creativity. But they tend to over-generalize, and fail to appreciate that many kinds of creative expression can emerge and be treated differently in society.

According to Robinson, most 'eureka' moments take a long time in coming. He describes psychologist John Hayes's finding that experts and geniuses must immerse themselves in a discipline for at least a decade before they have the knowledge and

#### **Sudden Genius? The Gradual Path to Creative Breakthroughs**

ANDREW ROBINSON  
Oxford University Press: 2010. 352 pp. £18.99

#### **Where Good Ideas Come from: The Natural History of Innovation**

STEVEN JOHNSON  
Allen Lane/Riverhead: 2010. 336 pp. £20/\$26.95

experience needed to produce world-class work. Yet exceptional achievement clearly requires more than application: no amount of practice would allow most people to compose music like Mozart.

Asking to what extent genes determine creative success, Robinson observes that talent runs in families, suggesting that some aptitudes are inherited. Genius, however,



A. WARD/LIFE FILE/PHOTOLIBRARY

does not span generations, implying that it arises through a rare set of circumstances. He disputes the conclusion of polymath Francis Galton that such brilliance is inherited, as set out in his 1869 book *Hereditary Genius*, by arguing that Galton's study focused on people of talent more than genius. But he misses the point that Galton's early work was also flawed because it didn't account for environmental influences: family attitudes may have as big an effect as genes.

Robinson asserts that psychologists have produced no firm evidence that talent is largely innate. He leaves room for genetic factors but, for him, "determination, practice and coaching" are most important. There is clearly a correlation between practice and achievement. But a genetic predisposition might be more significant than Robinson supposes in helping an individual to reach the highest levels in a particular domain. Those lacking natural talent are more likely to drop out.

Talent, Robinson ultimately believes, results from an interaction of heredity and environment. On top of that, genius requires a combination of high motivation, personality factors such as openness to experience, immense amounts of learning, at least ten years immersed in one's discipline and an environment that

**NATURE.COM**  
How creativity aided early chemistry:  
[go.nature.com/fzdowg](http://go.nature.com/fzdowg)

fits the potential genius like a glove. Many highly creative individuals, he also notes, lost a parent when they were young. This gives them an independent drive that might not have occurred otherwise.

Robinson leaves many questions up in the air, such as the relationship between intelligence and creativity, the role of the unconscious mind and links between genius and madness. There is evidence to suggest that intelligence (as defined narrowly by IQ) correlates with creativity up to an IQ of about 120, but has little effect beyond that. The unconscious does have a vital role in generating ideas, and a link has been demonstrated between bipolar disorder and certain forms of creativity, particularly in poetry.

Most provocatively, Robinson remarks that "talent appears to be on the increase, genius on the decrease". The reason for this shift, he suggests, is the increased specialization required for professional credentials, which makes the broad thinking that characterizes geniuses harder to develop. The problem is greater in the sciences than in the arts, owing to the higher technical skill base needed. And the astonishing amounts of complex knowledge that must be mastered today prevent most researchers from making deep connections between disciplines. Cross-disciplinary work, more and more, requires teams.

I believe that the culture of academia may also hamper genius. As philosopher of science Thomas Kuhn has pointed out, highly creative work that does not fit existing academic paradigms tends to be dismissed. Many great scientists have related how their most original ideas were repeatedly rejected by their peers.

Yet innovation can emerge from the collective, according to Johnson. In *Where Good Ideas Come From*, he argues that the world is better served by connecting ideas than by protecting them. He assigns creative ideas to four categories, according to whether they are the product of an individual mind or a network of minds, and introduced in a market or non-market setting. The most productive environment for the formation of ideas, he argues, is one that encourages networks of minds operating in a non-market setting. This category, he says, has yielded more great ideas than the others, including suspension bridges, anaesthesia, DNA forensics and the Krebs cycle for energy generation in aerobic respiration.

Universities, Johnson argues, have been the originators of many great concepts because they encourage the free interchange of ideas. To maximize creativity, you need both the availability of a network and the random collision of ideas within it, and universities offer both. He cites psychologist Kevin Dunbar's finding that few great scientific breakthroughs were the direct

results of lab experiments; rather, those groundbreaking ideas arose during discussions afterwards.

Johnson, like Robinson, argues for the importance of the slow hunch, the perception that great ideas are gradual rather than fast in coming. Because they often build on platforms that others created — Isaac Newton's idea of standing on the "shoulders of giants" — those ideas are even slower in arriving than they seem. As well as serendipity, Johnson suggests that many good ideas emerge out of previous errors and 'exaptations': things that were created for one purpose but later turn

**"Flashes of brilliance are slow in coming. So too is their recognition."**

out to be useful for another.

Although the two authors examine creativity from different perspectives — Robinson focuses on the individual, Johnson on the group — neither recognizes that there are different types of creativity and that the rules that apply to one type do not necessarily follow for others. For example, creative contributions that incrementally advance existing knowledge differ in their impact from those that redirect a field. The former are rewarded by a field's referees and editors; the latter, as Kuhn noted, may be accepted only grudgingly, if at all, as challenges to conventional wisdom.

Thus it takes more than years of practice and the availability of a network to foster creativity. Inventive people tend to be crowd-defiers. Metaphorically, they buy low and sell high: generating an idea that, at the time, has little or no currency; convincing others of the value of the idea; and once their idea is accepted, moving on to the next unpopular idea. Creative people are thus intellectually combative.

A working environment that encourages creativity must tolerate and even encourage such contrariness. It must also recognize that the more creative an idea is, the harder it will be to sell. Reviewers of grant proposals and journal articles must recognize that highly creative research may be less developed than that which furthers established paradigms, and should make more allowances for originality.

Robinson and Johnson prompt us to think about where our ideas come from. If you haven't had a sudden revelation recently, don't worry — flashes of brilliance are slow in coming. So too is their recognition. ■

**Robert J. Sternberg** is provost and professor of psychology at Oklahoma State University, Stillwater, Oklahoma 74078, USA. His latest book is *Explorations in Giftedness*, co-authored with Linda Jarvin and Elena Grigorenko.  
e-mail: [robert.sternberg@okstate.edu](mailto:robert.sternberg@okstate.edu)