

# SPRING BOOKS



COGNITIVE SCIENCE

## Mind as mirror

**Philip Ball** gets under the skin of a treatise on the brain as an analogy machine.

I finished this review and stored the file in the 'Nature' folder on my desktop, then e-mailed it to the editor. Or did I? A file, after all, was once a sheaf of papers, and a folder a cardboard sleeve for holding them. A desktop was wooden, and mail needed a stamp (no, it needed a little piece of adhesive paper). But all I did was use an interfacing device (named for the most superficial resemblance to a rodent) to rearrange the settings of some microprocessor circuits.

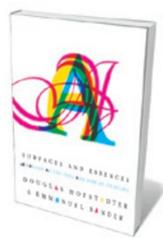
To see that almost everything we say and do refers by analogy to other things we or others have once said or done — which is the main point of *Surfaces and Essences* — there is no better illustration than our computer software, constructed as a conceptual and visual simulacrum of the offices our parents knew.

Why (science-fiction writers take note) would we invent new categories and labels for things when we can aid comprehension

by borrowing old ones, even if the physical resemblance is negligible? What cognitive scientists Douglas Hofstadter and Emmanuel Sander set out to show is that this sort of elision is not merely a convenience: all our thinking depends on it, from the half-truths of everyday speech ("that always happens to me too!") to the most abstruse of mathematical reasoning. I was convinced, and the ramifications are often thought-provoking. But when authors tell you the same thing, over and over again, for 500 pages, perhaps you'll believe it whether it is true or not.

Hofstadter is famous for his Pulitzer-prize-winning treatise on how we think, *Gödel, Escher, Bach* (Basic Books, 1979). Fans of that dazzling performance might find this book surprisingly sober, but it is also lucid

ILLUSTRATION BY ALEX ROBBINS



**Surfaces and Essences: Analogy as the Fuel and Fire of Thinking**

DOUGLAS HOFSTADTER & EMMANUEL SANDER  
*Basic Books: 2013.*  
 592 pp. \$35

The authors focus most on the use of analogy in language. Moving steadily from words to phrases and narratives, they show just how deeply embedded is our tendency to generalize, compare, categorize and forge links. Individual examples seem trivial until you realize their ubiquity: tables have legs, melodies are haunting, time is discussed in spatial terms,

and idioms are invariably analogical, if you get my drift. Thus the lexical precision on which dictionaries seem to insist is illusory — words are always standing in for other words, their boundaries malleable. This flexibility extends to our actions: we see that a spoon can serve as a knife when no knife is available. (Indeed, the spoon then becomes a knife — objects may be fixed, but their labels aren't.)

These arguments can be carried too far. Is to extrapolate to make an analogy, expecting the future to be like the past? Is a Freudian slip an analogy, or mere crosstalk of neural circuits? Is convention an analogy (why don't we write  $mc^2 = E^2$ )? Can we, in fact, turn any mental process into an analogy, by that very process of analogy? These are not rhetorical questions: one might, in principle, examine whether the same neural circuitry is involved in each case, for example. But a lack of interest in a neuroscientific examination of the authors' idea is one of the book's irksome lacunae.

In fact, this intriguing, frustrating book seems to exist almost in an intellectual vacuum. Unless one combs through the bibliography, one could mistakenly imagine that it is the first attempt to explore the idea of analogy and metaphor in linguistics, overlooking the work of Raymond Gibbs, Andrew Ortony, Esa Itkonen and many others. And one is forced to take an awful lot on trust. When, for example, Hofstadter and Sander describe the evolution of the concept of 'mother' in the mind of a child as he or she learns to generalize from experience, they offer a plausible story, but no empirical evidence for the developmental pathway they describe.

Neither is there any real explanation of why we think this way. Isn't it perhaps, in part, a way of minimizing the mental

resources we need to engage in a situation, to avoid having to start from scratch with every unfamiliar encounter, object or perspective? Is it an adaptive technique for making predictions? Are mirror neurons part of a built-in cognitive apparatus for analogizing ourselves into others' shoes?

The lack of historical perspective is also a problem; it is as if people always thought as they do now. Analogy was arguably all we once had for navigating experience, for example in the Neoplatonic idea of correspondences, "As above, so below." This "just as ... so ..." thinking remains at the root of pseudoscience as well as science: the Moon influences the tides, so why not our body fluids? In which case, how do we distinguish between good and bad analogies?

There are gems of insight in *Surfaces and Essences*, but again these are flawed by the authors' relaxed attitude towards evidence. An analysis of Einstein's thought is splendid, explaining what is missing from conventional accounts of the discoveries of light quanta, relativity and mass-energy equivalence — namely, the qualities that distinguish Einstein from his peers. These qualities are convincingly shown to be analogical: Einstein was able to take leaps of faith and make connections that postpone

rigour and are certainly not self-evidently true.

As Hofstadter and Sander show, these leaps were based on a conviction that different areas of physics were comparable. Einstein's intuition, which his friend and biographer Banesh Hoffmann was content to leave ineffable, is here taken apart so that some of the inner workings may be seen. An ability to draw deep analogies, the authors say, left Einstein like J. S. Bach on

hearing a theme: "very quickly able to imagine all of its consequences." All very fine — but such a detailed account must surely be supported by Einstein's own words. Almost none are offered; we get only fragments of Hoffmann's commentary.

Who is this fecund book for? Academic linguists will be irritated by the absence of references to other work. Physical scientists aren't indulged until page 450. General readers may find it a marathon. The concept of the mind as an analogy generator is persuasive — but would have been equally so explicated at half the length. ■

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**AN ABILITY TO DRAW DEEP ANALOGIES LEFT EINSTEIN LIKE J. S. BACH ON HEARING A THEME.**

and, page for page, a delight to read. Whether there is any conceptual continuity between the earlier work and this new vision of cognition is debatable, except perhaps that the delight in puns in *Gödel, Escher, Bach* here becomes an assertion that pretty much all our mental processing depends on them.

Analogies are the bread and butter (there we go again) of the visual, literary and theatrical arts, although the authors seem curiously unconcerned about any of these except poetry. Yet Hofstadter and Sander

are really inverting that usual picture: art is not a producer of analogies, but a producer of our analogical brains.

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 For Susan Blackmore on Hofstadter, see: [go.nature.com/zfzrbg](http://go.nature.com/zfzrbg)