on the idea that such weapons could now be developed because modern methods would overcome previously insurmountable technical obstacles. But by describing how difficult and costly it was to develop any functional bioweapons before the 1990s, the book could emphasize the false nature of the frequently repeated idea of bioweapons as a 'poor man's atom bomb'.

We also learn that the idea of terrorist 'sleeper cells' goes back to 1951, when the CIA suspected that Soviet saboteurs were living unnoticed on US soil while waiting for an order from Moscow to launch a biological attack. Reading on, I was surprised to learn that Hungary probably undertook some offensive bioweapons activities before 1945, and that this programme might have had ties with a clandestine, yet-to-be-described Italian programme. The equally new revelation that Czechoslovakia might have kept stocks of variola virus up to 1994 is, if proved correct, stunning and frightening. Smallpox (the disease caused by this agent) was eradicated in the late 1970s, and official stocks of variola virus have since been permitted in only two laboratories, one in the United States and one in Russia.

The chapter on bioweapons R&D in Iraq provides a fascinating comparison of official Iraqi statements with the actual findings of the United Nations Special Commission, the UN Monitoring, Verification and Inspection Commission, and the Iraq Survey Group. Once again it is emphasized that no evidence of bioweapons development was found in Iraq after 1996, that the UN monitoring regime was very effective, and that its negative findings were correct.

The description of South Africa's bioweapons programme, which began in 1981, shows that only 'crowd control' and assassination weapons, rather than weapons of mass destruction, were developed, and that the programme was not using sophisticated molecular biology. In discussing the allegations of bioweapons use by the United States in Korea and China in 1952, and by the Soviet Union during the war in Afghanistan, Furmanski and Wheelis take into account most available data on these allegations from either side so that assessment could not be misconstrued as parochialism or ill-conceived patriotism. They conclude that most allegations are probably false.

Deadly Cultures is written eloquently and has been edited superbly. The chapters have a uniform style and organization; scientific and political terminology is used in a consistent and correct manner throughout; and abbreviations are used only where absolutely necessary. In contrast to most other books on bioweapons, the editors have almost always used up-to-date taxonomy of biological agents, as well as the differentiation of agents and the diseases they cause. The authors also included the original names of all institutes involved in bioweapons R&D. This is not a trivial point as French, Iraqi or Russian institute designations have been translated differently in the past, and were also frequently changed during decades of reorganization, confusing both analysts and interested laymen.

I wish the book contained more references to biological anti-material weapons. Research activities on, for instance, rust-inducing, oil-degrading or asphalt-destroying agents are increasing and possibly challenge the 1972 Biological and Toxin Weapons Convention. Also, a chapter analysing the suspected motives (or lack thereof) of 'bioterrorists' would have been helpful, as it is by no means clear that terrorist organizations actually consider using weapons that would target politicians, civilians and themselves alike. Finally, in the chapter on legal constraints on bioweapons, there was no reference to the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques. These minor concerns aside, however, *Deadly Cultures* is informative, meticulously researched, important in its message, and a fabulous read for both scholars and interested scientists. ■

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What is it like to speed date?

Conversations on Consciousness
by Susan Blackmore
Oxford University Press: 2005. 288 pp.
£18.99, $23

Adina Roskies

The hard kernel of the mind–body problem — how we get first-person experience out of a purely physical object like the brain — was famously articulated by Thomas Nagel in a paper entitled 'What Is It Like To Be A Bat?' (*Phil. Rev.* 83, 435–450; 1974). The question of 'What is it like?' concerns the phenomenality and subjectivity of experience, and has come to be known as the hard problem of consciousness. This is the central focus of Susan Blackmore's latest book, *Conversations on Consciousness*, a compendium of 20 interviews she conducted with major figures in the field of consciousness studies. The illustrious but motley crew includes philosophers of radically different stripe such as David Chalmers, Pat and Paul Churchland, Daniel Dennett and John Searle; psychologists V. S. Ramachandran, Kevin O'Regan and Daniel Wegner; neuroscientists Francis Crick and Christof Koch; and explorer of altered states Stephen LaBerge.

The experience of reading Blackmore's book is the intellectual analogue of what it must be like to participate in the popular institution of speed dating, that maximally efficient method of meeting a potential partner. Blackmore devotes roughly 13 pages to each interview transcript, which reads roughly like a 10- to 15-minute conversation. Just as you might expect when interviewing potential romantic partners, some encounters with Blackmore's interviewees leave you wanting more, whereas others fail to connect and would be excruciating but for their merciful brevity.

In the course of Blackmore's discussions about how subjective experience might result from the operation of the three-pound hunk of meat that is our brain, she explores her subjects' disagreements with others' theories, their views about free will, and their opinions about the value of meditation and Eastern religious practices (the intellectual equivalent, I take it, of "What's your sign?"). She also poses personal questions to the interviewees, such as why they were drawn to studying consciousness in the first place, and whether their work has influenced the way they approach their own personal experiences.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

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Researchers have often wondered how we can get first-person experience from the matter that makes up our bodies.

The book best succeeds in providing a very brief survey of the multitude of positions occupied by thinkers in this area. The lack of agreement on any issue, such as whether there really is a hard problem — or if there is, what it is — is striking. Some theorists think that the problem is really hard. Even when we understand how the brain accomplishes its astounding variety of complex tasks, such as visual recognition, memory, planning and so on (the 'easy problems' of consciousness), something will be left unexplained: how or why these intelligent behaviours are accompanied in us by conscious states. Those who believe in the hard problem generally believe in the possibility of 'zombies' — beings who function exactly as we do, yet lack the mysterious spark of consciousness, so "all is dark inside". Others think the hard problem isn't really that hard, and that the problem of subjectivity will dissolve once we have a handle on the easy problems. Still others claim that the problem itself is illusory.

Because of the extremely light hand Blackmore takes in editing, the often quirky personalities and mannerisms of the interviewees shine through the text. The effect is magnified when you know the people: I could hear, for instance, Ned Block's enthusiastic voice and Crick's wry quips about philosophers in my mind's ear. This gives the book some added appeal: readers really get a sense of 'what it is like' to talk to these people. A few of the interviews with people I've never met made me wish I had a chance to explore their views further over dinner and a good bottle of wine, but others left me cold. Blackmore herself comes across as spunky and clever, and the probing follow-up questions she occasionally asks prevent the interviews from seeming too repetitive and boring.

However, if you are serious about meeting an intellectual soulmate in the quest to understand consciousness, speed dating may not be for you. The book is rather unsatisfying for anyone with a deep interest in the issues, for no position is articulated clearly enough for readers to see the depth of the problems or the breadth of knowledge (or ignorance) that characterizes our current understanding of issues related to consciousness. Despite Blackmore's obvious intelligence and familiarity with the issues, at crucial points she does not press her interviewees hard enough or deeply enough to provide us with truly novel insights.

Conversations on Consciousness provides an introduction to a variety of positions, but is too cursory to make possible their evaluation. For that, one would need to spend a few evenings alone with the works of one or another of the thinkers. Like speed dating, *Conversations on Consciousness* is low-risk, but ultimately also low-payoff. It is, at best, a good way to guide an interested novice into the field. Second date, anyone? ■

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Flame and fortune? Antoine Laurent Lavoisier (left) beat Joseph Priestley to the discovery of oxygen.

Burning ambition

A World on Fire: A Heretic, an Aristocrat, and the Race to Discover Oxygen
by Joe Jackson
Viking: 2005. 384 pp. $27.95, £17.99

Bernadette Bensaude-Vincent

One of the most famous episodes in the history of chemistry is the race for priority between the two rival champions of oxygen, Joseph Priestley and Antoine Laurent Lavoisier. Priestley was a Unitarian minister who divided his life between laboratory experiments and theology, and was forced to move from England to exile in the United States. Lavoisier was a young, ambitious and wealthy academician who never left France and met a tragic end in 1794, when he was guillotined by French revolutionaries. Joe Jackson plays nicely on the contrast between the two men in his extremely readable book *A World on Fire*. The title refers both to the role of oxygen in combustion, first established by Lavoisier, and to the context of scientific competition and political upheaval.

Jackson tells the story in the manner of a standard historical narrative, in chronological order, occasionally interrupted by glimpses of the broader cultural and political context. However, some of these interludes, such as the chapter on the guillotine, which speculates on how long its victims had to suffer before they died, do not seem particularly relevant. If the goal of the book was to weave together science and politics, it is not fully achieved. And this is not just because of the spelling mistakes and incorrect dates (for example, Descartes's *Discourse on Method* was published in 1637, not 1677).

The narrative fails to adequately recreate the scientific milieu of the late Enlightenment in Britain and France. Jackson consulted Priestley's archives, but he did not rely on primary sources for the French part of the story. He didn't even get his information from the recent wealth of scholarly publications on the chemical revolution. For instance, Frederic L. Holmes' *Antoine Lavoisier: The Next Crucial Year* (Princeton University Press, 1998) would have been a useful source for describing the pathway to the discovery of oxygen, especially as it is based on a close examination of Lavoisier's laboratory notebooks of the year 1773. As a result, Jackson's book reinforces some old clichés, such as the view of Lavoisier's career as a systematic development of a seminal idea, a revolutionary plan meant to overthrow Georg Stahl's phlogiston theory.

More importantly, Jackson's early chapters suggest that pre-lavoisierian chemistry was an inconsistent, empirical science, clinging to the ancient doctrine of the four elements. In truth, historians of eighteenth-century chemistry describe a booming field, based on more robust notions: not only had the four elements been redefined in terms of simple substances and agents or instruments, but laboratory practices were guided by tables of affinities.

The narrative itself suffers a major bias, being written from a present-day perspective. Because Jackson knows that the 'dephlogisticated air' that Priestley released from mercury calx was oxygen, he doesn't create any dramatic suspense. He assumes from the beginning that Priestley was wrong and Lavoisier was right. It would have been more interesting to show how the identity of oxygen was constructed through the confrontation between Priestley and Lavoisier. The contrast between Lavoisier's academic experiments, using sophisticated and expensive instruments, and Priestley's attachment to more democratic and qualitative practices, was described in a more balanced way by Jan Golinski in *Science as Public Culture* (Cambridge University Press, 1992). Jackson portrays Priestley as a complex and interesting character, but makes no effort to understand his strong convictions and religious beliefs. In contrast, the two-volume biography by Robert Schofield,