hard to follow is urged to reread them after going through the relevant sections of the book, which in spite of several similar (subtle) omissions and a number of unorthodox points of view is a superb introduction to what is most fascinating in science. The controversial aspects of the discussion present little danger to the practitioner and, though a more balanced account would have been even more useful, especially to the general readership, the author usually provides appropriate warnings so that nonexperts will not be led too far astray.

In a sense, the construction of the book is much like that of a detective novel, where the "crime" (the nonalgorithmic nature of consciousness) is identified early on (if only on the basis of somewhat circumstantial evidence) and various "suspects"—laws governing areas of physics potentially relevant to the operation of the brain—are introduced, thoroughly "interrogated," and found innocent. In the last sections the book returns to the "scene of the crime"—the human nervous system—and the detective (Penrose) points a finger at the presumed culprit.

A review of a detective novel should not spoil readers' fun by disclosing "whodunit," and I am not about to violate this rule. However, whereas the success of Poirot in Agatha Christie's novels is usually confirmed by a confession from the perpetrator, Penrose does not claim to be able to extract such an unequivocal "admission of guilt" from his suspect. This is just as well. I do not think it takes anything away from the excitement of the investigation. Indeed, in a sense it appears to be an open invitation for the readers to join in the on-going case.

The value of this book should be judged not just by the exciting overview of chosen areas of science, but, above all, by the fact that it puts into the center of natural science questions that so far have been asked mainly by philosophers and children. Penrose's book, I believe, anticipates the age in which science will have to come to terms with the fact that the minds that investigate the universe are inextricably embedded in its physics and in which the division between "mind" and "matter" will have to be either drawn more clearly or abolished altogether. When that happens, science in general, and physics in particular, will cease to be just a description of the universe by passive "detached" observers and, instead, will become a study of how minds are molded by matter and what role they play in the unfolding history of the universe they inhabit.

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Russians on the Psyche

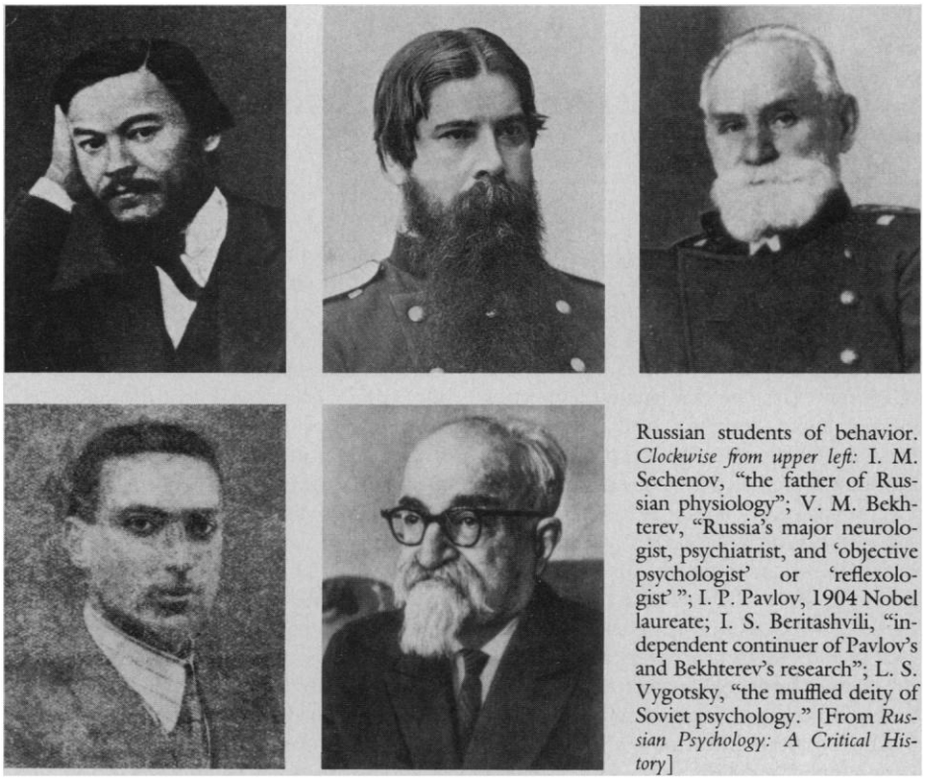
Russian Psychology. A Critical History. DAVID JORAVSKY. Basil Blackwell, Cambridge, MA, 1989. xxii, 583 pp. + plates. $34.95.

David Joravsky, one of the leading historians of Soviet science and culture, has a fascinating story to tell in this book. Or, to be more exact, he has many fascinating stories—about Sechenov and the birth of Russian neurophysiology and psychology in the second half of the 19th century, about Pavlov, his career under Tsarist and Soviet regimes and the remarkable triumph of Pavlovism in the Stalin period, about the influence of Freud in Russia, about Vygotsky and his school of psychology in the 1920s, and (in an absorbing and provocative chapter that is really more an appendage to the book than an integral part of it) about psychiatry and political power in the Soviet Union from the 1920s to the 1970s. As the author freely admits, this is not a normal history of a science, focused on a single discipline and viewing it from essentially the same perspective as its practitioners. Joravsky's theme is the study of mind and brain in Russia. In other words, he is writing the history of two distinct and often competing scientific disciplines, neurophysiology and psychology. Far from being abashed by the duality of his subject matter, Joravsky is intrigued by it. Indeed, that duality, which he sees as symptomatic of a larger problem of "fracture and frustration" in modern culture, is an integral part of his theme; and it is the Russians' persistent but unsuccessful efforts to overcome it that compel his most serious attention.

"Starting in the time of Marx and Comte, of Dostoevsky and Tolstoy," Joravsky writes, "I ask how that old-time amplitude of spirit came down to Pavlov and his molecule of mind, the conditioned reflex." As this quotation suggests, Joravsky's approach to Soviet neurophysiology—and in particular to Pavlov, that "assertive little one-sided man," as he calls him—is not particularly sympathetic. But at least he concedes that neurophysiology is a legitimate scientific discipline with a real core subject and an accumulating body of knowledge. Not so for psychology, of which Joravsky writes that "the psychologists' findings have persistently failed to cohere within a cumulatively developing body of knowledge, or worse: different heaps of data have been diligently accumulated by different schools, only to sink into pointlessness as the schools go out of fashion and new ones win favor." This is a judgment of the discipline as a whole, but Joravsky certainly holds no special brief for its Russian practitioners, including those like Vygotsky and Luria, whose studies of child development and brain-damaged subjects are often admired in the West. There was "something in the science of psychology" (as well as something in the Soviet political climate of 1920s and '30s) that "restricted even the best minds to humble tasks of adjustment." In Joravsky's view, it is social scientists and humanists—"Marx and Comte, Dostoevsky and Tolstoy"—who have proved to be the best investigators of the human mind and psyche. Logically, given this premise and his subject matter, Joravsky's book includes quite detailed discussions of such efforts by Russian *non*-psychologists, including Tolstoy, Dostoevsky, Chekhov, the poets Tiutchev and Briusov, and the prose writers Isaac Babel and Iurii Olesha.

Still, it is science that is Joravsky's central concern in this book; and of the various threads of scientific development he follows, the longest and perhaps most colorful is that of Pavlov and the Pavlov school. Born in 1849, Ivan Pavlovich Pavlov was a distinguished and successful physiologist well before the revolution. Recipient of a Nobel Prize in 1904 for work on the digestive system of dogs, Pavlov subsequently developed the theory of conditioned reflexes (which, as Joravsky points out, should really be rendered in English as "conditional [*uslovnye*] reflexes), which appealed strongly to American behaviorists and led J. B. Watson to hail him as a master in his 1915 presidential address to the American Psychological Association. Pavlov was as uninterested in politics as he was in philosophy (the latter attribute being a major cause for Joravsky's distaste, as well as the subject of several irreverent and entertaining anecdotes in the book), but he had no initial sympathy for the Bolsheviks and objected to the scientific pretensions of their Marxist ideology. The Bolshevik leaders, however, respected Pavlov's achievements and international reputation and basically treated him well in the 1920s, providing his Institute with special rations and support and leaving even his hostile comments on Marxism unpunished, though not unrebuked.

In the late 1920s, Pavlov's work on conditioned reflexes had reached an impasse in scientific terms and was coming under seri-



Russian students of behavior. *Clockwise from upper left:* I. M. Sechenov, "the father of Russian physiology"; V. M. Bekhterev, "Russia's major neurologist, psychiatrist, and 'objective psychologist' or 'reflexologist' "; I. P. Pavlov, 1904 Nobel laureate; I. S. Beritashvili, "independent continuer of Pavlov's and Bekhterev's research"; L. S. Vygotsky, "the muffled deity of Soviet psychology." [From *Russian Psychology: A Critical History*]

ous criticism from psychologists like the American Lashley and the Soviet Beritashvili who had originally tried to work within a Pavlovian framework. But his theory was already well known to a broad international public as the ultimate in mechanistic reductionism, and from the viewpoint of Soviet politicians (though perhaps not of Pavlov himself) his scientific reputation was undiminished. Encouraged by the writer Maxim Gorky, Stalin decided early in the 1930s that Pavlov deserved special recognition for his scientific achievements; and in the last years of his life Pavlov (who died in 1936) responded with gratitude and even made a public statement of approval of Soviet power. But the strangest chapter in the Pavlov story was still to come. In 1950, Soviet physiologists were summoned for the first of three meetings—the remaining two, held in 1951 and 1952, involved psychiatrists and psychologists respectively—in which Pavlov's legacy was declared to be, in effect, an immutable orthodoxy for Soviet science and the embodiment of Marxist-Leninist principles. In the same period, the notorious Lysenko (who, unlike Pavlov, was still alive and active in self-promotion) received similar canonization in the agricultural and biological sciences.

The Pavlov story, like Joravsky's earlier studies of Lysenko and the Soviet philosophy of science debates of the 1920s (*The Lysenko Affair* [1970] and *Soviet Marxism and Natural Science, 1917–1932* [1961], is a case study in the relationship of science and Soviet politics and ideology. But whereas in Joravsky's earlier works we seemed to be in a relatively straightforward moral world in which politics was, by and large, the villain and science the hero, here we have entered a realm of greater complexity and ambiguity. In *Russian Psychology*, the interventionist Soviet state with its pretensions to impose ideology on science is almost less of a villain than modern science itself, with its insistence on compartmentalization and specialization, or than modern Western political leaders who, Joravsky says, are content to "ignor[e] the major problems of science by blithely brushing them off to the specialists who deal with such technicalities" and thus "absolve themselves from the necessity of thought."

True, there were cases of state (party) intervention in Soviet neurophysiology and psychology, and Joravsky discusses them in this book. But in his presentation these are never straightforward examples of Soviet science being damaged by state interference. In neurophysiology, for example, Pavlov's theories were enshrined as dogma in the 1950s because of state interference, but that mattered relatively little because the Pavlovian dogma was "ritually avowed" but "practically ignored" by scientists. In another episode, this one from the 1930s, party leaders tried to further the fortunes of a Lysenko-like crank, A. D. Speransky, who offered a cure for cancer and other ailments with his theory that all pathological processes spread via the nervous system and that their spread could therefore be contained by novocaine blockage of the nerves in the affected part. But nothing came of Speransky—not only because he failed to get practical results, Joravsky argues, but also because the medical and neurophysiological professionals were solidly against him and the Soviet leaders "were *typically modern* [emphasis added]; they respected the autonomous knowledge claimed by the medical profession."

In psychology, unlike neurophysiology, there simply was no "party line" in the 1930s, according to Joravsky, meaning that the professionals in this field were left very much to their own devices. In the 1920s, of course, there was much talk about how "a Marxist psychological science would show educators and psychiatrists how to create a new man for a new social order." But that was "never more than talk," according to Joravsky's brisk summation. In contrast to an earlier writer on this subject (Raymond A. Bauer, *The New Man in Soviet Psychology* [1952]), Joravsky does not attach much importance to the party-supervised discussions in psychology at the beginning of the 1930s that subjected the Vygotsky-Luria school, among others, to heavy criticism. Luria continued working despite the criticism, Joravsky points out (Vygotsky died prematurely in the mid-'30s). Moreover, the Vygotsky-Luria field study of Uzbek peasants in 1931—an offshoot of their theoretical work on levels of mental development—is deeply flawed, judging by the extract quoted by Joravsky, and seems to have merited at least part of the official Soviet attack (specifically, the statement that "the experimenters literally extorted the situational thinking they presupposed" by their interviewing techniques). With regard to the official condemnation of IQ testing and the aspiring discipline of pedology in 1936, Joravsky's wry conclusion is that this was both a deserved rebuff to a "pseudo-science" *and* an egregious instance of political interference in scientific life. As for Freud (generally thought to have been completely outlawed in the Soviet Union from the end of the 1920s), Joravsky tells us that the prohibition applied only to Freudianism as a grand theoretical system, not to Freudian therapy, which continued to be practiced by a few Soviet psychiatrists until 1940.

When Joravsky attributes a "modern" attitude of respect for autonomous knowledge to Soviet leaders of the Stalin period, he is, of course, consciously and even mischievously challenging conventional wisdom, and exaggerating his own points to do so. In similar vein, he finds an elegant but perverse way of inverting the Sovietological cliché that relative tolerance on the part of Com-

munist leaders in the 1920s was succeeded by totalitarian intolerance in the Stalinist 1930s. When the Bolsheviks came to power, Joravsky writes, they still had some of the universalism of the Russian radicals of the 1860s, whose "old-time amplitude of spirit" he admires, and "clung to the conviction that political leaders must be intellectual leaders as well." That conviction was one of the causes of Soviet "thought control" (Joravsky's phrase) and its specific manifestations in science such as the outlawing of genetics that accompanied the triumph of Lysenko. However, the Bolsheviks' tendencies toward cultural dictatorship were always inhibited by their 20th-century faith in science, Joravsky argues. Even in the Stalin period, Soviet leaders—including Stalin, with his puzzling denunciation of "Arakcheev regimes" in science in 1950—were observably succumbing to the modern disease and were willing "to let knowledge be compartmentalized and left to separate professional groups of technicians." True, Stalin and his like were "almost as narrow" intellectually as Western politicians. But at least they still took ideas seriously enough to persecute them from time to time.

To sum up: *Russian Psychology* is a rich, deeply reflective, original, and encyclopedic work that is also provocative, opinionated, and sometimes (in the opinion of this reviewer) wrongheaded. It is never boring and never predictable. Read it.

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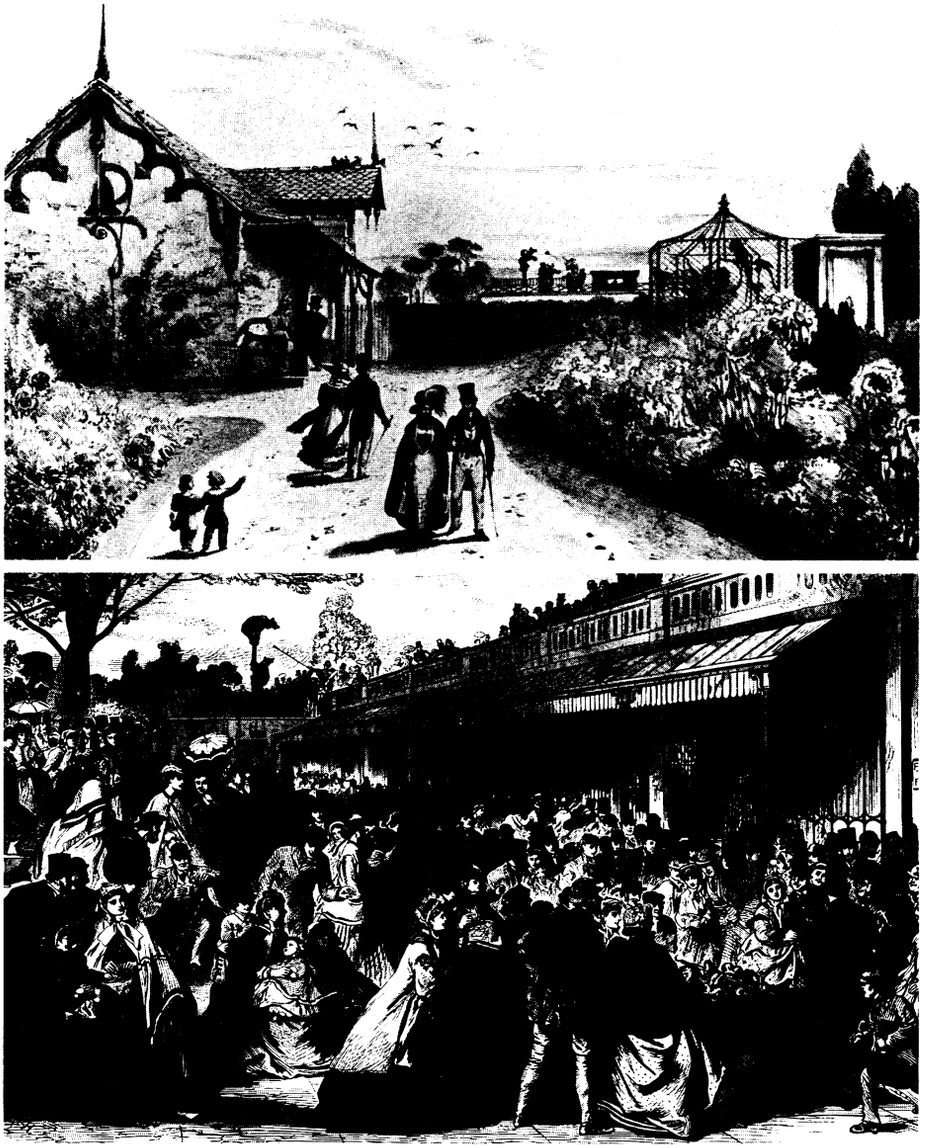

The London Zoological Gardens as "the most delightful lounge in the metropolis" in 1831, when only members and their guests were admitted, and later, when the gardens were open to the public. [1831 depiction by James Hakewell, © Zoological Society of London; later scene from *Illustrated London News* **48**, 509 (1866), © Illustrated London News Picture Library. Both reproduced in *The Politics of Evolution*]

Radical Anatomy

The Politics of Evolution. Morphology, Medicine, and Reform in Radical London. ADRIAN DESMOND. University of Chicago Press, Chicago, 1990. x, 503 pp., illus. $34.95. Science and Its Conceptual Foundations.

London in the 1830s was the scene of continuous radical ferment as disenfranchised Englishmen agitated for a more representative society. Neglected by the Great Reform Bill of 1832, working men rallied behind the banner of Chartism, a movement that rose to a crescendo of violence and agitation toward the end of the decade. At a different social level, dissatisfied physicians carried out a similar struggle against the religious exclusiveness, nepotism, and class discrimination of the Royal College of Physicians and the Royal College of Surgeons. Throughout the decade, general practitioners, medical radicals, and Dissenters railed against the narrow, self-appointed leadership of the colleges, calling for egalitarian reform. The contest was often bitter. To the sharp-tongued Thomas Wakley, editor of *The Lancet*, the corporation leaders were "mercenary, goose-brained monopolists and charlatans" (p. 252). They, in turn, referred to journals like Wakley's as the "reptile press" (p. 239).

Adrian Desmond provides a splendid account of this medical contest, locating the strongholds of the rebels in the medical school of the new merchant-financed London University and the proprietary schools that provided medical education to so many Dissenting physicians. He introduces us to a fascinating cast of characters, among them Joshua Brookes, director of the Blenheim Street School. Over the years Brookes assembled an anatomical museum second only to the Hunterian Museum of the Royal College of Surgeons, but discriminatory legislation by the RCS robbed him of students, ruined his school, and forced the auction of his collection. Brookes's student George Dermott, who opened the Gerrard Street School, was a pugnacious, hard-drinking man, eager to recruit poor students and convert them to his radical convictions. Not surprisingly, the fellows of the RCS looked down on him as being neither a "pretended gentleman nor a pretended surgeon" (p. 170).

What makes such men interesting to Desmond is not merely their struggle with social and professional superiors but also their