priate than the mathematics of physics for overcoming the obstacles he so ably discusses. The currently popular approach to psychology via biology also escapes comment.

Lacking reliable, scientific knowledge to guide political and social relations, what should serve? On the final pages, the author suggests that literature is best able to cut through the maze of cultural values. "The challenge to the behavioral sciences does not come from physics . . . but from the humanities" (p. 185). The traditional agents of social change—lawyers, priests, and politicians—do as well as we have reason to hope. Social science has yet to achieve sufficient literary quality to be a serious contender.

This essay is an example of literary social science at its best. Though much of it is intuitively winning, the gaps in its arguments and its ultimate lack of persuasiveness also demonstrate the limitations of this type of analysis. Its romantic conclusion about the value of the humanities as a source of social insight will be of little comfort to those who seek advice on specific policy, legislative, or judicial questions, on which literature, as a rule, stands mute or divided.

We of course should not have expected a definitive answer to the question Ziman addresses, for this requires a gratuitous conclusion about how much is ultimately beyond the human mind. The author examines and refines a viewpoint that has wide appeal among laymen and scientists alike, and much of his criticism of social science as it stands today is right on the mark. However, whatever novelty his analysis of science may possess, he does not contribute a new and winning argument but merely another vote. His doubts about the possibility of reliable social science come to rest on familiar ground: man somehow is just sufficiently competent to produce the wonders and mysteries of science and art, but not sufficiently so ever consciously to explain how he does it.

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Insects: Evolutionary Strategies

Sexual Selection and Reproductive Competition in Insects. Papers from a symposium, Washington, D.C., 1976. MURRAY S. BLUM and NANCY A. BLUM, Eds. Academic Press, New York, 1979. xii, 464 pp., illus. $23.

This volume is a collection of 13 papers that grew from a symposium organized by Daniel Otte at the 15th International Congress of Entomology. As in most such collections, the papers range widely in length, style, and quality. But they all address the question of the role of individual fitness in reproductive success, and they explore the evolution of male and female characteristics resulting from the battle within and between the sexes.

As most of the papers indicate, the behavior of an individual adult insect may be dedicated to an awesomely diverse and intricate set of strategies honed through evolution to insert the maximum number of its genes into the next generation. In this task the primary currencies are genetic and material benefits that may be won by force or deceit or through choice among displayed alternatives. Since the interests of the two sexes may be opposed, a dynamic evolutionary chase, examined in a mathematical model by G. A. Parker, is expected that will include separate male and female strategies and counterstrategies. The generalizations, given in several review papers and numerous introductions to narrower ones, are straightforward, but the details are endlessly complex and highly specific.

Most of the papers are not mathematical. Some of them deal with functional morphologies, such as those by W. G. Eberhard and by D. Otte and K. Stayman on the fighting armaments of male beetles (which have mandibles as long as the body). W. D. Hamilton discusses winglessness and lethal fighting weapons in male fig wasps, and D. K. McAlpine speculates on the possible significance of the eyestalks in a fly. Some of the papers contained in this volume suffer from poor illustrations, insufficient documentation, and redundancy. And there are other distractions. The flow in one paper is interrupted by 17 footnotes. I counted the word "may" 13 times on one randomly chosen page (p. 39) of a 53-page review. Perhaps this merely indicates a realistic attempt to be cautious while trying to cover all possible contingencies (the paper has 127 references). In any case, it emphasizes that much is a matter of interpretation, no matter what means are used to do the interpreting.

Some of the papers stand out in providing, in lucid fashion, evidence of the amazing sophistication of the sexual dirty tricks perpetrated by this prolific group of lowly organisms. For example, the paper by R. Thornhill documents the inter- and intrasexual struggle in scorpionflies. Males court females by offering them food rewards, and the females discriminate between males on the basis of the size of the prey items offered. Meanwhile the males battle each other in ball-and-chain fashion using their huge penis bulbs swung by motile abdomens. Females have nothing to lose, and much to gain, by bartering matings for food. They are willing and able to mate 15 times a day. A male, however, may lose the investment of his nuptial offering if another male mates after him and fertilizes the eggs. The male counterstrategy is to monopolize matings with a female by staying coupled with her. Long matings make the female refractory to subsequent matings (if not satiated) for several hours, allowing the initial male's sperm to fertilize the eggs rather than being pushed aside by the sperm of a subsequent male.

The paper by J. E. Lloyd also lucidly unfolds a fascinating scenario on signaling and sexual selection in luminescent beetles. It documents equally varied strategies of great apparent sophistication, making abundantly clear that messages not only are meant to communicate, they are also meant to deceive. Males have evolved signaling strategies to disrupt ongoing male-female dialogues. The painstaking research on such phenomena has also disclosed that females not only attract males of their own species to mate with, they may also mimic the flash patterns of other species to attract their males in order to eat them. I will henceforth view the spectacle of "fireflies" flashing in the night with increased awe and wonder.

In insects as well as most other animals, females, for the most part, make the greater material investment in the offspring, and they are stuck with a given genetic contribution after mating. They can afford to be (and generally are) choosy, since males are generally available. But males have nothing to lose by inseminating many females. Attracting females is not without cost, however, and nowhere is this more clearly demonstrated than in male crickets, whose calling attracts not only potential mates but also parasitic flies. The flies larviposit on the singing males and are then devoured. W. Cade neatly documents the strategy of "satellite" males that approach calling males to intercept arriving females while remaining silent, and unparasitized. J. Alcock further elaborates on the

diversity of male reproductive strategies found within some species of bees and wasps. The stimulating paper by R. Barrass on the survival value of courtship in insects, specifically *Nasonia* wasps, is a gem of lucidity and economy of style.

The discrimination by scorpionfly females, the silence in some male crickets, and the advantage the male praying mantis gains by being eaten by its mate can all make sense once the uncompromising and inevitable evolutionary logic of mating is clear. This logic is repeatedly explained in the different papers. In some of the papers the data are sufficient to disclose underlying patterns. Others report preliminary research results the meaning of which is still highly speculative. Still others are general and theoretical. In particular the leading paper by Otte traces the historical development of sexual selection theory, and G. Borgia discusses sexual selection and the evolution of mating systems, drawing heavily on the vertebrate, particularly bird, literature. The concluding paper, by R. D. Alexander and Borgia, explores the interesting question of why the asymmetrical "male" and "female" strategies evolved in the first place.

The volume contains highly interesting, if not original, material for the naturalist as well as for the theorist who is willing to sift through its sometimes wordy, poorly edited pages. It documents some of the invented tricks of one-upmanship insects exhibit in the highly competitive game of the selfish genes.

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Cases of Starvation

Hunger Disease. Studies by the Jewish Physicians in the Warsaw Ghetto. Translated from the Polish by Martha Osnos. MYRON WINICK, Ed. Wiley-Interscience, New York, 1979. xiv, 262 pp., illus. $15. Current Concepts in Nutrition, vol. 7.

"The history of the Warsaw Ghetto can be divided into two periods—[the 18 months] before July 22, 1942 and the period following. The first period was characterized by general hunger; the second period by massive death. It is not surprising, therefore, that when the second period started, the [research that was in progress] on hunger stopped. The hospitals and laboratories were destroyed and, most important, the human element, our workers and the subjects of our work, were gone. Work was stopped but not liquidated. . . . The accumulated scientific material was studied again and organized. This is the work being published now. It is an 'unfinished symphony' full of meaning, written by Jewish doctors in 1942. . . . 'Non omnis moriar,' 'I shall not wholly die.' "

These passages are taken from the introduction to this book, written in October 1942 by Dr. Israel Milejkowski, the head of the Department of Public Health, Jewish Council in Warsaw.

The report of the research, smuggled out of the Warsaw Ghetto to non-Jewish colleagues, hidden underground until the end of the war, and subsequently published in Polish and French (*Maladie de famine: recherches cliniques sur la famine executées dans le ghetto de Varsovie en 1942*, E. Apfelbaum, Ed., American Joint Distribution Committee, Warsaw, 1946), is now at last available to the English-speaking world. The book, a collection of seven chapters by eight physicians, is readable and technically easy to understand—a tribute to the authors' clarity and medical acumen and to the translator's linguistic skills and scientific knowledge.

Those who work among the malnourished become inured not just to the presence of a dehumanizing disease but even more to the injustices of its causes. Even such inurement, however, prepared me ill for the emotions evoked on discovering the French edition and again on reading this English translation a decade later, for the investigators and patients in the Warsaw Ghetto were victims of an injustice all the greater because it was willed. The book describes starvation, with 43,000 deaths over 18 months, and mentions the even more lethal deportation during which 250,000 deaths occurred in two months. A further reflection of the brutality of that deportation is that a number of the manuscripts that might have been chapters in the book were lost in 1942. Unsuspected at that time were the further 800,000 deaths of the survivors of famine and deportation in concentration camps and gas chambers. Twenty-two of the 28 investigators, including the initiator of the project, Milejkowski, were dead by 1946. (Apfelbaum, the editor of the Polish and French editions of the book, was the only senior investigator to survive the Holocaust, and he died before the manuscript was published.)

However, it is not the circumstances in the Ghetto but the way the opportunity was grasped that makes this a remarkable treatise. The scientific work was motivated above all by the most urgent need to apply science to alleviate the debilitating symptoms of starvation and to postpone or even cheat death. The questions addressed are clearly and concisely stated. The approaches that were taken to attain answers are often ingenious in the face of unpropitious circumstances. Clinical cases and descriptions are not lacking. Besides permitting differential diagnoses these studies identified the most urgent questions and the most promising approaches. The issues addressed range from immunology (why was tuberculosis so quickly lethal?) through vitamin, carbohydrate, fat, nitrogen, and energy metabolism and pulmonary, cardiovascular, and renal physiology to hematology and ophthalmology (what caused the cataracts in those suffering from starvation?). This information is complemented by sparse but well-focused autopsy and histological data. The result is the most comprehensive description of the clinical and physiological effects of severe starvation in the literature.

The American editor of this edition includes a preface and comments on every chapter. The purposes of these often extensive inserts are not clear. The preface explains the history of the document but leaves one inadequately informed about the circumstances of the work and about the antecedents and subsequent fates of this unique team of medical scientists. The editor's comments appended to the chapters may have been intended to place the findings in the context of today's science. If that was the intention it failed, except occasionally in areas of the editor's specific scientific competence or that of the two other American physicians who also contributed comments. Even then the lack of any references makes this attempt of doubtful utility—especially when starvation with edema is confused with kwashiorkor (protein-deficiency disease), which has a quite different pathophysiology. At worst there is a pundit's air of saying again what had been said better by the original authors and of interjecting opinions as facts without references that could be checked to differentiate the good from the bad. This contribution seems slim justification indeed for the American editor's name appearing on the title page in lieu of the names of those responsible for the work.

The Polish manuscript as translated in this edition attains the objectives of its authors. It is both a witness to great heroism and an exceptional scientific docu-