inductees throughout World War I. Kevles gives a detailed history of the mischievous ways the Army alpha test was used, but he does not cite the Galtonian views adopted by Terman. Jensen's revival of the IQ debate in 1967 and Herrnstein's tenuous interpretation of U.S. society as a genetically based meritocracy are flawed in the same way as the earlier studies. The arguments for major genetic components for intelligence are based on analogies to quantitative inheritance in plants with no new evidence identifying the inferred participating individual genes or their functions.

I would disagree most with Kevles's worries about the new genetics and medicine. Few physicians enter medical genetics today to reduce the number of defective genes in the population; they do so to treat the sick and to salvage the defective. Recombinant DNA technology is intended to be only one more medical tool, helping patients to function more normally. Will this medical revolution have genetic consequences? Of course it will; so has the use of antibiotics for bacterial infections, the chlorination of water supplies, mass inoculation against infectious diseases, or the use of blood transfusions. None of these programs was intended as a eugenic measure.

Similarly, parents rarely elect prenatal diagnosis and abortion because of their concern for the gene pool. They do so because they fear raising a severely impaired child and do not wish to take on the financial, psychological, and medical burdens that would involve. It is not a prejudice against the genotype of the handicapped child that the parents display, it is a rejection of what fate has dealt them. Whatever the merits of the choice involved, they are rarely based on eugenic considerations.

Kevles's survey of eugenics, despite my criticisms, illustrates well the shallow values, the cultural biases, and the private fantasies that motivate many of its ardent supporters. Perhaps the most important lesson for the idealistic geneticist who hopes to elevate humanity to direct our own evolution is to reflect on the repeated vulgarization of complex genetic studies, reduced to simplistic models of human health and behavior, by those with more fervor than professional competence. It may take many generations for us to compensate for the genetic consequences of our present breeding habits, but it would be folly, considering today's standards of cultural prejudices, to intentionally modify those habits as public policy in the name of eugenics.

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A Transmutation in Physics

From Maxwell to Microphysics. Aspects of Electromagnetic Theory in the Last Quarter of the Nineteenth Century. JED Z. BUCHWALD. University of Chicago Press, Chicago, 1985. xvi, 339 pp., illus. $70.

It was during the period roughly from 1875 to 1900 that the approach to electromagnetic phenomena enunciated by James Clerk Maxwell in his *Treatise on Electricity and Magnetism* of 1873 was transmuted into modern classical (nonquantum) field theory. Though the historical comments in physics textbooks often seem to suggest that classical electromagnetic field theory sprang fully developed from Maxwell's own writings, those who have taken more than a passing interest in the history of electromagnetic theory have long known that the story is more complex. In brief, rival approaches to electromagnetic theory coexisted through most of the 19th century: in Britain, the field theory tradition dominated, stemming from the work of Michael Faraday and further developed most significantly by William Thomson and Maxwell; on the Continent, the action-at-a-distance tradition prevailed, as represented most trenchantly in the work of André Marie Ampère, Franz Neumann, and Wilhelm Weber. Modern field theory resulted from a union of the two traditions, in which the field emphasis of the British approach was melded with the emphasis on electrical particles of the Continental approach to yield classical field theory, which regards both electromagnetic fields and charged particles as fundamental. *From Maxwell to Microphysics* deals with the final elaboration of the British tradition and its subsequent union with the Continental tradition.

Buchwald's detailed and perceptive study of the final, "Maxwellian" period in British field theory—beginning with Maxwell himself, extending through the work of the British Maxwellians such as J. J. Thomson, George Fitzgerald, and Joseph Larmor, and including also the more experimentally oriented work of the Americans Henry Rowland and Edwin Hall—establishes more clearly and concretely than ever before the extent to which, and the way in which, the Maxwellian theory of the later 19th century differed from modern electromagnetic theory. Two related themes are central in this connection. First, Maxwell and the Maxwellians—in this directly and faithfully carrying on the tradition of Faraday—were committed to the primacy of the field: rather than viewing charges and currents as the sources or causes of the field, as in modern electromagnetic theory, they viewed them as epiphenomena, emergent consequences of field dynamics. Second, and relatedly, they regarded electromagnetic phenomena as manifestations of an ethereal continuum, which was to be described in terms of continuous, macroscopic variables and whose interactions with ordinary matter were to be treated macroscopically as well, rather than microscopically as in modern electron theory. Though the issue of the primacy of the field is perhaps the more important in the broader 19th-century context, the question of macroscopic versus microscopic description is the more significant for Buchwald's part of the story: He discusses the Hall effect and magneto-optics as central examples of the Maxwellian approach, in which what are modernly regarded as manifestations of the microphysics of electrons were treated by the Maxwellians entirely in macroscopic terms.

The other part of the book is concerned with the decline of the Maxwellian approach and the transition to modern field theory. Emphasizing again the macroscopic-microscopic distinction, Buchwald presents this episode not as a simple melding of British and Continental approaches but rather as a two-step process, in which the British and Continental communities acted together to a substantial extent: Initially, there was a broad acceptance of the Maxwellian, macroscopic approach; Heinrich Hertz's macroscopic treatment of moving media is a good example of Continental participation in this. Thereafter, there was an internal collapse of this approach owing to technical failure (especially in connection with magneto-optics), followed by the transition to a microphysical approach; Larmor's electron theory is a good example of British participation in this phase. In this way—by giving particular attention to the macroscopic-microscopic issue—Buchwald gains a novel perspective, which greatly enriches our understanding of this period.

Buchwald's text is heavily mathematical, which turns out to be a mixed blessing. On the one hand, the perceptive renderings of the mathematical arguments associated with the various theories provide a level of concreteness and verisimilitude that is both salutary and unusual—too much of contemporary history of physics represents a flight from the mathematical rigor that the history of mathematical physics demands. On the other hand, the sheer weight of mathematical symbolism sometimes makes it difficult to see the forest for the trees, and one wishes—at least the present reader, in his weakness, does—that the mathematics had been edited down in places. Buchwald makes use of a reasonably uniform mnemonic vector notation, rather than the original variety of symbols—component, quaterni-

on, and vector. Purists might quarrel with this choice, but I would agree with Buchwald that if one truly wants to make sense of the history of electromagnetic theory, unified mnemonic notation is a necessity. Beyond this, Buchwald is concerned to establish the differences between the Maxwellian and the modern formalisms by explicit comparison and contrast, and uniform vector notation is a great help in this. Both for substantive reasons and for the sake of appearances, however, I wish that Buchwald had been more explicit in specifying the relationships between his renderings of the mathematical arguments and the originals, as regards both notation and content. Also, more careful and explicit definition of symbols would have been a help to the reader. These caveats notwithstanding, the book is required reading for anyone with a serious interest in the history of electromagnetic theory and represents a major contribution to the field.

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Papers from Khabarovsk

Beringia in the Cenozoic Era. V. L. KONTRIMAVICHUS, Ed. Balkema, Rotterdam 1985 (U.S. distributor, International Publishers Service, Accord, MA). xvi, 724 pp., illus. $38.50. Russian Translations Series, 28. From a symposium, Khabarovsk, May 1973. Translated from the Russian edition (Vladivostok, 1976).

The Special Foreign Currency Science Information Program made funds available to the U.S. Geological Survey to translate and publish this collection of papers presented at the All-Union Symposium on Beringia held in Khabarovsk in 1973. Beringia is that area of northeastern Asia and northwestern North America that lies north of 50° latitude between the Lena River, U.S.S.R., and the Mackenzie River, Canada. The interest of some scientists has been focused on this region because of the periodic emergences of the Bering land bridge, each lasting thousands of years, during the roughly two million years of the Quaternary as well as extended episodes during the Tertiary. The dynamics of landmass and sea level that controlled the existence of the land bridge and the exchange of the biota that this connection allowed continue to fascinate.

The Khabarovsk symposium was stimulated by the very successful one convened at the 1965 Congress of the International Union for Quaternary Research in Boulder. The volume that resulted from the earlier symposium (*The Bering Land Bridge*, D. M. Hopkins, Ed., Stanford University Press, 1967) contained several papers by Soviet scientists, but these gave us only a glimpse of the work being done in the U.S.S.R. The 1973 symposium, followed in 1976 by the publication of the papers (in Russian with English abstracts), more fully displayed the extent of the Soviet research. Contributors from the United States, Finland, East Germany, Hungary, and Switzerland rounded out the picture. Naturally the impact of the volume was limited to those who read Russian or were able to have translations made. Now the complete translation opens the work to a much wider audience.

Some of the papers are short, no more than extended abstracts, and most are rather broad-brush generalizations of the type endemic to symposium volumes. Nevertheless, we can read their conclusions, be introduced to the Soviet literature, and also appreciate how much of the English-language literature the Soviet scientists have incorporated into their syntheses. One difficulty lies in the vagueness of the geographic context, fossils, cores, and even mountain ranges typically not being placed with any precision.

The volume opens with ten papers that deal very generally with geologic structure, vegetation, and the invertebrate fauna of marine deposits. A section of 15 papers on the vegetation and paleogeography of Beringia includes studies of macro- and microfossils as well as contemporary floristics. These tend repetitively to demonstrate continuous and disjunct distributions as a confirmation of the Beringian connection of the two continents. Yurtsev's opening paper is one of the few that fully develops mechanisms and timing of exchanges as well as descriptions. His concept of temporal zonal dynamics in Beringia has already been assimilated into our botanical literature. Faunistic studies are divided into sections on fossil and contemporary taxa. The review of mammalian relationships by Sher is a nice companion to Yurtsev's paper in that Sher also establishes the basic outlines with evidence from both eastern and western Beringia. Eleven papers deal with the migration and evolution of such diverse taxa as esocoid fishes, birds, voles, and of course the megafauna and associated predators. Guthrie's paper on the environmental influences on body size, social organs, and population dynamics of mammals is not a review but original and should be consulted for a fuller understanding of his position in the debate over late-glacial paleoecology. Six papers are devoted to mammals (three of these to interesting karyological studies), three to insects, and one to the helminths of mustelids. Ten papers on human prehistory discuss the movement of antecedent cultures from the Old World to the New with evidence from archeology and (in one paper) population genetics.

The drawings, graphs, and maps were redrafted, but unfortunately no attempt was made to reduce the clutter of many, so that in the final, smaller, format of the translation volume the obscurity has been preserved or worsened. The reproduction of the photographs, which was mediocre in the original, is often poor. Misspellings and errant word choice are common. Altogether not a particularly good job of production has been done.

Although some conclusions have been modified in the decade since its first publication, the book remains a good reference. I value it for the papers that provide background for the Soviet contributions to the Burg Wartenstein conference of 1979 and the subsequent volume edited by Hopkins and others (*Paleoecology of Beringia*, Academic Press, 1984). The record of the Khabarovsk symposium is a significant link in a growing chain of statements, challenges, and replies that testify not only to sustained but also to increasing interest in Beringian history, here and abroad.

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Herpetology in the Pacific

Biology of Australasian Frogs and Reptiles. GORDON GRIGG, RICHARD SHINE, and HARRY EHMANN, Eds. Published in association with the Royal Zoological Society of New South Wales by Beatty, Chipping Norton, N.S.W., Australia, 1985. xvi, 527 pp., illus., + plates. $59. From a conference, Aug. 1984.

This volume presents papers from a conference held in Sydney in 1984. The program comprised eight symposia that form the sections of the book: Population Ecology, Ecological Biogeography, Phylogeny of Elapid Snakes, Reproductive Biology, Physiological Ecology, Rare and Endangered Species, and Husbandry and Snakebite. The 63 chapters reveal diverse approaches to herpetological research. The treatment of population ecology is disappointing. Many of the papers are purely descriptive, and few integrate information beyond the context of the individual study. Among the exceptions is T. D. Schwaner's account of morphological variation in the populations of tiger snakes on several islands off the coast of South Australia. The islands were isolated from each other and from the mainland by rising sea levels some 6,000 to 10,000 years ago. The snakes on the islands vary in mass