# Book Reviews

## An Approach to Human Nature

**The Inheritance of Personality and Ability.** Research Methods and Findings. RAYMOND B. CATTELL. Academic Press, New York, 1982. xxiv, 452 pp. $47.50. Personality and Psychopathology.

Suppose there exists a Great Man, whose many books and papers range across an entire discipline. Suppose the Great Man has had a lifelong off-and-on interest in a specialized and rather tricky subfield bordering on that discipline. Suppose he publishes a book in his eighth decade summarizing that subfield. What might such a book be like? Obviously, it could be a landmark, an intellectual treasure. It could, of course, also easily turn out to be rather an embarrassment.

Well, let us cast R. B. Cattell as the Great Man, psychology as the major discipline, human behavior genetics as the bordering subfield, and *The Inheritance of Personality and Ability* as the book. In this case, both the hopes and fears are realized. The book is often indeed a treasure, but sometimes it does evoke a bit of a wince.

*The Inheritance of Personality and Ability* is the first full-dress, modern technical treatment of its topic at book length. Its bibliography extends to 25 pages of references. They are current. More than half are subsequent to 1970; 11 percent are dated in the 1980's or in press. The book is subtitled "Research Methods and Findings," and it contains lots of both. It will be useful to consider matters of method first.

Some years ago the German Gestalt psychologist Kurt Koffka stated in brilliantly simple fashion the task of the psychology of perception: it is to explain why things look as they do. The psychologist who is concerned with personality and ability has a task that can be equally simply stated: to explain why people are as they are. It has seemed to many, including Cattell, that a logical early step in this task is to establish the relative influence of the genes and the environment in accounting for how people vary along some of the major dimensions by which psychologists characterize human intellectual capacity and personal style. Indeed Cattell argues that a proper study of learning (that is, of environmental influences on behavior) *requires* a prior or concurrent involvement with the genetics of behavior: "as the shape of the oceans delimits the land, and the map of land delimits the shape of the ocean, so a proper grasp of genetics tells us more precisely the shape of what we have to explain by learning" (p. 187).

Somewhat over half the present book is devoted to the discussion of methods by which this mapping might be accomplished, ranging from such broad conceptions as "path learning analysis" and the "genothreptic splitting of developmental curves" to disquisitions on the technical details of adjustment for errors of measurement and trait fluctuation. The major emphasis is on Cattell's multiple abstract variance analysis (MAVA). This method involves setting up equations in which the observable variation within and among families of monozygotic and dizygotic twins, adoptive and biological siblings, and so on are expressed as functions of abstract genetic and environmental variances and covariances, permitting—under appropriate conditions—solution for the abstract quantities.

In their broad conception, these methods contain abundant intellectual riches. What there are of embarrassments mostly arise in the details of their implementation. For example, the MAVA equations as given in the book include correlations that are assumed to remain constant despite variation in the standard deviation of one of the correlated variables, a constancy that would only be possible with a rather remarkable compensatory variation in the underlying regressions. Equally oddly, the among-family equations contain within-family components that do not vary with family size, although the contribution of within-family variation to the observed variance of family means ought to be less for larger families. Actually, the MAVA equations as presented appear to be appropriate only for the case of two-child families, although they are stated to be general. Most of the data Cattell uses do in fact consist of two-child families, so the embarrassment is more a theoretical than a practical one.

Likewise, the presentation of others' empirical findings is excellent in the large but often less so in the small. It is excellent in the sense that it gives a good exposure to the relevant literature; the reader who follows down all the paths that Cattell opens up will be well-informed indeed. But he or she will occasionally be surprised at the difference between what Cattell seems to say that a particular source says and what it does in fact say. Also, there are many typographical errors and minor slips in the text and tables. This is not the ideal book for the lazy scholar who relies heavily on unchecked secondary sources.

One major feature of the book is three chapters reporting results from a substantial new MAVA study, results brought together from scattered recent journal articles, some still in press. Because only final outcomes are reported here, and given some of the uncertainties in the MAVA equations by which they were reached, the careful reader will want, again, to consult the original sources before deciding where to believe and where to reserve judgment. It is, however, surely a convenience to have this important study now summarized in one place.

Finally, it must be cautioned that this book is not an easy read. From time to time there is a wonderfully apt and elegant bit of exposition or turn of phrase, but there is a lot of heavy going in between. Cattell is very much his own man, and it often requires a real effort to build the bridges connecting his ideas to those of others and to sort out the brilliant from the vacuous. It is, however, a very instructive effort, well worth a try.

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## Genetics in Humans

**Population and Biological Aspects of Human Mutation.** Papers from a symposium, Albany, N.Y., 1980. ERNEST B. HOOK and IAN H. PORTER, Eds. Academic Press, New York, 1981. xviii, 436 pp., illus. $34.50. Birth Defects Institute Symposia.

At a time of growing concern (and occasional uninformed debate) over the possible biological effects of environmental pollutants, this volume offers a useful summary of current research and unsolved problems regarding human mutation. The book contains 23 papers and three appendixes devoted to methods for assessing the effects of environmental

mutagens, the detection of mutation at various levels, the estimation of mutation rates, the assessment of the phenotypic effects of mutation, and the prediction of the evolutionary consequences of mutation.

The term "mutation" has been taken here in its most general sense to mean all changes in the genetic material. In keeping with this broad definition, the various authors have discussed the detection of mutation at the level of the nucleotide, the protein, the chromosome, the cell, the individual, and the population. Investigation of each of these levels has its own limitations. For example, the identification of DNA base changes is not sufficient for explaining the mechanisms by which mutations exert their phenotypic effects; studies of mutation in cultured somatic cells may not be applicable to germinal mutation; and documentation of birth defects in populations exposed to mutagens is of little use in arriving at estimates of mutation rates, unless the defects are known to be caused by single genes. In combination, however, the various approaches described are leading to a better understanding of human mutation.

The seven sections of the book are devoted to mutation, selection, and human evolution; mutations at autosomal and X-linked loci; cytogenetic mutation; somatic cell mutation; radiation and mutation; general topics; and concluding remarks. Specifically excluded from consideration are numerical human chromosomal abnormalities, mutations in nonchromosomal structures such as organelles, chromosome breakage in cultured human cells, and spontaneous mutation in wild mammalian populations.

Several papers are of special interest. These include reviews of human chromosome mutation (Jacobs *et al.*) and sister chromatid exchange (Latt *et al.*), a summary of studies in Hiroshima and Nagasaki of the reproductive effects of ionizing radiation (Schull *et al.*), investigations of mutation rates for X-linked diseases (Lubs; Thompson *et al.*; Francke *et al.*), and discussions of the neutralist-selectionist controversy (Crow; Harris). The one paper devoted primarily to work in species other than humans is a review of radiation genetic research in mice (Selby). Recurring themes in the book are the problems that are encountered in attempting to obtain meaningful estimates of human mutation rates (Morton), the advantages and disadvantages of using data from registries (Palmer; Hook *et al.*; Holmes *et al.*), and the need for new approaches to the study of human mutation (Neel).

In view of the enormous effort that has been devoted to the study of human mutation, it is disappointing that progress has been slow and that there is no general agreement about the best way to proceed. This volume accomplishes the difficult task of summarizing a diverse field, one which is of great public concern and in which the need for informed scientific exchange is crucial.

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## Neuronal Geometry

**Organization in the Spinal Cord.** The Anatomy and Physiology of Identified Neurones. A. G. BROWN. Springer-Verlag, New York, 1981. xii, 238 pp., illus. $86.50.

Until recently much of the available information on the details of neuronal geometry in the vertebrate brain came from studies of histological material stained by the use of the Golgi technique, a method developed late in the 19th century, which for mysterious reasons usually impregnates but a few neurons of a region with a silver salt. This stain allows the complex shape and fine extensions of a nerve cell to be visualized in partial isolation from the myriad of other processes and cell bodies in its vicinity. From analyses of Golgi material the renowned Spanish neuroanatomist S. Ramon y Cajal provided a foundation of knowledge about vertebrate neuronal shape and positioning in his *Histologie du Système Nerveux de L'Homme et des Vertébrés*, whose volumes were published in 1909 and 1911 (in Spanish in 1894–1904). The capricious alchemy of the Golgi technique never has been satisfactorily explained, even though variations of it have been employed by a number of subsequent investigators. Though these later workers have expanded our understanding, crucial questions about the intimate structural relationships in the organization of neurons remain unanswered.

A new era began about 15 years ago when it was discovered that the fine pipette electrodes used for intracellular recording of a neuron's electrical activity could also be employed to eject substances by pressure or iontophoresis to mark the cell being studied. Radioactively labeled amino acids and various dyes were the first intracellular markers. Intracellular fluorescent dyes gave dramatic pictures of an isolated neuron whose general geometry and location within a neuropil could be appreciated, making correlation of structure and function possible. In spite of the elegance of the pictures produced, both the radioactive and the fluorescent labels had serious drawbacks: the former required the complexity of autoradiography for visualization, and the dyes used for the latter interfered with cellular function and their fluorescence was evanescent.

Horseradish peroxidase (HRP) came onto the scene as a tool for neuroanatomy in 1973, only a few years after the first intracellular marking of functionally defined neurons had been reported. It initially gained prominence as a substance that could be used to trace long processes of neurons through the mechanism of retrograde transport; under appropriate conditions the extended axon of a neuron picked up and transported the substance back to the cell body, hence "retrogradely." Demonstration of peroxidase was accomplished by histochemical reaction with one of several substrates such as diaminobenzidine, producing a stable coloration that was electron dense and therefore identifiable at the electron microscopic level. However, in 1973, at the same time that the potential of HRP as a retrograde tracer was becoming known, G. Lynch and his colleagues pointed out that under some circumstances the intracellular transport (flow) system of neurons would carry HRP from the cell body distally toward the neuron's processes. In 1976, four laboratories published reports showing that HRP injected from a recording micropipette into a neuron was transported to the local processes of the neuron, permitting relatively uniform staining of its extensive arborizations. Publications in 1976 from the laboratories of Alan Brown in Edinburgh, Scotland, and Elżbieta Jankowska in Göteborg, Sweden, were the forerunners of a series of reports from their groups demonstrating how this technique could be used to correlate morphology and function. Moreover, the 1976 reports from the laboratories of Jankowska and Kellerth included illustrations of the ultrastructure of HRP-marked processes.

In essence, Brown's book describes results obtained by iontophoresing HRP into physiologically identified neurons of the cat spinal cord. By concentrating on his own work and ideas, Brown follows a tradition that was once the rule for philosophical and scientific monographs. The work provides a wealth of illustrative material from the observations made by him and his colleagues. The issues re-