develops methods for estimating our degrees of belief in such predictions, but he fails to show how these degrees of belief are related to the successes and failures (or anticipated successes and failures) of the predictions. This neglect is characteristic of those who interpret probabilities in terms of mental states. In fact, the objection to such an interpretation is that it tends to conceal this fundamental problem. This problem is important. For if degrees of belief should give no adequate characterization of anticipated successes and failures, then they could have no important connection with such successes and failures. Perhaps this seems trivial, but it readily follows that without such characterization degrees of belief would be of no importance in science or inductive thinking. Fortunately, however, it is possible to obtain a consistent non-trivial characterization of probabilities in terms of anticipated successes and failures. I have done this in an article published in *Erkenntnis*. In view of this possibility the above objection would not be serious if it were not for two additional difficulties. First, my characterization was accomplished with the aid of the statistical theory to which the author violently objects and, second, the failure to consider the question which I have raised has led to some very questionable reasoning in connection with the representation of certainty by infinity. It is of course conceivable that one could develop a theory of probability which was based on such an infinite scale and which contained a connection between probabilities and results. However, the author has not done this. Furthermore, in some applications of Bayes's principle he has used two different scales in the same problem without any interpretation or justification of the procedure. Thus in the case of problems of estimation we are left with formulas based on very doubtful prior probabilities. If this were the best we could do, we should have to be content. But Fisher and Neyman have developed corresponding formulas which are independent of the prior probabilities.

The author has tackled a problem which has previously received too little attention and much is to be gained by following his treatment of the subject. Thus my criticisms should be taken simply as indicating points that need further attention. The book is indeed a contribution to the advancement of science.

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EUGENICS

Preface to Eugenics. By FREDERICK OSBORN. 312 pp. New York: Harper and Brothers, 1940. $2.75.

THE preface to eugenics is the set of principles and practices that must be adopted before "a eugenic form of society will be possible" (p. 260). This set includes: birth control, "equal opportunities for development open to all children everywhere." "Children have the right to be born to parents who will care for them properly. Children have the right to be born free of the more serious hereditary defects." The book under review is largely an elaboration of these points.

There are seven chapters. The first refers to chromosomes and genes, human variability and the need of improvement of the racial stock. The second is a keen and sound study of the hereditary and environmental factors in the psychological sphere. This is largely the work of Dr. Gladys Schwesinger. Chapters 3 and 4 deal chiefly with population and are largely quantitative; but reference is made to relative fecundity of whites and Negroes and that of various socio-economic groups. Chapter 5 deals with eugenic selection under the influence of a favorable environment and stresses the importance of birth control and especially the desirability of the reduction of births among those least responsive to the possibilities of their environment and the increase of births among parents who are most responsive. The author does not discuss the craving for children that exists among certain middle-class women like the mother of President Harding, who had eight children and stated that she wished she had had more. On the other hand, just as in Rome great prosperity resulted in reduction of fecundity among the "higher" classes, so prosperity seems to act in the United States. No subsidy would alter their attitude. Chapter 6 deals with the psychological aspects of a eugenical environment. This cites from Dr. Margaret Mead the case of two primitive peoples in one of whom the children are handled gently by the parents and become gentle; in the other the children are handled roughly and grow into hard and aggressive adults. The possibility that there is a genetic thread running through the generations that may be partly responsible for the difference is not discussed. In geese, living in flocks, the parental instinct herds the young from infancy and when they in turn become parents they herd their young. Is this merely a transmission of a tradition, or is there an hereditary factor? The author states that the ideal of equalizing educational opportunities in the United States has never been fully attained. He does not discuss the possibility that the inequality of opportunity is partly due to the inequality of the children for taking advantage of it. The author finds that the atmosphere of colleges and graduate schools is generally unfavorable to marriage. Perhaps there is a selection here such that the more marriageable are married before they get to the graduate schools. If, as the author concludes, "parents who want no more children should be helped not to have them, and par-

ents who want children should in most cases be helped to have them" then the career-seeking and the prosperous, the ambitious and educated would have even fewer children and the group at the opposite socio-economic scale would have more of them. A feeble-minded girl discharged from a state institution had 14 children, perhaps because she wanted them.

As a whole, the book is well and interestingly written. The principal criticism might be that the author tends to make generalizations which are the result of his profound conviction and reasoning, but for which the factual basis is often not given. Of the high idealism of the author there can be no doubt, but as to whether we should wait for the completion of the preface before beginning education in regard to mate selection and inheritance of traits there may well be a difference of opinion, and to many students the preface to the Preface would be more research.

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ABSTRACTS OF PAPERS

(*Continued from page 458*)

Orthogonal polynomials and closure: JAMES A. SHOHAT (introduced by L. P. Eisenhart). The following two results are established: (1) If closure holds for a symmetric system of orthogonal polynomials (OP), it also holds for property related non-symmetric systems of OP, and *vice versa*. Illustration: the polynomials of Hermite and Laguerre. (2) If the remainder in Parseval Formula, applied to a given $f(x)$, is $O\left(\frac{1}{\log_n^{2+\epsilon}}\right)$, with some $\epsilon > 0$, then the expansion of $f(x)$ in a series of OP under discussion converges almost everywhere in the orthogonality interval (a, b), assumed to be finite. This yields very general criteria of convergence, in particular, for continuous functions.

General invariants of irregular curves: EDWARD KASNER. The general group of analytic transformations is applied to curves expressed in fractional power series. Some types have invariants, some have not. This presents a new aspect of restricted topology. An extensive complete classification has been obtained with the collaboration of J. De Cicco.

A supplement to Ramanujan's identities: HANS RADEMACHER (introduced by L. P. Eisenhart). S. Ramanujan gave two identities which make evident certain divisibility properties of the number of partitions $p(n)$. If these identities are written in terms of the Dedekind function $\eta(\tau)$ they can be subjected to modular transformations. In this way we obtain new identities, which are noteworthy because of the occurrence of the Legendre symbol.

The evolution of a peculiar stellar spectrum: Z Andromedae: OTTO STRUVE and P. SWINGS. The new 82-inch telescope of the McDonald Observatory has been devoted, during the past year, to a study of a relatively small group of peculiar stars whose spectra can not be fitted into the continuous sequence of normal stellar spectra. One of the most remarkable members of this group is the variable star, Z Andromedae. It was discovered as an irregular star of variable brightness in 1901 and it was early suspected to be subject to eruptions similar to those of a nova. The latest eruption took place a year ago, with an increase in brightness from magnitude 10.7 to magnitude 7.9. Since then the brightness has slowly declined. This eruption was accompanied by changes in the spectrum. Near maximum light the spectrum was that of a P-Cygni type star showing lines of relatively low excitation (Fe II, Ti II, etc.), displaced toward the violet by amounts corresponding to velocities of expansion between 100 and 60 km/sec. Since the early summer of this year the spectrum has taken on an entirely different character. We recognize essentially four distinct sources of light: (*a*) a hot star presenting some of the characteristic features of Wolf-Rayet stars; (*b*) a cool, M-type, giant star forming a binary system with the hot star; (*c*) a tenuous nebula giving rise to forbidden and permitted emission lines of [O III], O III, [Ne III], [Ne V]; this nebula probably surrounds the binary system; (*d*) remnants of an expanding shell giving rise to a P-Cygni type spectrum of H, He I, Fe II and to emission lines of Mg II, Si I, Si II, Ti II, Fe I and [Fe II]. The occurrence of irregular violent outbursts in a binary system is of special interest. They are probably responsible for the enveloping nebula and for the disappearing spectrum of the expanding shell. The latter is remarkable because of the exceptional strength of the so-called forbidden auroral transition of [O III] at λ 4363. This line is also strong in several other binary systems of similar type, namely, in T Coronae, AX Persei, CI Cygni, RW Hydrae, etc. The effect is interpreted as a consequence of high electron density in the nebula—a phenomenon which we have also observed in the planetary nebula IC 4997. Z Andromeda bears a certain resemblance to the famous variable Mira Ceti, in which the hot binary companion is a variable emission-line star of spectral class B, and to Antares, whose hot companion is surrounded by a small nebulosity which exhibits forbidden lines of [Fe II]. It is exceedingly probable that the close association of a cool giant star with a compact, hot companion results in disturbances which we observe as eruptions, and which produce a succession of spectroscopic anomalies: an outburst of the surface layers of one of the two components, the gradual dissipation of the exploded material and, finally, the creation of a nebula surrounding the entire system.

Orbital motion in the multiple system Sigma Coronae Borealis: PETER VAN DE KAMP and JANET M. DEVILBISS (introduced by C. E. McClung). A twelfth magnitude