rated as predominantly correct; success was greatest for those predictions in which the predictor had expressed a high degree of confidence. Results were broken down in terms of such variables as sex of the subject, his age at the time of the initial and later studies, and the formal and content characteristics of the predictions. This itemized-outcome rating method constitutes Escalona's purely descriptive presentation of results.

Heider has preferred to present findings in terms of the correctness of prediction for each individual child and to employ nonparametric techniques, as well as Pearson's r, in the analysis of the data. I consider this a more justifiable approach than Escalona's treatment of 882 predictions about 31 subjects as if these predictions constituted a single population.

In addition to formal presentation of findings, the book contains illustrative case descriptions and some interesting theoretical discussions.

The methodology of the study is extremely weak. Some of its weaknesses are shared by many other studies in child development, which have employed data collected before the studies were planned. Other weaknesses—for example, the use of the authors as judges of the correctness of predictions—could easily have been avoided. The main fault of the study, however, lies in the manner in which the predictions were written. Had these predictions been set up in a more formal manner, thus allowing for planned observations that would confirm or disprove them, the authors would have been able to present their findings in a more meaningful way and could have avoided some of their statistical problems.

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A Short History of Scientific Ideas to 1900. Charles Singer. Oxford University Press, New York, 1959. xx + 525 pp. Illus. $8.

Singer's original *Short History of Science to the Nineteenth Century* was a work of his middle years. First published in 1941, it has been deservedly popular. The present volume, more than a hundred pages longer and much better illustrated, is a revision and expansion of the same book. Large portions of the original stand unchanged, and the plan and the themes remain unaltered. The chief difference lies in the enlargement of the treatment of biological science from about 1850 to 1900; this section is paralleled by a new section on physical science during the same period, contributed by Herbert Dingle. The new book is much better printed and is more pleasing to read than the older one.

Despite a new look on the contents pages, the structure of the earlier part of the book has not been greatly modified. It now opens with a few pages on Babylonian and Egyptian astronomy and mathematics (by Angus Armitage). The importance of the Alexandrian period of Greek science is more justly recognized. But Singer has not thought fit to revise the part that relates the pattern in which Roman decadence heralds the medieval collapse, and modern science is founded solidly on the Renaissance of the 15th and 16th centuries. No medieval "precursors" of modern science are admitted, and one will look in vain for such names as Buridan, Ockham, and Oresme. While I agree with Singer that modern science is the creation of modern times, it seems regrettable that the background to Vesalius, Copernicus, and Galileo is not more clearly sketched; one is left with the paradox that a return to Greek sources produced a revolt against Greek science. On the other hand, medieval technological advances do now receive a favorable mention.

The central section, "The insurgent century," has been improved by a section on Newton's optical work (unaccountably omitted from the earlier version) and remains an excellent survey of the turning point in modern science.

In the new material, Dingle is mainly concerned with the limitations of "billiard-ball" physics and the new science of astrophysics. Singer's own new pages follow the lines of his volume on the history of biology. On the whole—partly because the sequel is cut off by abandoning the story—the continuation is less successful than the older bulk of the book.

As is inevitable, some fresh errors have crept in: thus, Ptolemy's observations were not accurate to 5 *seconds* of arc (page 90); a plumb line should be normal to the horizontal (Figure 70); Newton's first law of motion is not generalized from Galileo's concept of inertia (pages 235–36); medieval blast furnaces did not produce steel (page 254); the two sentences about eyepieces are meaningless in conjunction (page 298). In general, however, the changes in this new version are all for the better, and, if the broad historical picture emerging from it owes few touches to the fresh scholarship of the last 25 years, it is the best we have within its limits. The organization is good, the language is neat and sometimes witty, and thought is there for those who look for it. The Grand Old Man of the history of science is still a master of his craft of easy presentation.

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Applications of the Theory of Matrices. F. R. Gantmacher. Translated and revised by J. L. Brenner, D. W. Bushaw, and S. Evanusa. Interscience, New York, 1959. ix + 317 pp. $9.

There are today many fine books in English on the theory of matrices. Few of them, however, treat applications of the theory in more than an incidental manner. A book of the caliber of the present one is, therefore, a valuable addition to the bookshelf of the analyst, applied mathematician, or physicist, for it contains sophisticated and elegant treatments of several topics which ultimately require matrix analysis.

The first chapter contains a fairly exhaustive treatment of the normal forms of complex symmetric, antisymmetric, and orthogonal matrices. The second chapter deals with equivalence relations between singular bundles of matrices and follows closely the work of Kronecker. The results are applied to the integration of systems of differential equations with constant coefficients. Then there is an excellent account of the theory of matrices with non-negative elements. This includes the classic work of Frobenius and various recent extensions. The preceding results are then specialized for the study of stochastic matrices, and the theory of Markov processes with a finite number of states is discussed from the matrix-theory point of view. A succeeding chapter treats applications to the theory of differential equations, including the little-known but elegant concept of the multiplicative integral developed by Volterra. A final chapter (alone almost worth the price of the book) deals very comprehensively with the Routh-Hurwitz problem of determining the number