the writing. J. M. Greenberg, author of a chapter on Interstellar Grains, states that he first drafted his chapter in 1961 and that he revised it in 1965. Hence some of the material of the book is out of date.

I believe that texts by single authors which would synthesize the large amount of material available, together with review series like the *Annual Reviews*, would serve the needs of both students and researchers better than these monumental compendia. The compendia are often out of date before the editor finally succeeds in getting a chapter from every author who has promised him one.

Several chapters, such as those of Spitzer on star formation, Greenberg on interstellar grains, Aller and Liller on planetary nebulae, and Parker on cosmic rays, are excellent. Their thrust is timely, their coverage comprehensive, and their references useful. Others are less useful for one reason or another.

H. M. Johnson's article on diffuse nebulae catalogues a variety of objects, but falls short on interpretation and synthesis. Friedman's article on discrete X-ray sources has little to do with the main subject of the book and, since the references indicate it was last revised in 1966, is hopelessly out of date in such an exploding field of research. The article by Davis and Berge, only 15 pages long, is too brief to do justice to the wealth of information on the galactic magnetic field.

I found the lack of balance annoying. While Greenberg's article on dust is very good, it should have been compressed below 143 pages to make room for more extended articles on such things as the galactic magnetic field and nonthermal radio emission. Upton's article on primordial stellar evolution should have been omitted entirely, as it is only remotely connected with diffuse matter in space.

While some articles, such as Kerr's on radio spectral lines, are comprehensive and accurate without overwhelming the reader with detail, others, like Czyzak's on atomic processes, are much more detailed, having over 200 equations and 20 tables. Too much detail makes it difficult for a starting graduate student to get an overall view which this kind of book should provide.

Having pointed out the various defects in this volume and in the series as a whole, I admit there is no other book which comes close to this one in providing comprehensive coverage of the subject. We are still awaiting a graduate text which will synthesize it all in a compact and much less expensive volume.—*George B. Field, Astronomy, University of California, Berkeley*

Pygmalion in the Classroom by R. ROSENTHAL & L. JACOBSON; 240 pages; $3.95; Holt, Rinehart, and Winston, Inc., 1968.

Do culturally disadvantaged children perform relatively poorly on intelligence tests because their teachers have low expectations for their ability? This belief has now gained popular currency from an experiment reported in this book. The authors' notion is that the teacher's expectations for the child's test and scholastic performance act as a self-fulfilling prophecy. (The book reviews much interesting material on the role of self-fulfilling prophecies in behavioral research.) According to the authors' hypothesis, one way to boost children's intelligence, and presumably their general scholastic performance as well, is to cause teachers to hold out higher expectations of the children's ability. To test this idea, the investigators picked about five children at random from each of the classes in an elementary school in San Francisco and then informed the classroom teachers that, according to test results, the selected children were expected to show unusual intellectual gains in the coming year. Since the "high expectancy" children in each class were actually selected at random, the only way they differed from their classmates was presumably in the minds of their teachers. Group IQ tests administered by the teachers on three occasions during the school year showed a significantly larger gain in the "high expectancy" children than in their classmates. Both groups gained in IQ

by amounts that are typically found as a result of direct coaching on tests or of "total push" educational programs for the disadvantaged. Yet the authors note that "Nothing was done directly for the disadvantaged child at Oak School. There was no crash program to improve his reading ability, no special lesson plans, no extra time for tutoring, no trips to museums or art galleries. There was only the belief that the children bore watching, that they had intellectual competencies that would in due course be revealed" (p. 181). The net total IQ gain (i.e., Expectancy group minus Control group) for all grades was 3.8 points. Net gain in verbal IQ was 2.1; for Reasoning (nonverbal) IQ the gain was 7.2. Differences were largest in grades 1 and 2 and became negligible after grade 2. But the statistical significance of the gains is open to question and permits no clear-cut conclusion. The estimation of the error variance is at issue: The investigators emphasized the individual pupils' scores as the unit of analysis rather than the statistically more rigorous procedure of using the means of the E and C groups for each classroom as the unit. The latter analysis yields statistically negligible results.

Because of the questionable statistical significance of the results of this study, there may actually be no phenomenon that needs to be explained. Other questionable aspects of the conduct of the experiment make it mandatory that its results be replicated under better conditions before any conclusions from the study be taken seriously or used as a basis for educational policy. For example, the same form of the group-administered IQ test was used for each testing, so that specific test practice gains were maximized. The teachers themselves administered the pre and post tests, which is a faux pas par excellence in research of this type. The dependability of teacher-administered group tests leaves much to be desired. Would any gains beyond those normally expected from general test familiarity have been found if the children's IQs had been accurately measured in the first place by individual tests administered by qualified psychometrists without knowledge of the purpose of the experiment? These are some of the conditions under which such an experiment must be conducted if it is to inspire any confidence in its results.

Although the phenomenon of expectancy gains is considerably less well substantiated by this experiment than, say, the existence of extrasensory perception, it runs the risk of being uncritically accepted by many parents because of the prevailing need to believe that if only teachers had the proper attitudes and could perceive and treat disadvantaged children fairly, these children would gain in IQ. No one denies the importance of encouraging confidence and self-esteem in all children, and teachers who cannot find the means for doing this in their classrooms are poor teachers indeed. But the belief that disadvantaged children are generally below-average in IQ and scholastic achievement because their teachers regard them unfairly or fail to give them the proper encouragement is quite another matter. It is a calumny on the altruistic, dedicated teachers who are the vast majority, and it obscures the major causal factors in scholastic performance.—*Arthur R. Jensen, Institute for Human Learning, University of California, Berkeley*

Greek Mathematical Thought & the Origin of Algebra by J. KLEIN, trans. from the German by E. BRANN; 360 pages; $12.50; M.I.T. Press, 1968 (Original version "Die griechische Logistik und die Entstehung der Algebra," *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*, Abteilung B: Studien, Vol. 3, fasc. 1 (Berlin, 1934), pp. 18–105 (Part I); fasc. 2(1936), pp. 122-235 (Part II).

Klein's admirable study of the conceptual foundations of seventeenth-century algebra deserves a wider audience than it has enjoyed thus far since its appearance in German in the mid-1930's. One seldom finds a reference to it in works written since that time; neither rebutted nor accepted, the work has been largely ignored. And regret-