by the ideal of the creative artist—an ideal which expresses itself in thought precesses which move in a different dimension to those of logic and experiment." One can only hope that this wisdom can be squared with the *wisdom* of the evolutionary process.

The theory presented in *The Ethical Animal* will not, as Waddington is well aware, be accepted unanimously by everybody, or even by all biologists. It is nevertheless a significant contribution to the discussion of a momentous issue. By changing what he knows about the world, man changes the world he knows; by changing the world, he changes himself. Are these changes in accord with biological and other wisdom?

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Geological Survey Research 1960. Professional Paper No. 400, part A and part B. U.S. Geological Survey, Washington, D.C., 1960 (order from Supt. of Documents, GPO, Washington 25). Part A, 142 pp., illus., $1; part B, 523 pp., illus., $4.25.

The United States Geological Survey is currently engaged in so many activities and projects, spanning the full range of the geological sciences, that publication of results has tended to lag behind the completion of many investigations. This book has been prepared to make available a digest of important new ideas and new discoveries, both published and unpublished, made by survey personnel during the 12 months that ended 30 June 1960. This presentation is an experimental one, and only the work of the Geological Division is included.

The arrangement of material is dictated by what the Geological Division considers to be its major objectives: increasing our knowledge in economic geology, regional geology, and geologic principles and processes. Pages A1–A26 are devoted to economic problems, by district and region, together with commodity and topical studies. Many persons outside geology will consider this to be the most important phase of the survey's work, because the economic studies help in solving problems connected with the construction of highways and dams and, while developing information in the search for new deposits of minerals and fuels, provide the nation with a continuing appraisal of its known and potential mineral and fuel resources. It should be noted, however, that without the supporting regional studies (pages A26–A54) and those that deal mainly with principles and processes (pages A54–A73), the specific economic studies would soon become sterile.

All reports and articles by survey personnel, actually published or otherwise released to the public during fiscal 1960, are listed alphabetically by author in the bibliography (pages A107–A127). Not every title that will eventually bear dates between July 1959 and June 1960 could be included, since publication in periodicals is commonly delayed several months. The inclusion of journal articles and survey open-file reports with standard survey publications will greatly aid geologists and others searching the recent literature. The "Subject classification of publications" (pages A127–A136), together with the very detailed table of contents, makes the lack of a general index less inconvenient.

The list of investigations now in progress, which gives the name and headquarters of those in charge of each investigation (pages A77–A105), alone makes the publication worth the price. Too often in the past, even after extensive inquiry, have workers outside the survey started a research project only to find that it duplicated a survey project which was well under way. The only illustrations in part A are four index maps.

The second part of this professional paper is bound separately and consists of 232 papers, generally of less than 1000 words each. Some of the papers are primarily announcements of new discoveries or observations on problems of limited scope, and for many, this will probably be the final report. Others are progress reports on more extensive investigations which have been under way for some time. It is expected that these conclusions will, in large part, be included in much longer reports to be published when the projects are complete.

Most authors are represented by one paper, but some have as many as seven. The papers, well-illustrated by line drawings and a few photographs, are arranged, as to subject matter, in the same order as those in part A. The volume has a comprehensive index, by subject and author, referring to article number rather than to page.

I hope that the publication will be continued and that it will be expanded to include the work of other survey divisions.

Obviously few, if any, will read the entire book but almost every geologist will enjoy and benefit by browsing, not only in his own field of interest but also in the many others presented. There is a wealth of material for the teacher and the research geologist, as well as for those more concerned with practical application of the science.

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Analysis and Design of Feedback Control Systems (formerly *Servomechanism Analysis*). George J. Thaler and Robert G. Brown. McGraw-Hill, New York, ed. 2, 1960. xiii + 648 pp. Illus. $14.50.

The first industrial revolution provided abundant power for operating machinery, but this power had to be controlled by human beings. In the present industrial revolution, more and more of the control functions are being taken over by the machines themselves. This is done by using the principle of feedback. A standard is set up for the variable to be controlled in an industrial process. This standard is continuously compared with the actual value of the variable, and an error signal is obtained, which is then used to actuate machinery in such a way that the error is reduced.

The present volume is intended for use by electrical engineering students who are taking the analysis and design of such apparatus at the senior or graduate level. The authors first provide an introduction to the subject and some of the basic working tools. They then deal with the analysis of linear control systems: how to evaluate their performance—the speed of response, stability, overshoot, steady-state error, and so forth. They continue with the design and construction of control systems for given specifications. Finally they go on to more advanced aspects of the subject and discuss Mitrovic's method, sampled data control systems, and the analysis and design of nonlinear control systems, including relay servomechanisms. There are five appendixes, giving, in addition to some useful tables, descriptions of physical components

such as error detectors, motors, and hydraulic and pneumatic devices.

I especially enjoyed the two chapters on the design of linear systems. Here the authors include down-to-earth advice: "Once a design has been made acceptable by changes which satisfy test conditions, further changes should be avoided. It often happens that additional changes are requested in order to further improve performance, lower cost, etc. Such changes seem insignificant and unrelated to sources of trouble, but often prove very unwise." They also provide a step-by-step discussion of the design of several control systems which were actually built. The volume contains a large number of exercises for the students, and reflects throughout the authors' experience, both in the classroom and on the workbench. It should serve its intended purpose admirably.

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Cultivated Palms. Special issue of *The American Horticultural Magazine*. R. Bruce Ledin, Guest Ed. American Horticultural Society, Washington 2, D.C., 1961. 189 pp. Illus. Paper, $3.

The general thesis of this handbook on the palms is "what the plants look like taxonomically and horticulturally . . . how to grow the plants. . . . [and] the difficulties that may arise" in cultivation. The idea of preparing such a volume was presented by W. H. Hodge to the executive committee of the Palm Society when he was president of the society.

The material is divided into three sections: "An introduction to the palms," "Culture of palms," and "Uses of palms." The first section includes a paper by Hodge, entitled "The world of palms," eight pages (containing 32 illustrations) showing palm characteristics (fruit clusters; palm flowers, leaves, and stems; and others), a series of 80 full-page illustrations, arranged alphabetically by botanical name, called "Palm portraits," as well as other illustrations and papers.

The second and third sections contain 16 contributed papers, a check list of palms known to be growing in Hawaii (by L. W. Bryan), a list (one page) of living palm collections, and an index of palm names.

The Bradley Volume. A special volume of the *American Journal of Science* in appreciation of Wilmot Hyde Bradley on his sixty-first birthday. American Journal of Science, Sterling Tower, New Haven, Conn., 1960. 433 pp. Illus. $4.75.

The Bradley Volume comprises 38 papers dealing with modern geologic science, written by 48 authors who hail from a dozen or so different institutions. This fine collection honors Wilmot Hyde Bradley who, as chief geologist of the U.S. Geological Survey from 1944 to 1959, directed an inspired program by the Geologic Division, a program that constantly sought and explored new vistas in geologic research. Traditionally the survey's forte has been the investigation of geologic problems by means of surface and subsurface detailed mapping and attendant topical studies. Bradley, dedicated to the growing importance of the interdisciplinary connections of geology with chemistry, physics, biology, and engineering, created within the survey another forte that is currently being maintained by a staff of vigorous young scientists who are setting the stage for future break-throughs in the understanding of geologic processes. It is this contribution to the development of the science and of the survey's research program that is the true focus of *The Bradley Volume*; accordingly, the assembled papers represent a spectrum of inquiry which recreates the image of this enlightened leader.

To list the papers by title or to comment on their excellence would be tedious. The book has no central theme other than the breadth of geology itself, as expressed in these short papers. Strong emphasis emerges on the experimental, theoretical, and philosophical aspects of the subject matter. In the papers dealing with geochemistry and geophysics, for example, measurements per se are stepping stones en route to the formulation of conclusions in crystal chemistry, mineral genesis, solution chemistry, and mineral stability in natural environments. Field observations and compilations, set forth in detail or graphically summarized, lead to the philosophical treatment of crustal formation, rock alteration, distribution of elements, and the petrologic history of igneous, metamorphic, and sedimentary rocks. Biological inquiry is used to develop perspective on organic resemblance and evolution, stratigraphic and zoogeographic distribution, and paleoecology and sedimentary basins.

Although the individual specialist may find only a few papers in his field within this volume, the whole is much more than the sum of its parts; the assemblage represents a formidable sampling of modern geology, which brings credit to the *American Journal of Science* for its role in sponsoring *The Bradley Volume*. Certainly the volume brings great pride and pleasure to those of us who find that it is also a fitting tribute to Bill Bradley's keen sense of human values which underscores his concept of a creative research community. If you are interested in what modern geologists are thinking and writing about, you will want your own copy.

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The Rich and the Poor. A study of the economics of rising expectations. Robert Theobald. Potter, New York, 1960. 196 pp. $4.50.

The title suggests that this book could have been written 100 years ago when farsighted people in industrial countries were concerned with the broad gulf between the rich and the poor and when, in several countries, conservative statesmen urged the adoption of progressive taxation and social policy measures in order to forestall a revolt of the poor. They did it because of humanitarian motives and enlightened self-interest. They knew that a small group of rich people could not survive surrounded by hopeless poverty.

A very similar appeal, to both humanitarian motives and enlightened self-interest, is now addressed to the rich countries urging them to pursue a more vigorous policy in support of economic development in the poor countries. In this respect Theobald adds his voice to many others who have felt the same sense of urgency.

Most interesting is his elaboration of the thesis that different economic reasoning should apply to the industrially advanced and the underdeveloped countries. He points out, for instance, that even relatively stiff progressive income taxes do not seriously interfere with incentives to great effort or with the necessary capital formation in the industrial countries. If poor countries