context is identified with our inability to analyze completely what is really going on in the extraordinarily complicated processes of evolution.

This is an extremely stimulating book, partly because of the wealth of evidence that has been brought to bear on all aspects of evolution and partly because of the way that Rensch interprets this evidence. As Dobzhansky points out, this is indeed a most important contribution to the grand synthesis.

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Louis Agassiz. A life in science. Edward Lurie. University of Chicago Press, Chicago, Ill., 1960. 449 pp. Illus. $7.50.

The name Agassiz is familiar to those living in the neighborhood of Cambridge, Mass., because of the Agassiz Museum of Harvard University. Agassiz is a name that is also known to some of those who work at the great Marine Biological Laboratory at Woods Hole, because that laboratory is, in part, an outgrowth of a small teaching and research station that was founded on Penikese Island by Louis Agassiz. But most biologists remember Louis Agassiz primarily as an old-fashioned member of their profession, as one who could not accept or even understand Charles Darwin's theory of evolution.

Thus, Louis Agassiz is neatly labeled and pigeonholed. Perhaps this stereotyping of our precursors is necessary, that is, if we are to remember them at all; for they steadily grow more numerous, and their very numbers now insure that many worthy men will be forgotten. Some few, however, may be remembered through the fact that they have been abstracted until they are little more than proper nouns and thus their names have become serviceable in the taxonomy of scientific ideas. We have always found it convenient to attach the name of some past scientist to a discovery or to an attitude or, even, to some past event. That this treatment of our predecessors is less than just we readily admit, and so we can welcome the labors of a biographer who rescues a scientist who has been reduced to little more than a mnemonic device, and who restores him to full human status. This is just what Edward Lurie has done in writing this remarkably complete, authoritative, and interesting biography.

Louis Agassiz reads almost as if it were a picaresque novel, but a picaresque novel in reverse, because the hero was in no way a picaroon. In fact, he was the very opposite; he lived a life of exemplary virtue, and he excelled in just those qualities that we find today in many of our scientific leaders. As a youth he was a model of industry; he led in his studies and soon mastered the classical learning that was available to him in the Collège de Bienne in his native Switzerland. But this was not enough. He wanted to become a naturalist, and without the entire approval of his family, he extended his studies and his field researches. Even as a boy he revealed both his ambition and his determination. He decided to become the greatest naturalist of his generation, and he determined that no person, no hardship, and no obstacle should deter him.

He was remarkably well equipped for his chosen career. He learned easily and quickly, and he retained great masses of facts almost automatically and without effort. He also understood what he learned and he could organize his knowledge and recognize the underlying principles in his accumulated data, as he showed when he classified the fishes of the world and when he devised his theory of continental glaciers. It would be an understatement to describe his personality as winning, because he routinely charmed all with whom he came in contact. (His personal difficulties were limited to a few of his students and to a couple of his colleagues who had been his intimate associates for some years, and perhaps he also had difficulties with his first wife.) Almost automatically he observed Cabell's great law of living, "Thou shalt not offend against the notions of thy neighbors." But Agassiz was in no way a hypocrite; his notions *were* the notions of the academic world in which he lived, only he expressed his ideas a little better than most.

Early in life Agassiz exhibited a characteristic that we are only now beginning to appreciate fully—he was always able to raise money. When his father's resources for financing his extended education in Germany proved insufficient, he found a maternal uncle whom he persuaded to take over. His teachers were also uniformly helpful. Later, in France, Cuvier did his part and made it possible for Agassiz to remain a while in Paris. Baron Alexander von Humbolt contributed to Agassiz from his personal funds and used his political influence to get Agassiz grants from the Prussian state. Later, at Harvard, Agassiz routinely and conscientiously ignored all budget limitations and overspent his funds almost as a matter of principle, but he was always able to raise enough money to cover the deficits. He could always rehabilitate his own personal finances by giving a few public lectures. Such talents we can appreciate.

It is not the purpose here to outline either the character of Agassiz or the events of his life, but only to call attention to some of the aspects of his biography that Lurie has presented so interestingly. Agassiz' was a complex personality, and some of his attributes and actions seem very modern and up to date. He definitely preferred opportunities for advancing his standing as a scientist to mere academic status, as he demonstrated when he declined a professorship at Heidelberg because his research and publications were going on so well where he was. But he was also an expert academic politician, a quality he demonstrated when he joined a small group, who called themselves the "Lazzaroni" and who were instrumental in establishing the National Academy of Sciences. This group sought by combining their influence to control all academic appointments in the sciences in American universities. The Lazzaroni were, for a while, all powerful, and they placed their friends and supporters in many important chairs.

That Agassiz failed to become the greatest naturalist of his time was due to a development he could never quite understand. He was equipped with almost unlimited industriousness and ambition. He was exceptionally intelligent and attractive. As a youth, he worked with the leading scientists of his time, and they one and all liked him, admired him, and advanced his fortunes in every way they could. He had also prepared himself in the best of all possible ways. He had mastered *Naturphilosophie* in Germany but had also learned, by studying in France with the hard-headed and practical Cuvier, to prefer the factual to the speculative aspects of science. He had mastered and practically dominated ichthyology and was credited with establishing the glacial theory. For a time he dominated biology in America, all the while remaining a very potent force in Europe. He and his work were universally respected, but something went wrong.

In 1859, Charles Darwin hit him in his postulates, and he found his basic assumptions under attack. That Agassiz did not know at first what had happened to him is clear from his reactions. Later on, when he began to suspect, he was dazed and puzzled. He made an honest effort to understand the newer developments and to evaluate the evidence on which the theory of evolution was based, but he failed completely, as he showed by a paper he wrote just before his death.

A character as complex as Agassiz' is hard to depict, but Lurie has succeeded brilliantly. His treatment of Agassiz is both sympathetic and critical. He fits Agassiz into the intellectual climate of his time, but he also (and rightly) judges him from the vantage point of today. Historians of science, of course, must observe their subjects from these two viewpoints. It is only a truism to state that science changes drastically and continually, but that the scientists themselves are altered only with the slowness of organic evolution. A considerable number of our active, productive, and creative contemporaries furnish evidence that Agassiz was not a *lusus naturae* but that he was unique, perhaps, only in the way that all human beings are unique. He accomplished a great deal, advanced the science of his time, and rose to the top of his profession. He was unfortunate in that the science to which he had contributed so much left him behind some years before he died. The whole story of this interesting man is well told. All in all, Lurie has written a distinguished biography.

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Control Systems Engineering. William W. Seifert and Carl W. Steeg, Jr., Eds. McGraw-Hill, New York, 1960. xiv + 964 pp. Illus. $15.

There are many treatments of specific aspects of control system engineering; few attempt as encyclopedic an account of the ancillary mathematical techniques as the present volume. There are chapters, written by various authors, on the mathematics suitable for the analysis of linear systems—that is, linear differential equations, linear integral equations, transform techniques, and matrix methods. In addition, there are chapters on nonlinear differential equations, statistical theory and applications, optimization of linear systems, sampled-data analysis, numerical analysis, and an introduction to game theory.

While there are many sloppy mathematical statements in this book, a more serious objection is that it tries to cover too much ground and pays the price in superficiality. Although the volume is not likely to be considered suitable for use as a textbook, it can be rather valuable as a reference for the practicing control engineer.

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Radioisotopes and Radiation in the Life Sciences. 2nd Inter-American Symposium on the Peaceful Applications of Nuclear Energy, Buenos Aires, 1959. Inter-American Nuclear Energy Commission and the Argentine National Atomic Energy Commission. Pan American Union, Washington, D.C., 1960. 264 pp. Illus.

This symposium, jointly sponsored by the Inter-American Nuclear Energy Commission (IANEC), and the Argentine National Atomic Energy Commission, reflects the great progress achieved by the American States in the field of nuclear energy since the first inter-American symposium was held at Brookhaven National Laboratory in 1957.

The 38 papers presented by scientists from the 21 member countries of the organization dealt with 10 topics, among them problems of basic botany and zoology, radiobiology, clinical applications, animal studies, agriculture, entomology, and food preservation. Special emphasis was given to research of practical value to the Americas, such as tracer studies in the coffee plant, soil fertility studies, the use of radioisotopes and radiation in plant physiology, mutations produced in flowering plants, and milk formation in cows (studied with radiocarbon as a metabolic tracer). General aspects of the field, administrative problems, and radiation protection questions were discussed by experts in the introductory speeches, as well as between and at the end of the sessions. An attendance of about 100 scientists from the Americas, and abroad (including observers from Canada) underscored the importance of this stimulating event in the history of the Americas and made possible its success.

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A History of Metallography. The development of ideas on the structure of metals before 1890. Cyril Stanley Smith. University of Chicago Press, Chicago, Ill., 1960. xxi + 291 pp. $8.50.

This beautifully illustrated book covers much more than the specialized history of metallography; it should be of interest, as the author hopes, to those concerned with the broader aspects of the history of science. Cyril Stanley Smith, former director of the Institute for the Study of Metals at the University of Chicago, was so greatly interested in metallurgical history that he spent a full year in England, on a Guggenheim fellowship and a research grant from the National Science Foundation, following his avocation. The result of his research is this thought-provoking work covering the growth of concepts on the nature of all materials as well as on the structure of metals. The book will be especially useful for reference because of the extensive bibliographic notes that have been included. Most of the sources quoted have not previously been used in metallurgical histories and are not contained in any similar bibliography.

The book's first section outlines some of the artistic uses made by swordsmiths, armorers, and jewelers of surface phenomena depending on metal structure. Particularly interesting chapters cover the Damascus blade and the Japanese sword, considered by many to be the supreme form of metallurgical art.

A brief review of the rise of the corpuscular theory during the 17th century emphasizes the author's point that a proper balance between "applied" and "pure" science is required for the development of human knowledge. In the field of metallurgy, R. A. F. de Réaumur alone proceeded to develop corpuscular theory into something useful. In developing theories on the nature of steel and iron, he was able to