adjust the drug prescription to the psychological individuality of the patient (*Political Economy*, p. 102). Unfortunately an equally profound rule for neurosurgeons seems as yet undiscovered. The Roses do not tell us how to distinguish between psychosurgical "biologism" and acceptable types of neurosurgery. Is it all right to excise brain tumors? The Roses do not say.

Steven Rose's exposé of the "IQ racket" is almost entirely devoted to hereditarian figures and issues of a bygone age, and to such vestiges as Jensen and Shockley. We can only guess what Rose may think about the live issues in educational psychology. He seems to be against any effort to establish standardized, objective tests as a method of discovering which children need what kinds of education. Yet he also rejects, en passant, "the self-fulfilling prophecies of teacher labelling of children" (*Political Economy*, p. 140). He seems unaware of the implicit dilemma. If intuitive assessment and standardized testing are both no good, how is universal compulsory education to work? Perhaps the answer is that it can't work and should be scrapped, but Rose is silent on that radical proposal. He is too intent on pasting a label, "biologism," on the would-be science of educational psychology, which is in fact overwhelmingly indifferent to the problem of biological determinants of human behavior.

Three excellent essays (by Gorz, Lévy-Leblond, and Enzensburger) imply that modern science and society are so organized as to be jointly incapable of dealing in a humanly satisfying way with large social problems, such as education. Gorz is especially forceful:

> The expansion of knowledge . . . has gone in parallel with a diminution of the power and autonomy of communities and individuals. In this respect, we may speak of the schizophrenic character of our culture: the more we learn, the more we become helpless, estranged, from ourselves and from the surrounding world. This knowledge we are fed is so broken up as to keep us in check and under control rather than to enable us to exercise control. Society controls us by the knowledge it teaches us, since it does not teach us what we need to know to control and shape society [*Political Economy*, p. 64].

Lévy-Leblond argues that within science itself the process of discovery is increasingly "diffuse"—it is harder and harder to know exactly who made the important discoveries—and nominal rewards are therefore increasingly arbitrary. As a result scientific creativity declines, and "visible signs of sclerosis and deterioration" appear. "The theoretical content of this science [physics] is devalued or forgotten to the benefit of a purely technical conception" (*Radicalisation*, pp. 156, 164).

The most notorious case of modern social organization causing "sclerosis and deterioration" in science is of course the thirty-years' war of Lysenkoism against biology—in the Soviet Union, not in a capitalist country. That is an awkward anomaly for the radical science movement, and Lewontin and Levins summon their comrades to an explanation, lest they lose faith in "cultural revolution," which is good and healthy in China though it proved "abortive" in Russia. In Medvedev's book (*1*) and in mine (*2*), they have seen the argument that Lysenkoism was a product of collectivization and the protracted crisis that ensued in agriculture. Lysenko carried Stalinist willfulness from "the great social experiment" into agronomic and biological experimentation. In all these enterprises normal reasoning from average results was rejected in favor of authoritarian insistence that the unfortunate majority (of farms or experiment stations or laboratories) must follow the example of the happy exceptions—until massive, protracted failure forced a grudging retreat.

In principle Lewontin and Levins like that method of experimentation—it is Maoist as well as Stalinist—which gives them the problem of explaining the poor results and the retreats, or explaining them away. They blame the northern climate—of Russia proper, to be precise, not the supplementary breadbasket discovered in Canada. They blame the Russian peasantry for petty-bourgeois "sabotage" of the agrarian revolution, yet praise that class for its role in the cultural revolution: it produced "peasant scientists" like Lysenko. They blame the geneticists, whose "class origin" was subversively nonpeasant, by and large, and whose science was so full of such terrible faults that poor Lysenko could see only the errors and missed the truths (*3*). As for Marxist-Leninist ideology, it cannot possibly be blamed, for it is divinely perfect: "There is nothing in Marx, Lenin or Mao [or Stalin?] that is or that can be in contradiction with the particular physical facts and processes of a particular set of phenomena in the objective world" (*Radicalisation*, p. 59).

It would be unfair to compare this to Arthur Koestler blaming Galileo for the Inquisition's ban on the earth's motion (*4*). Koestler's argument was not nearly as ridiculous, and the Inquisition was not nearly as brutal as Stalin's regime. It is a puzzle why self-styled radicals humiliate their minds and damage their cause by worship of tyrannous regimes in distant lands. Perhaps Enzensburger, one of the intelligent contributors to the present anthologies, has solved the puzzle. Criticism of one's own society is a pain in the critic's mind, especially if it can find no outlet in effective action to change society. In such circumstances radical criticism tends to shift from "the methodical investigation of reality . . . [into] a defence against that very reality, . . . a collection of exorcisms. . . . Reference to the need for revolution becomes an empty formula, the ideological husk of passivity" (*Political Economy*, p. 180). Conservatives will be foolish to find smug satisfaction in that degeneration of the left. It may be another sign that our problems are becoming insoluble.

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References and Notes

1. Zh. A. Medvedev, *The Rise and Fall of T. D. Lysenko* (Columbia Univ. Press, New York, 1969).
2. D. Joravsky, *The Lysenko Affair* (Harvard Univ. Press, Cambridge, Mass., 1970).
3. In fact Lysenko's attack on genetics was provoked by the most elementary truths in that science, not by its imperfections in advanced theory. See Joravsky (*2*), p. 207 and passim.
4. See A. Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe* (Macmillan, New York, 1959), part 5.

Molecular Biology

RNA Polymerase. R. LOSICK and M. CHAMBERLIN, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1976. x, 900 pp., illus. $38. Cold Spring Harbor Monograph Series.

The enzyme RNA polymerase, which is responsible for the transcription of genetic information from DNA to RNA, plays a central role in the control and expression of genetic information. Our current understanding of this complex enzyme is reviewed and discussed in this book. The book is divided into two sections: the first consists of articles reviewing particular subjects and the second is a series of research papers.

The scope of the book is wide, including topics such as protein chemistry, DNA recognition sequences, the function of a variety of bacterial and phage-induced transcription factors, and their mechanisms of action at the stages of initiation, elongation, and termination of RNA synthesis. Inevitably, the emphasis is on bacterial enzymes, which have been the most intensively studied. In addition, there are articles on more recently discovered RNA polymerases, in-

cluding those of eukaryotic cells and those that synthesize primer RNA's for the initiation of DNA synthesis.

A careful choice of contributors has resulted in a book of high quality. After a brief and interesting historical article by S. B. Weiss about the discovery of RNA polymerase, there is an overview article by M. Chamberlin, written with the clarity and thoroughness that one has come to expect from him. It is an excellent review of the field and a stimulating preview of the rest of the book.

In a very readable article, R. R. Burgess describes various methods for the purification of bacterial RNA polymerases and discusses in detail the problems and artifacts one might encounter in isolating and studying or using the enzyme. The article closes with a summary of some chemical and physical-chemical characteristics of bacterial RNA polymerase. It will be a valuable reference for anyone entering the field.

Other review articles deal with subunit genetics, modifications and functions, mechanisms of initiation and termination, and punctuation signals. About a fifth of the book is devoted to enzymes isolated from yeast, *Drosophila*, wheat germ, and mammalian cells.

The research papers are in themselves reviews of the research currently in progress in the laboratories of the contributors. The papers constitute a rather well-balanced collection: often several discuss a common subject, such as the rho factor and the control of transcription by antitermination.

There is no mention in the book of the psi factor and the excitement and controversy it generated. There appears to have been a concerted effort by the editors to deny that such a factor was ever discussed. The lessons learned from the controversy would be useful for the uninitiated; moreover, those readers not in the field would probably like to know what psi is—or is not. They will not learn it from this book.

Overall, however, the book is well written and comprehensive. It is up to date as of 1976; the subject and author citations are complete, and a wide cross-listing of subjects in the index makes it a valuable source of references. Because of the book's clarity and organization, it would be a very useful textbook in an advanced course on nucleic acid biosynthesis. I strongly recommend that every laboratory working in this field have its own copy.

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Nonlinear Effects in Plasmas

Plasma Physics. Nonlinear Theory and Experiments. Proceedings of a symposium, Lerum, Sweden, June 1976. HANS WILHELMSSON, Ed. Plenum, New York, 1977. xiv, 514 pp., illus. $39.50. Nobel Foundation Symposium 36.

Reflecting the fact that most of the impetus for plasma research in recent years derives from attempts to achieve controlled thermonuclear fusion in order to provide a new source of energy, this book is concerned primarily with topics such as laser-plasma interactions, parametric instabilities, ponderomotive forces, strong plasma turbulence (with emphasis on solitons and cavitons), nonlinear effects in magnetically confined plasmas, and relativistic beam interactions with plasmas.

For the nonspecialist this collection has a number of attractive features. The authors have evidently been given a great deal of latitude as far as length is concerned, which makes it possible to go beyond the usual conference format. Many of the papers are of a quasi-tutorial nature and can serve as an introduction to certain aspects of nonlinear plasma physics for those not actively engaged in such research. This is especially true of a series of papers by authors such as Tsytovich, Galeev and colleagues, ter Haar, and Chen and Liu that deal with strong plasma turbulence in connection with recently developed concepts such as solitons, cavitons, and Langmuir collapse. Another agreeable feature is the interplay between theory and experiment. Though there are only a few experimental papers as such, many of the analytical papers review experimental work or are concerned with particular experimental results. This is the case with the papers on laser-plasma interactions, which discuss topics such as the relation between superthermal electrons and the x-ray spectrum, radiation forces, and the wavelength dependence of the laser-plasma coupling (Brueckner), the modification of hollow glass shells to prevent preheating due to coronal radiation (Johnson), and the effects of pellet and radiation inhomogeneities (Basov and colleagues). These papers all contain detailed comparisons of theory and experiment in laboratories in the United States and the Soviet Union. Numerical computations indicate that the absorption and polarization dependence of the scattered light are inconsistent with classical absorption mechanism but are compatible with certain collective plasma effects (Kruer and colleagues). This group of papers also contains a very readable review of experimental work on parametric instabilities in laser-plasma interactions (Chen) and a coherent discussion of the mechanisms that might be responsible for the generation of lines at 2ω and $(3/2)\omega$, where ω is the incident frequency (Bobin).

The standard theories of weak plasma turbulence use the random-phase approximation, on the assumption that unstable modes are uncorrelated. However, it is gradually being realized that this approach is open to question in the case of parametric instabilities, in which a coherent pump wave can establish phase and amplitude relations between daughter waves. Coherence effects of this kind in parametric interactions are discussed by Dubois and Bezzerides and by Wilhelmsson. Another paper in the general area of coherence effects deals with plasma diffusion due to a single wave in a magnetized plasma (Smith and Kaufman). An interesting paper by Cotsaftis entitled "Nonlinear dynamics of joule heated toroidal discharges" employs methods of group theory and dimensional analysis to obtain a rather striking correlation between the analysis and recent results in the TFR (Tokamak at Fontenay-aux-Roses) device. Another paper on a topic of great recent interest is that on the free-electron laser (Kwan and colleagues).

In general this collection, written by a group of knowledgeable authors, provides a useful survey of a number of specialized topics in contemporary nonlinear plasma physics.

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