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Micrograph A
Detail of nephron proximal cell from mouse kidney. Prepared and sectioned with CryoKit and Ultrotome. Temp.: specimen -140° C, knife -60° C.

Micrograph B
Red rubber tubing. Prepared and sectioned with CryoKit and Ultrotome. Temp.: specimen -80° C, knife -110° C.
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that the world owed them a living while they pursued their own personal interests. We are the fools who opened Rutherford’s Pandora’s box, and in so doing we defied ourselves as his inheritors. And now, from our Mount Olympus, we scold a disenchanted citizenry which is beginning to question our godliness in telling it how to live and work so that it can continue to meet our presumptuous demands for bigger and better ivory towers. We are indeed obsessed—with ourselves as Scientists.

ETHYL WARD MCLEMORE
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DDT and Safer Substitutes

In response to Hoffman (Letters, 10 July), it is not at all surprising that “the greatest losses to growers of sweet cherries and grapes have been due to an increasing population of birds, rather than a decreasing population.” It is a basic principle of ecology that oversimplification of an ecosystem (that is, by intensive agricultural or residential use of land) results in a decrease in the diversity of the community, but an increase in the numbers of those species which tolerate the changed environment. Insect pests of agriculture are generated in just this manner. The fact that in New York State populations of native birds such as robins, orioles, catbirds, and grackles are reaching pest proportions should be a clear warning that severe damage has occurred.

Pesticides and other pollutants are by no means the only factors which contribute to this simplification, but there is no question that they are having effect. Joseph W. Still (same issue) claims that there has been “irresponsible slander of DDT . . .” but he then joins the ranks of the irresponsible by referring to “isolated and loosely reasoned claims about brown pelicans, bald eagles, and so forth. . . .” I suggest that Still take a second look at the number of reports in the scientific literature and the reasoning behind them. They are neither isolated nor loosely reasoned.

I know of no ecologist who is unaware of the benefits of DDT to human health and agriculture; to argue that DDT has not saved lives and increased crop production would be foolish. The disturbing fact is that we are just beginning to understand the subtle ef-

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fects of DDT on living organisms, despite the fact that the compound has been used commercially for more than 20 years. Most ecologists are not demanding complete abstinence from the use of pesticides; these chemicals are absolutely essential to the production of food in quantity by our current agricultural system. What the ecologists are asking is that, where nonpersistent substitutes for DDT are available, they be used. Granted, the cost of these substitutes is usually higher than that of DDT, and this cost would undoubtedly be passed on to the consumer. But I submit that the continued use of chemicals such as DDT is the greatest act of ecological irresponsibility, especially in light of the fact that safer substitutes are available.

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Energy without Pollution

I strongly concur with John N. Nasikas, chairman of the Federal Power Commission, who was quoted in "Energy crisis: Environmental issue exacerbates power supply problem" (26 June, p. 1554) about the need for a comprehensive energy policy to effect balanced objectives of efficient utilization of our energy resources in harmony with the environment, I do not confine this concern to the United States either.

The amount spent on research and development for electrical power generation utilizing fossil fuels is pitifully small. We must increase our efficiencies in conversion to electrical energy, as well as to utilize the thermal energy presently being rejected. Although the article was concerned mainly with electrical energy (about ⅓ of the energy utilized in the United States), the conclusions are applicable to all forms of energy; we need better utilization of all energy resources—for example, a transit system more energy-efficient than the present individual automobile.

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... Boffey in his article briefly alludes to what may prove to be the only truly successful long-term solution—the development of controlled thermonuclear power. In view of pollution problems
(chemical, thermal, and radiological), it seems appropriate to list some of the obvious advantages of such power sources as they are envisioned. The fuel supply is essentially limitless. Air pollution problems are eliminated. Compared to fission power plants, radiological hazards are reduced by many orders of magnitude. Direct conversion systems might be upward of 90 percent efficient, thus drastically reducing thermal pollution. With such characteristics, generating plants could be located much nearer the cities they serve, improving reliability and efficiency and reducing the number of unsightly cross-country high voltage transmission lines.

As Boffey states, suitable thermonuclear fusion has not yet been produced. Nevertheless, there is cause for optimism based on the recent successes of the Russian Tokamak machines in which plasma confinement times of 20 milliseconds at densities of \(5 \times 10^{13}\) have been achieved and in the less publicized success of the Lawrence Radiation Laboratory 2X machine which has attained comparable densities at less times but at higher temperatures. The successor to 2X, called 2XII, will be operational about October of this year and is expected to produce plasmas of higher energy density than any created before. The operating regime approaches fusion reactor conditions.

Engineering studies have been underway for some time to take advantage of the plasma when it becomes available. These studies deal with power stations using both conventional and direct conversion schemes. Present funding of the controlled fusion effort in the United States amounts to only $30 million per year, much less than the premium we pay for white sidewall tires on our new cars. A 15 percent increase in funding per year could be used without waste, but for the new fiscal year which began 1 July, the funding was cut. What a dismal sense of priorities.

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The calculation of the Committee for Environmental Information that "in the year 2000 . . . power plants of all kinds will produce roughly enough heat to raise by twenty degrees the total volume of water which runs over the surface of the United States" is based on steam power plants, which will be obsolete well before the year 2000. Closed-cycle, nuclear-powered gas turbines, developed by the Swiss and already in production, need only a small amount of heat to be extracted from the gas, and the gas can be cooled by air. The amount of heat rejected to the atmosphere is negligible compared to heating by solar radiation, even if the power production increases tenfold—and there is no contamination of the atmosphere.

Breeder reactors will be ready to use in a few years and they can be combined with methods of energy-conversion other than using steam. Also underground transmission lines are not a novelty—high-voltage direct-current lines are in operation in Europe. Thermal and atmospheric pollution as well as other environmental problems caused by energy production can be solved by the actual state of art, but we must act now.

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entitled An Introduction to Automata Theory consists of chapters on finite automata (including circuits), a chapter on Turing machines, and a chapter on Post systems and context-free languages.

The last section of the book has chapters on partial recursive functions, computational complexity, algebraic decomposition theory, stochastic automata, and constructors. Unfortunately, the mathematical side of Arbib's book is the weakest. There are a number of errors in the proofs. Many arguments are sketched vaguely, and nontrivial gaps are left. In some cases, proofs are lifted from the literature (almost word for word). This is unfortunate, since proofs in the open literature often omit steps too difficult for students to supply. To summarize, Arbib's book is an excellent survey of the different sides of automata theory, but I would not recommend it as a textbook.

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Books Received


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