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OF THE WEEK

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COVER: A dark-field fluorescence photomicrograph of the noninnervated face of a single electrocyte — just one example of how the techniques of fluorescent microscopy are opening up a colorful world of information for biologists. See p. 298. (Photo courtesy Easton, Valinsky and Reich/Cell)

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LETTERS

Riggatron: Pro

D. L. Jassby's letter (SN: 9/2/78, p. 163) on the "disposable fusion reactor" concept makes three technical/economic assertions which are alleged to "correct...misleading statements" in the basic article (SN: 8/12/78, p. 106).

Unfortunately Jassby is wrong on all three counts:

- The cost of the tokamak-associated equipment in a hypothetical fusion plant depends strongly on the volume filled by the main confining magnetic field and on the volume occupied by the plasma chamber. Studies of "conventional" tokamak power plants show that the costs of this set of equipment and systems scales approximately as $R2.8$ — not quite as the cube, but certainly *not* as the square of the machine size, R.

Conversely, the power output for fixed wall heat flux scales directly with plasma chamber surface area, thus as the square, *not* the cube of dimension, R. Thus the cost per unit power (of the tokamak-related systems, other things being kept equal) scales roughly directly with R, *not* inversely as claimed by Jassby.

- The choice of superconducting magnets was, indeed, made because they can operate with no ohmic losses. However, this choice forces such tokamaks to large dimensions and consequent low wall fluxes, in order to provide space for shields (to protect the magnets) and blankets (for T breeding) *inside* the magnet coils. What Jassby (and most of the rest of the fusion community) fails to grasp is that inversion of this geometry and use of water-cooled copper coils leads to a design window of small dimension but finite size in which such resistively driven coils *can* yield tokamak machines which make significant (and economical) net power. This "island" in BTF vs R space is unattainable by use of superconductors. Its virtue is that the machine size is very small and, therefore, R&D and construction can be carried out very quickly and cheaply as compared with the costs and time scales of the mainline program directions.

- Finally, nothing could be less well-founded than Jassby's assertion that neutral beam injection (NBI) is the magic key to "practical" fusion machines. NBI systems and components are very complex, short-lived, and exceedingly expensive. To date, they have operated only on plasmas which do not "talk back" — i.e., in which no significant nuclear reactions are occurring. It is not at all clear that NBI will work at *all* when the plasmas they are attempting to drive begin to send fast alphas and 14 mev neutrons back up the beam line, to cause secondary electron emission, arc breakdown, and beam ionization. The far simpler, more direct, and less costly ohmic heating is clearly to be preferred, if truly practical fusion power is to be attained in this century.

Robert W. Bussard
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New light on old data

It is important to know that scarcity and specialization make a species prone to extinction. I am surprised, however, to learn that Edwin O. Willis's conclusions to this effect (SN: 9/30/78, p. 233) are considered new.

Over 25 years ago my father, ecologist Leonard W. Wing, took me to the Kirtland Warbler country of lower Michigan, a relatively small region containing stands of young jack pines. He explained that this species nests only among trees roughly 5 to 18 feet high, in only certain types of ground cover, and thus depends on forest fires and the activities of man for its continued existence. It is further threatened by its habit of migrating to the Bahamas in winter, and by its relatively narrow humidity and temperature tolerance. In 1953 less than 1,000 Kirtland Warblers were estimated to exist. The Michigan legislature once rejected this precarious species as state bird in favor of the common robin, presumably in fear of embarrassment should it become extinct.

The case of the Kirtland Warbler, and those of several other species in similar straits, are discussed in my father's book, *Natural History of Birds* (Ronald Press, 1956). His material was drawn from the ornithological research literature of the preceding several years. It would appear from this that the connections among scarcity, specialization and extinction have been known for some time. Presumably Willis's data verify and illuminate them in particular cases.

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Cancer and tire dust?

"Cancer and the workplace: 'A disaster'" (SN: 9/30/78, p. 228) includes tire worker as a high risk occupation relative to cancer. I would like to query the experts who read SCIENCE NEWS regarding the contribution that the finely ground particles of automobile tire composition make to cancer.

Each year millions of tons of fine automobile tire dust are generated on the highways. Periodically I read reports concerning the higher cancer rate of persons living in the vicinity of busy highways. These reports automatically link this higher rate to the emissions from internal combustion engines but nothing is said about the breathing and internal ingestion of the dust from rubber tires.

Since 1954, there have been many reports linking the breathing of coal tar products, hydrocarbons and sulphur compounds to cancer of the lung. Which of these poisonous elements are in, or are oxidized from, hot tire dust?

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