The problem with this attractive notion is that, with the possible exception of one site in Brazil, every paleobotanical test of putative refugia in tropical America has shown the forest to be absent in the late Pleistocene. A leading theorist on forest refugia, Ghillean Prance of the New York Botanical Garden, says that with pressure from data such as Leyden's and "more time to think about the problem" the basic ideas are changing. "During the past few years there has been a shift to thinking about a repeated resynthesis of the tropical forests from their various components, which were scattered during glacial periods" (*5*).

This repeated reassembly, as opposed to repeated regrowth of pristine communities, forces one to view the tropical forest as less of a cohesive, natural unit than previous theory implied. Drawing on her work on temperate forests of North America, Margaret Davis of the University of Minnesota suggests that the forests formed during each interglacial might be quite distinct, depending on how different component species responded to the glaciation and how migration routes developed as the temperature rose. Graham's work in the mid-1970's on vegetation shifts of the Mexican lowlands throughout the Pleistocene forced him to view tropical forests as dynamic and ephemeral rather than stable and ancient. Others are following his lead. "There has been a complete turn around of opinion among ecologists, and data such as those from the Peten lake cores are helping it on its way."

The tremendous diversity of both plant and animal species of tropical forests has long dazzled inquiring naturalists. Pondering on the origin of this diversity, ecologists have doubtless been impressed by the apparent agelessness of the forests, and so diversity came to be associated with environmental stability. The emerging realization that tropical forests are mere biological youths, constantly suffering dynamic turnover, is helping to overthrow this intuitively appealing equation. High diversity through instability, not stability, is how the equation now reads, which brings the forests in line with other avenues of biological inference (*6*).—**Roger Lewin**

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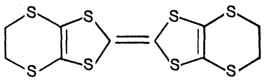
New Organic Superconductor

The first sulfur-based organic compound that is a superconductor at ambient pressure has recently been reported by two research groups, I. F. Shchegelov and his colleagues at the Institute of Chemical Physics in Moscow and Jack Williams and his associates at Argonne National Laboratory.* The compound, a triiodide salt of bis(ethylenedithiolo)tetrathiafulvalene or BEDT-TTF, is the first of a new family of compounds, one of which



is superconducting at a temperature three times higher than any previous ambient-pressure, organic superconductor.

The search for ambient-pressure superconductors that operate at readily achievable temperatures has been frustrating. When the so-called critical temperature apparently hit a plateau at 23.2 K for metal-based superconductors in 1973 (with Nb_3Ge) attention switched to organic compounds. The first candidates here were based on a selenium compound, tetramethyltetraselenafulvalene or TMTSF. For the most part, salts of TMTSF require high pressures, on the order of 10,000 atmospheres, to be superconducting. One derivative that did not, $(TMTSF)_2ClO_4$, has a very low critical temperature, 1.3 K.

Researchers feared for some time that these TMTSF materials, known as Bechgaard salts, might turn out to be the only superconducting organics. That fear was allayed last year when a team at IBM San Jose Research Laboratory reported superconductivity in a perrhenate salt of BEDT-TTF (*Science*, 11 November 1983, p. 606). Unfortunately, this compound, $(BEDT\text{-}TTF)_4(ReO_4)_2$, is superconducting only under 4000 atmospheres and has a critical temperature of 2 K.

Williams developed the most recent BEDT-TTF-based superconductors following a theoretical consideration of the molecular structure required for superconductivity. The organic molecules in superconducting salts stack one over the other like pancakes: electrons can thus pass between adjacent π-electron systems while counterions occupy the spaces between the stacks. Based on x-ray crystallography studies, the Argonne group had suggested that the selenium-selenium (or sulfur-sulfur) distance between the stacks is the major factor in determining whether material will be superconducting. He inferred that high pressures compress the stacks to the appropriate distance and angles. He then calculated that small counterions should combine with BEDT-TTF to produce the correct interstack distance and angles for superconductivity.

Williams's prediction turned out to be correct, but he was beaten to press by the Soviet group. Shchegelov and his colleagues reported that $(BEDT\text{-}TTF)_2I_3$ superconducts at ambient pressure with a critical temperature of about 1.4 to 1.5 K, and the Argonne group confirmed this. Both groups also found that the salt occurs in several different crystal structures, only one of which is superconducting.

More recently the Argonne group has gone on to develop a family of salts with the general formula $(BEDT\text{-}TTF)_xI_yBr_z$, which are superconducting at ambient pressure. The precise identities of these materials remain to be established, but one of them, probably $(BEDT\text{-}TTF)_2IBr_2$, has been shown to have a critical temperature of 4.2 K. This is the highest critical temperature recorded so far for any organic superconductor. Encouraging though it is, there is still some way to go before the apparent critical temperature plateau of metallic superconductors is reached.

—**Thomas H. Maugh II**

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