LETTERS

(Continued from page 1217)

lation. As a noun to stand for the condition of being extaille, I propose "extation." In unusual instances where a transitive verb is necessary, "extaille" could serve. Thus, one might write that the Eskimo curlew is extaille, or that loss of habitat was the cause of the extation of the ivory-billed woodpecker.

Other words describe population levels or status with other connotations. "Rare" refers to frequency of observation or occurrence and may or may not imply a reduced population level or an inability to function in an ecosystem. "Endangered" and "threatened" are more sociological than biological in nature. Most species to which the word "extaille" would apply would also be considered threatened or endangered, but the converse would not necessarily be true.

Strictly speaking, one might say that whatever causes the death of the last remaining individual of a species is the cause of extinction. In general parlance, discussion of causes of extinction are really related to the causes of extation, the factors that lead to a condition whence extinction is possible. From a conservation viewpoint, the causes of extation are much more important than the cause of extinction because it is easier and more feasible to control the destiny of a population than of an individual. Further, extation may be reversible whereas extinction is not.

The verb "become" is most frequently used to indicate the course of a species to extinction, and could also be used with extation. Despite the precedence of modern usage, and particularly Will Cuppy's famous essay (*1*), I suggest that the verb "go" is more appropriate. Thus, a species would go extaille or extinct. "Become" usually implies a positive goal orientation, whereas "go" implies a departure. In an economic analogy, one becomes wealthy, but one goes broke.

RICHARD C. BANKS
Division of Cooperative Research,
U.S. Fish and Wildlife Service,
Washington, D.C. 20240

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1. W. Cuppy, *How to Become Extinct* (Farrar and Rinehart, New York, 1941).

PCB's in Bald Eagle Eggs

The continued threat of polychlorinated biphenyls (PCB's) is reported in a Research News article by Thomas H. Maugh II (19 Dec. 1975, p. 1189). I would like to emphasize the magnitude of the threat to natural fisheaters, such as bald eagles. Maugh notes that salmon and striped bass from the northeastern United States contain PCB's in concentrations from 5 to 20 parts per million and that 2 ppm is the upper limit adopted for edible fish. From a population of bald eagles with declining reproduction in northwestern Ontario I obtained a number of addled eggs during a period from 1967 to 1972 (*1*). The contents of these were analyzed for mercury and several organochlorines, including PCB's (*2*). The PCB concentrations in the three eggs in which that contaminant was measured were 25, 30, and 166 ppm, respectively (*3*). These levels are higher than those reported for bald eagle eggs in other regions of North America (*4*), and the last is among the highest on record for North American wildlife, amounting to nearly 0.1 percent of the entire dry weight content of that egg. I would not advise eating bald eagle eggs for breakfast.

JAMES W. GRIER
Zoology Department,
North Dakota State University,
Fargo 58102

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1. J. W. Grier, *Can. Field Nat.* **33**, 961 (1974).
2. PCB's were analyzed by gas chromatography, using Aroclor 1260 as reference standard, with calculations averaged from peaks 8 and 10. Analyses were performed by the Ontario Research Foundation for the Canadian Wildlife Service.
3. Concentrations are expressed as parts per million of estimated fresh wet weight to be consistent with Food and Drug Administration bases for reporting. Levels are converted from dry weight [see (*1*)] by assuming 83 percent moisture in freshly laid eggs.
4. S. N. Wiemeyer, B. M. Mulhern, F. J. Ligas, R. J. Hensel, J. E. Mathisen, F. C. Robards, S. Postupalsky, *Pestic. Monit. J.* **6**, 50 (1972).

Solar Models

Roger K. Ulrich, in his article "Solar neutrinos and variations in the solar luminosity" (14 Nov. 1975, p. 619), seriously misrepresents my work (*1*) on stellar structure and variations of solar radiation. He rightly says that the described model "is physically untenable," but it is not my model, but rather, so to speak, the very opposite of mine, which he describes. With a solar core depleted of hydrogen, this element (not "heavy elements," as Ulrich says) diffuses inward, leaving the practically nondiffusing heavy elements in an outer shell, thus increasing the opacity in this shell (not "in the center of the sun"). There a superadiabatic gradient is formed, causing convection and leading to a fresh supply of hydrogen being transported to the core (not "causing the

heavy material to be thrown out of the core"). Rightly, Ulrich says that "the diffusion time for the heavy elements . . . is quite long," but this is also my starting point. Curiously, while diffusion of hydrogen and the increased nuclear energy output are the main processes I considered, Ulrich's critique of my theory does not even contain the words "hydrogen" or "nuclear energy generation." My assumption that stellar cores are enriched by heavy elements in the prestellar process of condensation of diffuse matter during star formation may have been misunderstood by Ulrich as having been based on some process of diffusion inside the existing star.

ERNST J. ÖPIK

Armagh Observatory,
Armagh BT61 9DG,
Northern Ireland

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1. E. J. Öpik, *Icarus* **4**, 289 (1965).

Öpik points out that my comments about his theory for solar variability do not accurately represent his model (*1*). This misrepresentation was inadvertent and resulted from my efforts to find a modification of Öpik's model which was consistent with the theory of diffusion as presented by Aller and Chapman (*2*). Competing processes operate in the diffusion theory, and it turns out that all elements diffuse toward the center of the sun relative to hydrogen. Rather than simply abandon Öpik's model, D. Elliott and I tried to make it work by the slight modification of allowing the elements to diffuse to the solar center and there trigger the type of transient convection zone envisioned by Öpik. Such a model would proceed essentially along the lines described already by Öpik and would represent a possible solution to the solar neutrino problem. Unfortunately, diffusion models of any sort do not work for the solar core because the rates for all elements to diffuse relative to hydrogen are so low as to require 10^{11} years before any modification of chemical composition can occur. The additional models for inducing transient mixing discussed in my article are in fact efforts to find a way of modifying the thermal diffusion theory by postulating an additional physical process.

ROGER K. ULRICH

Department of Astronomy,
University of California,
Los Angeles 90024

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1. E. J. Öpik, *Icarus* **4**, 289 (1965).
2. L. H. Aller and S. Chapman, *Astrophys. J.* **132**, 461 (1960).