Letters

Shanidar Cave

We wish to point out certain errors in the technical comment by Berger and Protsch (15 Mar., p. 1101). Berger and Protsch reply to an earlier comment by Bökönkyi, Braidwood, and Reed (14 Dec. 1973, p. 1161) on their article "Earliest radiocarbon dates for domesticated animals" (19 Jan. 1973, p. 235).

First, the name of our site is not "Zain Chemin Shanidar," but Zawi Chemi Shanidar. Second, there is not just one ^{14}C date for Zawi Chemi; a second confirming date, 10,600 ± 300 B.P. (*1*), was obtained from the Zawi Chemi occupation in Shanidar Cave. Third, we are puzzled about how the close association of sloth dung and an atlatl shaft in Gypsum Cave, Nevada (*2*), referred to by Berger and Protsch relates to the dating of the Zawi Chemi occupation at the type site. There are only two occupations at the latter site, an early one dating from the 9th millennium B.C. (on the basis of the ^{14}C dates) and a late one dated at around the 6th century A.D. on the basis of the associated "Christian Ware" pottery and a coin, minted in Constantinople (*3*).

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Breast or Bottle?

Nicholas Wade, in his report on bottle-feeding of babies (News and Comment, 5 Apr., p. 45), blames, not one, but two devils for luring mothers away from nursing their babies. These are the pediatrician and the commercial suppliers of milk products.

As one who practiced pediatrics during the peak of the bottle-feeding era (circa 1948) I cannot recall any pediatricians of that time claiming that the bottle was superior to the breast (this situation is changing now in view of the possible transmittance of a viral agent for breast cancer in mother's milk). It was my impression that the majority of new mothers insisted on the bottle mainly because they were unwilling to be fettered to a squalling infant 24 hours a day for a full postpartum year. Even among those who followed their doctors' recommendations and attempted nursing, many quit after a few days, complaining that their milk output was inadequate. Women were becoming liberated way back then, and it was widely felt that new fathers should share the nighttime and weekend feeding chores. I suspect that this feeling prevails today in the Third World. Industry, of course, was quick to meet the new demand. If Technology is a devil, we should recognize that it is the Faust in us who conjures him up.

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Wade's review of bottle-feeding and its tragic consequences in the underdeveloped nations was timely and valuable. However, it does not adequately cover what is perhaps the most important function of the breast, that of tiding the immunologically naive infant over until his own immune system is operative. Since the discovery of the transfer of antibodies from mother to offspring by Paul Ehrlich in 1892 (*1*), much information has been gained that clarifies this relationship. It seems that the immunity transferred via the ingestion of milk and colostrum is essential to mammals and that, in its absence, the young of all species will suffer from diarrhea caused principally by the pathogenic types of *Escherichia coli* and by various strains of *Staphylococcus*. The exceptions to this are infants raised in the very clean environment which obtains in highly developed countries and calves raised in areas where cattle have not been previously housed or pastured. Among the lower classes in Egypt, for example, the mortality rate of infants not breast-fed is extremely high compared with that of favored societies (*2*).

My colleagues, Petersen and Sarwar, and I have shown (*3*) that this relationship is complex and involves the immunization of lactating mammary gland to the pathogens in the infant's mouth (diathelic immunization) which can raise specific antibodies in the milk within 8 hours. The mammary gland is an exocrine reticuloendothelial organ which is "lend-leased" to the baby during the time when its own immune mechanisms are unable to function adequately. Widespread appreciation of these fundamental mechanisms as well as of the remarkable nutritive value of breast milk could save many lives around the world.

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Catching the Empiricists

Theorists in exercise physiology will have to run hard to catch the empiricists. Only the latter can supply an answer to Chenhall's query, If I run 3 miles in 24 minutes, how long will I take for a marathon? (Letters, 5 Apr., p. 9). The answer: about 4 hours and 12 minutes, assuming you avoid dehydration, injury, and prepare yourself for the feat by commencing progressively longer continuous runs at least 2 to 3 months before your attempt. The source of this extrapolated answer is a remarkable set of tables assembled by a pair of engineers-cum-runners, J. B. Gardner and J. G. Purdy. Their "Computerized running training programs" (*1*) are to serious runners with scientific pretensions (or should it be serious scientists with Olympic pretensions?) as the Bible is to a funda-

mentalist. What the myriads of tables in this version of the Good Book provide is information on the trade-off between speed, distance, and recovery times. The tables provide remarkably accurate predictions of performance. Consequently, the absence of much in the way of a theoretical underpinning is the more surprising. Fortunately, at least one stellar miler and cross-country runner (C. R. Taylor) appears to be devoting professional attention to these matters, even though he adopts an unorthodox style [see C. R. Taylor and V. J. Rowntree, "Running on two or on four legs: Which consumes more energy?" (12 Jan. 1973, p. 186)].

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Power, Fresh Water, and Food from the Sea

Othmer and Roels (12 Oct. 1973, p. 121) suggest a system by which the oceans would be used to provide electric power, desalinized water, and nutrients for mariculture. Power would be generated by operating a heat engine between the warm surface waters and the cold bottom waters of the ocean. The Othmer and Roels scheme makes use of steam, produced by flash vaporization of the warm surface waters, as the working fluid.

A major problem with this approach is that the low vapor pressure (25 to 30 mm-Hg) of steam at the water temperatures available at the ocean surface (25° to 30°C) necessitates the use of very large turbines. For a power plant producing 1 gigawatt (1 million kilowatts) of electrical power (the typical size of a modern plant) the total area of the nozzle throat at the inlet to the turbine must be of the order of 10^4 square meters. For a conventional power plant, the comparable area is about four orders of magnitude smaller.

Such low-pressure turbines of the size necessary for a 1-gigawatt plant have never been constructed. The use of many moderate-sized turbines would be prohibitively expensive. Although a smaller plant, such as the 7180-kilowatt (net) plant suggested by Othmer and Roels would require a smaller turbine, the turbine size would still be out of proportion to the plant capacity, and the quantity of power produced would be uninteresting by today's standards. Ting (*1*) has estimated that the turbine inlet pipe for such a plant would exceed 13 meters in diameter.

The problem of turbine size is considerably alleviated if a separate working fluid is employed in a closed cycle. Lavi and Zener (*2*) suggest ammonia, and Anderson and Anderson (*3*) suggest propane. A more suitable pressure profile in the available temperature range can thus be realized, permitting a reduction in the turbine size by two to three orders of magnitude. For large-scale power production from sea thermal gradients, it would appear that schemes employing a separate working fluid are the more realistic.

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A suspension bridge may be the best structure for crossing a particular stream; the advantages of a trestle bridge indicate it should be used over another. Then there are oranges which are squeezed, and prunes which are dried. Ammonia is a good thermodynamic fluid, propane another, each for particular conditions; and water has outstanding advantages for the system described in our article.

Whether bridges, fruits, or volatile liquids, individual methods are best for particular situations. A plant using water can be safe on shore rather than anchored far off at sea, where one part would be swept with the hurricanes that occur so often in tropic seas, a second part would be hundreds of meters below the surface, and a third part would be between these two. Cables on the ocean floor a kilometer below the surface would have to carry the *single* product, electric power, many kilometers to shore. Situations may exist where this is the only