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Tracing Steps of the Earliest Americans

In her article "Mother tongues trace steps of earliest Americans" (AAAS Meeting, 27 Feb., p. 1306), Ann Gibbons reviews linguistic evidence that the Americas were populated by humans long before the generally accepted date of roughly 11,000 years ago. She states that "Archaeologists trying to address that question [when did the ancestors of Monte Verde's inhabitants of 12,500 years ago first set foot in North America?] have come up empty-handed, as there are few reliably dated digs in America older than the Chilean site."

Digs are not the only way to obtain reliable data about antiquity. The steps of the earliest Americans have already been traced more directly by archaeologists Rogers (*1*) and Hayden (*2*), who derived their data from artifacts left along ancient trails and migratory routes in what are termed "fragile-pattern areas" (*3*), and their data demanded the same interpretation as given recently by the linguists: that the Americas were populated long before the dates accepted by the conventional view (*2*).

It is gratifying to note the self-correcting nature of science and the fact that at least one of the two authors (Hayden) whose analysis of footsteps originally challenged the conventional view was still alive to witness this correction (*4*).

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The Brain's Normal Function

The identification of new peptides acting in the lateral hypothalamus to modulate feeding behavior is intriguing (M. Barinaga, Research News, 20 Feb., p. 1134), but we would like to comment on the key issue of whether they "may be key to that brain area's normal function."

In the past 10 years, many different peptides have been identified within the brain acting on specific receptors to suppress or stimulate appetite. However, their critical role in determining feeding behavior is yet to be demonstrated. A clear example is represented by neuropeptide Y (NPY). This orexigenic peptide has been implicated in mediating food intake under normal conditions (*1*), as well as during illness (*2*). This thesis has been challenged by a recent report showing that mice genetically lacking the NPY gene have the same eating activity as controls, but are more susceptible to seizures (*3*). Thus, it appears that NPY is not essential for certain feeding activities, but is an important modulator of neuronal excitability. We therefore reason that NPY, and possibly the orexins, do not mediate feeding behavior per se, but possibly, or at least in part, because of their modulatory effects on brain neurotransmission (*4*). As a consequence, the study of the peptide-neurotransmitters (including serotonin and dopamine) interactions is the critical issue in better understanding of the mechanisms controlling feeding behavior under normal conditions and during illness.

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The Black Sea: A Freshwater Lake?

In his Research News article "Black Sea deluge may have helped spread farming" (20 Feb., p. 1132), Richard A. Kerr discusses a paper by W. Ryan and W. Pitman (*1*). According to these researchers, a spectacular flood event would have raised the freshwater Black "Sea" by some 150 meters in less than 3 years (15 centimeters per day) some 7500 years ago, when a sea-level rise caused the Mediterranean Sea to spill over the Bosporus into the Black Sea basin. Many Earth scientists and archaeologists seem to be reluctant to accept the fast rates of infilling on the one hand and their consequences on population migration on the other. The idea has another flaw, with regard to the saltiness of the Black "Lake" before and after the event. I wonder how Ryan and Pitman would explain their statements that the Black Sea was at the same time (before the flood): a freshwater lake; cut off from the Mediterranean; and at 150 meters below present-day sea level (that is, without any outflow).

To be a freshwater lake, the basin must have had an outflow somewhere (for example, southward into the then lower Mediterranean Sea); in this case, it could hardly have been at 150 meters below sea level. If the Black Sea basin was cut off from the Mediterranean Sea and if the lake level was lower than today, the only way it could have maintained that state would have been by evaporation. Then we should expect it to have been a salt lake or an inland sea, not freshwater.

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Response: The giant (more than 300,000 cubic kilometers) and deep (more than 2 kilometers) New Euxine freshwater lake in the ancient Black Sea is well attested by the assemblages of its infauna (mollusks, gastropods) and phytoplankton (diatoms and dinoflagellates), by its seabed porewater salinity, and by the isotopic composition of its calcareous sediment belonging to the lake phase of deposition more than 7500 years ago (calibrated), as summarized in our figure 3 and in the many citations contained in reference 1 of our original paper. This lake was a flow-through type basin (*2*) as recently as Meltwater Pulse 1 (13,500 to 12,500 years ago) of the global postglacial sea-level rise (3). Its total river input at peak glacial discharge has been estimated to have been 300 cubic kilometers per year (*4*). Beginning with the Younger Dryas return to near-glacial conditions (12,500 to 11,400 years ago), there was not only a marked episode of regional aridity throughout southwest Asia, but also meltwater that formerly reached the Black Sea as overflow of the Aral and Caspian seas became permanently diverted to the North and Arctic seas (5). A back-of-the-envelope calculation shows that if river discharge (with a maximum salinity of 0.5 parts per thousand) had continued at two-thirds of its previous discharge value (generous) for the next 5000 years without outlet at the Bosporus, the salinity of the lake would have increased only a little more

than three times that of the supplying river water. A slight rise of a few parts per thousand is actually accounted for by an observed modest increase in the ratio of oxygen-18 to oxygen-16 (−8 to −6 parts per thousand compared with the ratio for Standard Mean Ocean Water) measured on the carbonate mud from the basin floor (6) and on the shells of littoral New Euxine mollusks (*Dreissena rostriformis*) from the continental shelf (*1*). The negative isotopic ratios are strongly diagnostic of fresh to slightly brackish water (6). One also finds a spotty appearance of *Didacna morbunda* Andr. (*7*) in the paleo-shoreline deposits of the drawn-down lake then at more than 100 meters below today's sea level. Its presence has been attributed by a researcher other than ourselves (*2*) to a mild increase in alkalinity and possible "complete isolation." The pore-fluids of the preflood sediments indicate a salinity no higher than 3.5 parts per thousand (*8*), a value still potable for animals and humans. The rate of infilling mentioned by Kerr is no more spectacular than the rate of the draining of Lake Agassiz through the Clearwater spillway (*9*), around 9900 years ago (uncalibrated).

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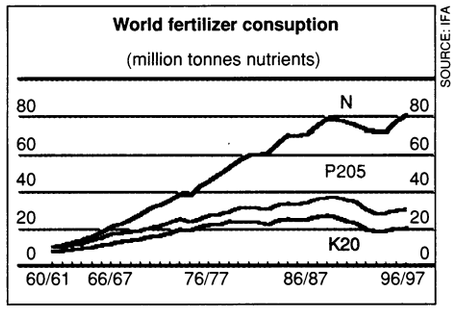
Fertilizer Use

In her article "Global nitrogen overload problem grows critical" (Research News, 13 Feb., p. 988), Anne Simon Moffat quotes Cornell University biogeochemist Robert Howarth as saying, "In recent years, the worldwide rate of fertilizer applications has risen exponentially...." She also cites Peter Vitousek *et al.* (*1*), who wrote, "[Nitrogen] fertilizer production has grown exponentially since the 1940s."



Data from the International Fertilizer Industry Association (*2*) (above) show that the increase in fertilizer use worldwide has been linear since 1960, peaking at about 80 million metric tons of nitrogen in 1990 and again in 1996-97.

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