money for Brücke. Brücke, in the meantime, after much delay and frustration, managed to get a visa to leave Nazi Austria once he had a bona fide offer of a position at Harvard that was conditional on Forbes securing the salary. Brücke arrived in the United States to resume his work just 2 weeks before the start of World War II.

It is well known that extraordinary acts of kindness, sacrifice, and what we label "humanity" occur during troubled times. This remarkable story (*4*), which is thoroughly documented in the Forbes archive (*5*), stands as a lasting testimony to Forbes' leadership and humanity and serves as an example for us all.

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4. An exhibition entitled "Escape from the Nazis: The Transatlantic Friendship of two Neuroscientists" (co-sponsored by Temple Shalom of Milton) celebrating the scientific contributions of and friendship between these two great neurophysiologists is currently showing (1 March through 31 May) at the Captain Forbes House Museum in Milton, MA.
5. At the Francis A. Countway Medical Library, Harvard Medical School, Boston, MA.

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Gray Whales in Cold Water

In their report "Thermoregulation in the mouths of feeding gray whales" (7 Nov., p. 1138), John E. Heyning and James G. Mead hypothesize that the special array of arteries and veins found in the tongue of baleen whales may act as a countercurrent heat exchanger. In such arrangements of arteries surrounded by veins, which occur in the appendages of some species, heat from the warmer arterial blood flows into the cooler venous blood that is returning to the core of the animal (*1*). Heat loss from distal tissues is limited because the blood arriving there is pre-cooled. Core temperature (and heat) is preserved because the blood arriving there is pre-heated (*2*). The temperature measurements presented in the report, however, do not demonstrate a counter-current heat exchanger function in this vascular array. There appear to be deficiencies in the report's method, results, and interpretations.

1) Method. Heat transfer from arteries to veins within a purported subdermal vascular heat exchanger (rete) can be demonstrated with measures of blood temperature in vessels proximal and distal to the rete (*3*), but not by, in this case, tongue surface temperatures. Such temperatures alone cannot even indicate the amount of heat flow between the tongue surface and its environment, which would have to be measured with heat flow disks or Peltier meters.

2) Results. Skin temperature data are omitted and a confusing presentation of results is made in the report. A brief sentence could have made the point that, during 1 min when the whale calf was suckling, the tongue surface temperature dropped 2 to 5°C, until it was about 0.5°C above the surrounding water temperature. Also, it is unknown whether the temperature of deeper tissues in the tongue declined, which is more relevant to the hypothesis.

3) Interpretation. Heyning and Mead incorrectly conclude (p. 1139) that "the drop in temperature on the surface of the tongue was a result of recirculation of heat back to the body core via a countercurrent heat exchanger." The fact that tongue temperature was initially well above (2.5° to 5.5°C) water temperature indicates that it contained significantly more heat than the water. The marked decline in the tongue surface temperature during 1 min of suckling indicates heat lost from the tongue. Such heat must be lost to the environment (including the water, feeding tube, or food), because countercurrent heat exchangers cannot gather and recirculate heat already present in tissues.

In sum, the data presented neither support nor refute the countercurrent heat exchanger hypothesis for the vascular array in the whale tongue. It remains a good hypothesis, and as such, is an admirable contribution.

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Response: We would like to address each point of criticism in turn.

1) Methods. The measurement of skin temperature relative to ambient temperature does provide a index of heat loss to the environment through conduction [for example, (*1*)]. In fact, the now popular technique of thermal imaging uses this concept to provide a graphically rich, albeit qualitative, depiction of relative heat loss. To quantify this heat loss, a device such as a heat flux transducer, as suggested by Heath, is required. We hoped to use such an apparatus, but the logistics of applying such a device onto the tongue of a free-swimming whale were overwhelming.

2) Results: With regard to skin temperature, the report states that the ambient water temperature was either 12.5° or 19.5°C. After feeding, the temperature of the whale's tongue was consistently 0.5°C above that of ambient temperature, and skin temperature ranged from 0.5° to 2.0°C above that of the tongue. Because of the qualitative nature of the data and the fact that the relationship of the body temperatures to ambient did not vary, these data were presented in relative terms.

3) Interpretation. Our results do show that the temperature of the tongue initially dropped while feeding, and we concur that this result represents an initial loss of heat across the tongue to the environment. If an extremity with a countercurrent heat exchanger is in a warm environment, the blood in that extremity will be warm and the countercurrent heat exchanger has little effect. This is the condition when the whale's mouth is closed and the oral cavity is surrounded by the insulating blubber of the head. When that extremity is exposed to a cold environment, however, the countercurrent heat exchanger cannot retain the heat already in the extremity, but it does serve to prevent further heat loss by recirculating heat (in blood on its way to the tongue) back to the body core. This is what happens when the whale opens its mouth to feed and exposes the warm tongue to the cold polar waters. Initially, the heat within the tongue is lost to the environment, but a continual heat loss is prevented by the countercurrent heat exchangers.

This prediction agrees with our temperature measurements. Theoretically, without these countercurrent heat exchangers, the highly vascular tongue should have registered surface temperatures far greater than ambient temperature, resulting in endless heat loss during feeding. The complex countercurrent heat exchangers in the tongue of the gray whale would seem to meet the thermal challenge that arises when the tongue is exposed to near-freezing water.

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Ring Laser Design

In relation to the article "Ring laser senses Earth's spin" by Alexander Hellemans (Research News, 5 Sept., p. 1435) about the C-II laser gyroscope, we note a letter by H. R. Bilger (3 Oct., p. 17), asserting sole authorship of the design of this ring laser. This is incorrect.

1) In particular, even the inaugural design document ("The C-11 design manual," August 1994), itself skeletal in places, had two authors, Hans Bilger and Ulrich Schreiber. Early input at this level by Schreiber in the design document and from experience operating a large ring laser in New Zealand is not adequately acknowledged in Bilger's letter.

2) Bilger's letter omits mention of the more detailed and lengthy design work for C-11 by the Carl Zeiss company in subsequent years. This was necessary to provide a substantial part of the novel applied technology and to make the instrument possible.

3) The setup and the conditions of operation have changed drastically over the last 15 months. Major modifications were made during the 8-month commissioning by Schreiber on site at Christchurch, New Zealand.

In summary, Bilger's letter underrates the contribution of others at all levels and ignores items 2 and 3.

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Corrections and Clarifications

■ The affiliation of Frederick Prete, the second author of the report "Visual input to the efferent control system of a fly's 'gyroscope' "by Wai Pang Chan *et al.* (10 Apr., p. 289) was given incorrectly. He is in the Department of Biological Sciences (not "Psychology") at DePaul University in Chicago, Illinois.

■ In the Meeting Brief "Clues to unsolved arsenic case" by Jocelyn Kaiser (20 Mar., p. 1850), the affiliation for Michael Waalkes should have been given as the National Cancer Institute.

Letters to the Editor

Letters may be submitted by e-mail (at science_letters@aaas.org), fax (202-789-4669), or regular mail (*Science*, 1200 New York Avenue, NW, Washington, DC 20005, USA). Letters are not routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for reasons of clarity or space. They may appear in print and/or on the World Wide Web. Letter writers are not consulted before publication.