

## SCIENCE'S COMPASS

dents a grasp of the core disciplines and their many connections.

As for Seaborg's letter, we certainly agree that a seamless 6-year science sequence (grades 6 to 11), with which, however, mathematics is fairly carefully woven, is an ideal. With an increase to 3 years of high school science in places like Chicago and New York City, Project ARISE (American Renaissance in Scientific Education) focused on grades 9 to 11, hoping eventually to add a fourth year in high school and to influence middle schools. Seaborg favors a disciplinary approach; so do we, although we put more emphasis on the value of interdisciplinary connections. Where we differ is in the sequence of courses. We favor an inverted order. It may be that 8th-grade chemistry and physics prepare children for 9th-grade biology, but if that is sound rationale, then why not continue the logic? Modern biology (as most of the textbooks we have seen agree on) rests on basic physics and chemistry, which are taught more rigorously to high school students than mid-level physical science. We have made a reasonably logical argument in favor of "moderate" reductionism that gives coherence to the scientific disciplines. We agree with Moore that, to make our case,

we need far more experience with a physics first sequence, in real schools with real teachers, than the few dozen schools we know about, successful as they are. Finally, we would love to listen to a debate between Moore and Seaborg!

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### 5200-Year-Old Acupuncture in Central Europe?

The Tyrolean Iceman (*1*), by far the oldest European mummified human body (5200 years old), shows 15 well-preserved tattoo groups on his back and legs, none of which appears to have ornamental importance. The tattoos have a simple linear geometric shape and are located on parts of the body that are not expected to be displayed (*2*). Moreover, several tattoos that would have entailed superficial skin puncture seem to be located on Chinese acupuncture points.

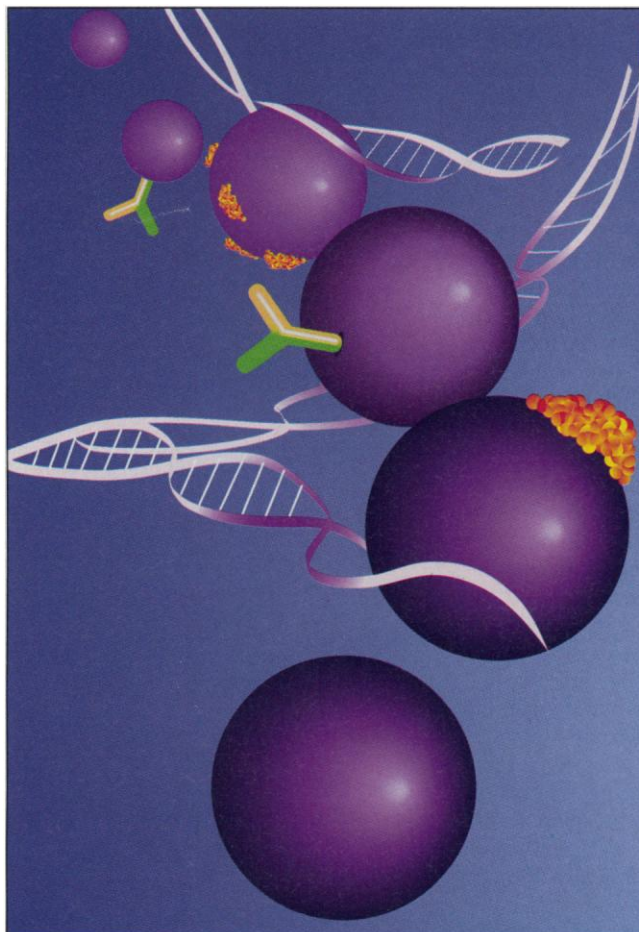
The tattoos were therefore investigated morphometrically, and photographs were subsequently overlaid by topographic representations of acupuncture points (*3*). Ac-

cording to the expert opinion of three accredited acupuncturists (*4*), nine of the 15 tattoos could be identified as being located on or within 5 millimeters of acupuncture points. Five tattoo groups on the back of the Iceman were located in close proximity, or directly over, acupuncture points of the urinary bladder (UB) channel. A close match between the acupuncture point UB 60 and one of the two tattoo crosses near the left, lateral ankle was observed.

The theory of acupuncture predicts that perforation or irritation of the skin at specific locations, the acupuncture points, results in modified function of related, not necessarily adjacent, organs, allowing relief of pain or inflammation.

It is known from computer tomography (*5*) that the iceman suffered from arthrosis of the lumbar spine. Acupuncture points used for treatment of this condition (*3*) coincide with tattoos found along the UB channel.

These findings raise the possibility that the practice of therapeutically intended acupuncture originated long before the medical tradition of ancient China (approximately 1000 B.C.) and that its geographical origins were Eurasian rather than East-Asian, consistent with far-reaching intercultural contacts of prehistoric mankind.



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### References and Notes

1. H. Seidler *et al.*, *Science*, **258**, 455 (1992); K. Spindler, *The Man in the Ice* (Weidenfeld & Nicolson, London, 1994).
2. T. Sjøvold *et al.*, in *Der Mann im Eis*, K. Spindler *et al.*, Eds (Springer, Vienna-New York, 1995), vol. 2, pp. 279–286.
3. Beijing, Shanghai, and Nanjing colleges of traditional Chinese medicine, *Essentials of Chinese Acupuncture* (Foreign Languages Press, Beijing, 1980).
4. F. Bahr, L. Dorfer, and S. Suwanda, presidents of the German, Austrian, and Swiss academies of acupuncture, respectively.
5. D. zur Nedden and K. Wicke, in *Der Mann im Eis*, F. Höpfel, W. Platzer, K. Spindler, Eds. (Univ. of Innsbruck, Innsbruck, Austria, 1992), vol. 1, pp. 131–148.

## Maternal Investment in Human Brain Growth

Regarding the energy requirements of the evolving human brain and maternal investment (A. Gibbons, "Solving the brain's energy crisis," *Research News*, 29 May, p. 1345), a well-nourished Western woman stores one-quarter of her body weight, about 16 kilograms, as fat, equivalent to 144,000 calories, by the time she completes her growth at age 18 (1). This caloric store is sufficient for a pregnancy to term (50,000 calories) (2) and about 3 months of lactation after birth (about 1000 calories a day) (3), a period of rapid brain growth. The most rapid fat storage occurs (4) during the years of the adolescent growth spurt up to menarche.

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### References

1. R. E. Frisch and J. W. McArthur, *Science* **185**, 949 (1974); R. E. Frisch, *ibid.* **199**, 22 (1978).
2. K. Emerson Jr., B. N. Saxena, E. L. Poindexter, *Obstet. Gynecol.* **40**, 786 (1972).
3. *Caloric Requirements* (Food and Agriculture Organization of the United Nations, Rome, 1957).
4. R. E. Frisch, *Biol. Rev.* **59**, 161 (1984).

## Typographical Error

We have identified a novel receptor-ligand interaction between the cytokine osteopontin and the homing receptor CD44 through studies of cells that stably expressed CD44 (Reports, 26 Jan. 1996, p. 509) (1). Recent

correspondence from several colleagues regarding the splice variants of CD44 that are necessary for this interaction has alerted us to a typographical error in footnote 17 of our original publication. The CD44 complementary DNA that was used for transfection contained exons 7–10 (not exons 7v–10v, as stated), which corresponds to splice variants 3–6 (3v–6v). Although our report did not address whether the standard form of CD44 (which lacks variant exons) also binds osteopontin, subsequent analyses suggest that this is not the case (2).

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### References

1. G. F. Weber, S. Ashkar, M. J. Glimcher, H. Cantor, *Science* **271**, 509 (1997).
2. S. Ashkar *et al.*, *Proc. Natl. Acad. Sci. U.S.A.*, in press.

## CORRECTIONS AND CLARIFICATIONS

Robert Service's 25 September News of the Week article "A biomolecule building block from vents" (p. 1936) incorrectly identified Robert Hazen as the lead author of the study that was described. Jay A. Brandes conceived and directed the investigation.

In Joseph Alper's article "Assembling the world's biggest library on your desktop" (*News Focus*, 18 Sept., p. 1784), Usama Fayyad and Susan Dumais should have been identified as senior researchers in the Decision Theory and Adaptive Systems group at Microsoft Research.

In the letter "Solution to a conservation problem?" (18 Sept., p. 1805), a co-author's name was inadvertently omitted. The name of William von Hippel in the Department of Psychology at Ohio State University, Columbus, OH 43210, USA, should also have appeared.

The ScienceScope piece "Societies leap Into California standards fray" (4 Sept., p. 1425) incorrectly stated that the American Astronomical Society (AAS) supported the Scientists' Standards Project, a group hoping to revise California's proposed science standards. Rather, in its own letter to the State Board of Education, the AAS's Astronomy Education Board urged "careful reconsideration" of the standards.

In the response to the letter "Populations as 'species-in-waiting'?" (26 June, p. 2031), the names of co-authors Gretchen Daily and Paul Ehrlich should have appeared (p. 2033) after the name of Jennifer Hughes. All are in the Department of Biological Sciences at Stanford University.

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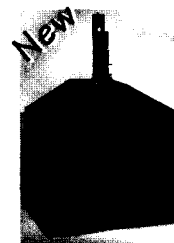


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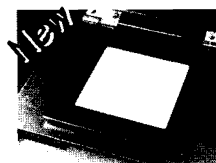
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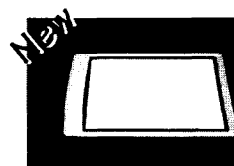
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