## Museum of Comparative Zoology: Expanded "Skeleton Staff"

In a news Briefing "Funding unsexy science" (25 Jan., p. 377), I was correctly quoted as referring to the "skeleton staff" of Harvard's Museum of Comparative Zoology. Unfortunately, this occurred near a mention of the recent drastic staff reductions at the British Museum of Natural History and the San Diego Museum of Natural History, giving the impression that the staff of the Museum of Comparative Zoology has been similarly trimmed. The opposite is the case. The Museum of Comparative Zoology has managed some expansion in staff despite the great difficulty in raising funds, and it is committed to further growth as opportunity allows. But like natural history museums everywhere, it is still sorely understaffed, given the now obvious needs and opportunities of systematic biology.

EDWARD O. WILSON
*Museum of Comparative Zoology,*
*Harvard University,*
*Cambridge, MA 02138*

## IQ and Heredity

T. J. Bouchard *et al.* (Articles, 12 Oct., p. 223) use the IQ score correlation of one-egg (monozygotic) twins reared apart (MZA twins), which was about 0.7 in their recent study and in three previous studies by others, as an estimate of IQ heritability in the population at large. Bouchard *et al.* assumed "no environmental similarity" for co-twins. But the previous studies, each of book length, warned *against* such an extrapolation (*1, 2*), as did the two most thorough reviews of previous MZA data (*3*). In the main previous MZA study in the United States (*1,* pp. 337–343), Stanford-Binet score differences within twin pairs correlated 0.79 with rated differences in educational environment, most of which were small; some pairs had even gone to the same school. Bouchard *et al.* cite neither review and do not report on educational environments.

Correlations for twins in related environments may result from gene-environment interaction (*4*) as well as from purely genetic (or purely environmental) effects. Above-average mean IQs (around 110) and smaller than average variances for IQ in adoption studies (*5*) indicate that adoptive homes make similarly positive contributions to IQ scores (*6*), not that homes in general make small contributions.

RICHARD M. DUDLEY
*Department of Mathematics,*
*Massachusetts Institute of Technology,*
*Cambridge, MA 02139*

REFERENCES

1. H. H. Newman, F. N. Freeman, K. J. Holzinger, *Twins: A Study of Heredity and Environment* (Univ. of Chicago Press, Chicago, IL, 1937), p. 362.
2. J. Shields, *Monozygotic Twins* (Oxford Univ. Press, London, 1962), p. 53; N. Juel-Nielsen, *Individual and Environment* (International Univ. Press, New York, ed. 2, 1980), p. 13.
3. L. J. Kamin, *The Science and Politics of IQ* (Erlbaum, Potomac, MD, 1974), pp. 33–71; S. L. Farber, *Identical Twins Reared Apart* (Basic Books, New York, 1981), pp. 30–32.
4. H. L. Le Roy, in *Biometrical Genetics,* O. Kempthorne, Ed. (Pergamon, New York, 1960), p. 107; R. Plomin, J. C. DeFries, J. C. Loehlin, *Psychol. Bull.* **84**, 309 (1977); R. M. Dudley, *Behav. Brain Sci.* **13**, 132 (1990).
5. M. Skodak and H. M. Skeels, *J. Genetic Psychol.* **75**, 85 (1949); S. Scarr and R. A. Weinberg, *Am. Psychol.* **31**, 726 (1976); S. Scarr and R. A. Weinberg, *Am. Social. Rev.* **43**, 674 (1978); *Race, Social Class, and Individual Differences in IQ,* S. Scarr, Ed. (Erlbaum, Hillsdale, NJ, 1981); M. Schiff *et al.*, *Science* **200**, 1503 (1978); J. M. Horn, J. C. Loehlin, L. Willerman, *Behav. Genet.* **9**, 177 (1979).
6. R. M. Dudley, *Behav. Brain Sci.*, in press.

Bouchard *et al.* purport to show that several psychological traits are highly heritable and, therefore, genetic in origin. They go beyond past hereditarian claims in this field and contend that there is a large genetic basis not only for IQ but for myriad traits such as religiosity, temperament, and vocational and leisure-time interests. Some of their data, however, have not been published in a format that permits independent scrutiny. Investigators in this field should indicate the precise nature of being "reared apart," including, for example, whether it involved only being raised in separate households within the same community. They should also consider the nature of particular adoptions, for example, whether they were made by relatives of the biological parents or friends. In the case of adoptions mediated by welfare organizations, investigators should indicate the criteria by which potential adoptive parents were chosen. Moreover, they should consider the reliability of answers given by identical twins who may be under social pressure to appear to be similar. The fact that data were collected only from the relatively few twins who came forward might also bias the data.

Given these potential problems in assessing the impact of the environment on twins, it is imperative that case studies be fully published. In 12 years, the Minnesota group have not provided these case studies, and the two apparently relevant articles cited by Bouchard *et al.* (*1*) contain no case studies.

JONATHAN BECKWITH
*Department of Microbiology and Molecular Genetics,*
*Harvard Medical School,*
*200 Longwood Avenue,*
*Boston, MA 02115*
LISA GELLER
*Department of Neurobiology,*
*Harvard Medical School*
*Boston, MA 02115*
SAHOTRA SARKAR
*Theoretical Biology Group,*
*Boston Center for the Philosophy and History of Science,*
*745 Commonwealth Avenue,*
*Boston, MA 02215*

REFERENCES

1. T. J. Bouchard, Jr., N. L. Segal, D. T. Lykken, *Acta Genet. Med. Gemellol.* **39**, 193 (1990); D. T. Lykken, T. J. Bouchard, Jr., M. McGue, A. Tellegan, *ibid.*, p. 35.

*Response*: Dudley questions how far one can generalize from studies of IQ heritability in separated monozygotic (MZA) twins to the general population. He cites the authors of the three original studies of twins reared apart, each of whom had reservations about generalizability, as well as reviews by L. J. Kamin and S. L. Farber.

We believe we carefully qualified our findings.

> Since only a few of these MZA twins were reared in real poverty or by illiterate parents and none were retarded, this heritability estimate should not be extrapolated to the extremes of environmental disadvantage still encountered in society...these findings do not imply that traits like IQ cannot be enhanced....[the] present findings, therefore, do not define or limit what might be conceivably achieved in an optimal environment.

Critical comments about the reviews cited by Dudley have been published elsewhere by a member of our research team (*1*).

We are aware of the reported correlation (0.79) between Stanford-Binet IQ score differences and rated differences in the educational environment for MZA twins in the study by H. H. Newman *et al.* (*2*). This correlation is, however, only indirectly related to the heritability of IQ. It is the correlation between a measured environmental feature and the variance in IQ *not accounted for by genetic factors* (differences in IQ between MZA twins must be environmental in origin). The higher scoring twin, on average, received more education. This does not mean that education is responsible for the difference in IQ. The direction of causation may be the reverse. The heritability of IQ in a sample such as ours could be high, and the correlation between co-twin difference in IQ