Fetal Mortality and Sex Ratio

McMillen (*1*) may be correct in "conservatively" estimating the primary ratio of human male to female conceptuses to be at least (Y_1:100 =) 120:100, but the argument she presents shows only the consistency of that range of ratio values with certain selected empirical data.

Since the quantity of interest is y_1, the proportion of males at conception [or equivalently $Y_1 = 100\ y_1/(1 - y_1)$], the analysis is much simplified by solving the equation of her reference 14 for y_1 [d defined below, the other variables as in (*1*)]:

$$y_1 = y_2\,(1 - f)/[d(y_2 - 1) - f + 1]$$

where f = proportional female zygote loss, "reported" to be between 0.2 and 0.5; $d = m - f$ = excess male-over-female mortality ratio, "observed" to be between .04 and .18; y_2 = the proportion of live-borns that are male, the male secondary sex proportion, observed to be between .5115 and .5131 for the later (1950 to 1972) of two sets of data used in her analysis. With this equation for y_1, the cited ranges of f, d, y_2, and the definition of Y_1, we obtain Y_1 values between 110 and 165; this range is quite close to the previous estimates, 110 to 170, that McMillen cites in her first paragraph. Thus she has not succeeded in reducing the range of uncertainty regarding the primary sex ratio.

JOHN T. LOWRY
Improved Pregnancy Outcome Project, Texas Department of Health, Austin 78756

References

1. M. M. McMillen, *Science* **204**, 89 (1979).

14 May 1979

McMillen's (*1*) study of fetal mortality and her estimate of fetal sex ratio serve as a reminder of the difficulty of obtaining accurate data on the sex of aborted fetuses. The tables she has used for fetal mortality (*2*) are compiled from fetal death certificates and are inevitably fraught with uncertainty. On these certificates sex is recorded on the basis of morphological criteria, which are notoriously unreliable, especially as early as 3 months of gestation; and throughout gestation these criteria will give inaccurate or ambiguous indications of sex when external genitalia are abnormal. Many of the tables (*2*) report large numbers of fetuses of unknown sex, and it cannot even be certain that those classed as males and females are what they seem to be. Cases of polyploidy and sex chromosome aneuploidy, such as Turner's (XO) and Klinefelter's (XXY) syndromes, which lack the normal sex chromosome constitution, should be eliminated from a rigorous study of fetal sex ratio. But there is no way of knowing how they have been classified in these tables.

It seems unlikely that such uncertainty will be overcome until first-hand data on fetal mortality are available from a systematic study of the karyotypes of spontaneous and induced abortions, examined by modern staining techniques. Although there have been several large-scale studies along these lines, the published reports (*3, 4*) are inadequate for a confident count of sex ratio. Because the major purpose of these studies was usually to look for abnormal karyotypes, only one report (*4*) gives full details of the rest of the population studied, and information about gestational age is sparse. The data on which credible values for fetal sex ratio can be based are not likely to emerge from the archives: they have yet to be published.

MARY LINDLEY
Nature, *4 Little Essex Street, London WC2R 3LF, England*
BARBARA R. MIGEON
Department of Pediatrics, Johns Hopkins University School of Medicine, Baltimore, Maryland 21205

References

1. M. M. McMillen, *Science* **204**, 89 (1979).
2. *Vital Statistics of the U.S.*, vol. 2, part A, *Mortality* (Government Printing Office, Washington, D.C., 1922 to 1936 and 1950 to 1972).
3. M. Yamamoto, R. Fujimori, T. Ito, K. Kamimura, G. Watanabe, *Humangenetik* **29**, 9 (1975); T. J. Hassold, A. Matsuyama, I. M. Newlands, J. S. Matsuura, P. A. Jacobs, B. Manuel, J. Tsuei, *Ann. Hum. Genet.* **41**, 443 (1978); M. R. Creasy, J. R. Crolla, E. D. Alberman, *Hum. Genet.* **31**, 177 (1976); T. Kajii, K. Ohama, N. Niikawa, A. Ferrier, S. Avirachan, *J. Hum. Genet.* **25**, 539 (1973).
4. J. G. Lauritsen, *Acta Obstet. Gynecol. Scand. Suppl.* **52** (1976).

16 May 1979

A Terminal Mesozoic Greenhouse

McLean (*1*) has postulated a significant global warming trend during late Maastrichtian time; this warming trend, he suggests, led to wide-scale extinctions of terrestrial faunas and marine plankton. We question two aspects of McLean's argument.

First, McLean (*1*) cites Voight's (*2*) data on the distribution of rudistids and other marine invertebrates as evidence for a "cool early Maestrichtian [sic] with subsequent warming in late Maestrichtian." Polšak (*3*) used $^{16}O/^{18}O$ ratios to determine water temperatures from 139 Cretaceous limestone (41) and fossil (98) samples from the Dinarids and Slovenian Alps. Paleotemperatures obtained in this work are shown in Table 1. These data show that in the Tethyian seaway, water temperatures were highest in Santonian to late Campanian time, *declined* slightly during late Campanian through middle Maastrichtian time, and *declined* by 5°C during late Maastrichtian time.

Table 1. Paleotemperature of Tethyian sea (*3*); B.P., before present.

Geologic age	Water temperature (°C)	Approximate age (10^6 years B.P.)
Late Maastrichtian	18.5	
		67
Late Campanian–middle Maastrichtian	23.5	
		77.5
Santonian–late Campanian	25	
		80
Coniacian	23.5	
		85
Late Turonian	24	
Early Turonian	16	
		90
Cenomanian	21	
		100
Albian	16	
		105
Aptian	14.5	
		118
Barremian	16.5	
		122
Neocomian	13.5	

Second, McLean (*1*) states, "Warming of the earth's surface would warm the oceans. As the water warms, the solubility of CO_2 decreases and it is driven from the oceans into the atmosphere."

McLean considers only one factor, the other being precipitation of calcium carbonate when the saturation value of CO_2 is exceeded in warmed waters. The exact balance between precipitation and loss to the atmosphere is not now precisely known. However, it has been shown (*4*) that degassing of CO_2 is accompanied by precipitation of carbonate in modern marine environments. Hence, precipitation of large volumes of calcium carbonate would be expected to have accompanied McLean's Maastrichtian warming. Further, these large quantities of readily available calcium carbonate would not have caused solution of the calcareous shells of marine protists. Had warming occurred, we would expect the late Maastrichtian distribution of such protists to be geographically enhanced, and that the abundance of these fossils would have been significantly increased. Polšak (*3*) also shows this relationship with reference to the stenothermal rudists.

0036-8075/79/1221-1428$00.50/0