ESTIMATION OF THE INBREEDING COEFFICIENT FROM ABO BLOOD-GROUP PHENOTYPE FREQUENCIES

To The Editor: The confusing, not to say confused, discussion of the above topic [1–5] may be enlightened by the simple expedient of sketching the log-likelihood or support [6] surface (fig. 1). If we limit the region of interest to $0 \leq p,q,r,F \leq 1$, it may be represented as an equilateral prism, since $p + q + r = 1$. We expect that on data from an inbred population there will be a maximum of the support at the point given ex-

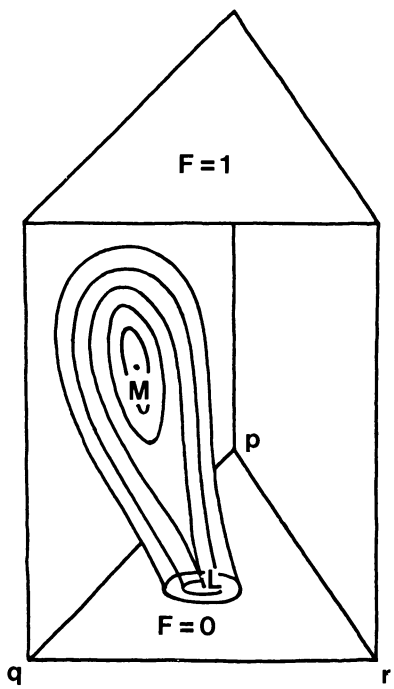

FIG. 1

plicitly by Schull and Ito [3], which we may represent by a point M surrounded by closed surfaces of constant support, approximately ellipsoidal near M. We know that on the plane $F = 0$ there is the usual maximum-likelihood point L for the ABO gene frequencies without inbreeding, surrounded by curves of constant support, approximately elliptical near L. We may guess that at other planes of constant F there are similar curves also devoid of singularities.

We also know [1] that on the plane $F = 0$, a linear relation holds in the scores for p, q, and F: $2U_F + pU_p + qU_q = 0$. This means that the support is constant in the direction $(2,p,q)$, to first order, and defines the angles in which the "bulbs" of constant support intercept $F = 0$. At the maximum-likelihood point L in this plane, U_p and U_q are, of course, zero, so that U_F must be zero as well. Thus the bulb of constant support equal to the support at L has an infinitely thin neck at L, which is

therefore a singular point; in whichever direction one leaves L, the log-likelihood decreases, unless one goes precisely in the direction $(2,\hat{p},\hat{q},)$ where $\hat{p}$ and $\hat{q}$ are the conditional maximum-likelihood estimates at $F = 0$.

The fact that the support is bulb-shaped makes for less of a difference in support between M and L than would otherwise be the case, but apart from this the singularity and the relative uninformativeness of the system about F seem to be rather separate issues.

A. W. F. EDWARDS
Gonville and Caius College
Cambridge, England

REFERENCES

1. YASUDA N: Estimation of the inbreeding coefficient from phenotype frequencies by a method of maximum likelihood scoring. *Biometrics* 24:915–935, 1968
2. YASUDA N: Estimation of the inbreeding coefficient from ABO blood group gene frequencies. *Amer J Hum Genet* 22:111, 1970
3. SCHULL WJ, ITO PK: A note on the estimation of the ABO gene frequencies and the coefficient of inbreeding. *Amer J Hum Genet* 21:168–170, 1969
4. SCHULL WJ, ITO PK: Estimation of the inbreeding coefficient from ABO blood group gene frequencies. *Amer J Hum Genet* 22:113–114, 1970
5. YEE S, MORTON NE: Estimation of the inbreeding coefficient from ABO blood group gene frequencies. *Amer J Hum Genet* 22:111–113, 1970
6. EDWARDS AWF: Statistical methods in scientific inference. *Nature* 222:1233–1237, 1969

New Journal in Medical Genetics

The first issue of a new journal entitled *Clinical Genetics*, published by Munksgaard and edited by three Scandinavian medical geneticists, Drs. Berg, Böök, and Mohr, has appeared. The editors feel that the important implications of medical genetics for the practice of medicine are often neglected. The new journal is to foster the interrelationship of genetics and clinical medicine. The first issue has a comprehensive article dealing with new concepts on human sex chromosomes as well as more specific articles on biochemical and cellular genetics. Further issues of the journal will be looked forward to with interest.