Macaque "Semispecies"

A recent report by Goodman *et al.* (*1*) presents interesting data on individual variation of serum transferrins in macaques. In this article statements previously published by me (*2*) have been misconstrued to support a taxonomically revolutionary hypothesis to which I do not subscribe. On the basis primarily of their findings for crab-eating macaques, "*M. irus*," and stump-tailed macaques, "*M. speciosa*," the authors suggest that taxonomic subdivisions of the genus *Macaca* should be regarded as "semispecies rather than complete species." The crab-eating macaques and stump-tailed macaques discussed by the authors occur together with pig-tailed macaques in large areas of southeast Asia without showing the slightest evidence of intergradation or interbreeding. There is no basis for regarding these three sympatric kinds of macaques as representatives of anything but three distinct species. The term "semispecies" proposed by Mayr (*3*) is explicitly defined to apply only to allopatric forms, not to sympatric forms. My remarks (*2*, p. 364) on known and probable intergradation of allopatric forms of macaques also have been misapplied to sympatric forms; this distortion results from the authors' paraphrased citation of my words "another enlarged species" as "an enlarged species" (*1*, p. 886). Transferrin phenotypes discussed by the authors appear to vary individually within and between species; such individual variables are irrelevant in species determination.

Information presented by the authors on the geographic source of their specimens also appears to require correction. In their map (*1*, Fig. 2), sources of two of seven groups of specimens are indicated outside the known range of the race or species to which the specimens belong; crab-eating macaques are not known from northeastern Burma (circle no. 5), and stump-tailed macaques are not known from west of the Bay of Bengal (circle no. 6).

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References

1. M. Goodman, A. Kulkarni, E. Poulik, E. Reklys, *Science* **147**, 884 (1965).
2. J. Fooden, *ibid.* **143**, 363 (1964).
3. E. Mayr, *Animal Species and Evolution* (Belknap, Cambridge, Mass., 1963), p. 501.

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Because of the smallness of the map in our Fig. 2, only an approximation of geographic locations was attempted. Group 5 is not meant to be from northeastern Burma any more than groups 4 and 3 are meant to be from the ocean. The legend to Fig. 2 and the information on geographic sources in Table 1 make it clear that group 5 (*M. irus*, Mainland) was from Thailand, Viet Nam, and Malaya. The only information we have about group 6 (*M. speciosa*, India) is that the monkeys in this particular group were always imported from India.

In support of our suggestion that it may be helpful to look upon the genus *Macaca* as a monophyletic assemblage of "semispecies," we wish to emphasize the possibility that the sympatry of several of the distinct species of macaques is a secondary sympatry of former geographic races—in other words, that the degree of speciation had progressed far enough in these former geographic races so that on secondary contact with each other they could interbreed only to a limited extent, even after extensive geographic overlap, rather than freely as would be the case with conspecific populations or races of a single species. We believe (perhaps erroneously) that the term "semispecies" as recently described by Mayr (pp. 118, 455, 501) appropriately designates the species groups in such a situation. Since the term "semispecies" is not a designation of formal taxonomic rank, the suggestion that the species groups of macaques are an assemblage of semispecies does not in itself call for any revision of the current taxonomic classification of macaques.

We doubt that Fooden has the evidence to rule out the view that a limited degree of gene exchange or introgression is possible between sympatric macaque groups such as *M. irus* and *M. speciosa*, or *M. irus* and *M. nemestrina*, in their zones of geographic overlap. If we now have a correct understanding of the concluding remarks in his report, he believes his preliminary studies indicate that *M. nemestrina* and *M. assamensis* (and perhaps some other macaque groups?) may intergrade to constitute an enlarged species which is distinct from the enlarged species group he would create consisting of *M. mulatta, M. fascicularis* (*irus*), and perhaps some other currently recognized macaque species. However, a not uncommon view among students of the primates is that *M. assamensis* (along with *M. cyclopis*) is closely allied to *M. mulatta*. There are probably other conflicting opinions on the phyletic relationships of different macaques. It is our position that biochemical and serological data on the polymorphic forms of macromolecules can help determine the actual genetic affinities which exist among the various populations within the genus *Macaca*. Admittedly, many genic alleles which are common to more than one lineage of macaques have resulted from either parallel mutations or from the retention in these lineages of alleles which were present in the common ancestral population. Nevertheless, a well-designed survey of the distribution of genic alleles in natural macaque populations throughout their geographic ranges would certainly shed some light on whether or not gene exchange has occurred among different macaque groups. We hope our article has indicated that it would be important to study geographic variations in the polymorphism of transferrin in such a survey.

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Primate Blood Groups and Evolution

In "Organisms and molecules in evolution" (*1*), G. G. Simpson discusses some reservations concerning the validity of comparing molecular and organismal data in order to elucidate phylogenetic relationships. In studies of primates, the basis of such a comparison could be broadened by making use of data on blood groups of man, apes, and monkeys. The considerable amount of information along these lines available since the work of Landsteiner and Miller (*2*) and, later on, of Wiener (*3*) has recently been greatly augmented by the introduction of new techniques of blood grouping and as a result of the greater accessibility of apes and monkeys in the newly created Regional Primate Research Centers. The present data on primate blood groups permit comparative studies in an area which, because of its early development and clinical importance, has the additional advantage of having been thoroughly investigated in man. The techniques applied are those of hemagglutination, known to be more sensitive than precipitation methods and more