those parents who want information on the sex chromosomes of their infants are entitled to have it and the investigators must be entitled to provide it for them.

WAYNE H. DAVIS
School of Biological Sciences, University of Kentucky, Lexington 40506, and *Free Speech Committee, Kentucky Civil Liberties Union, 134 Breckenridge Lane, Louisville 40207*

The controversy over the ethics of identification and study of individuals of XYY karyotype is an example of our fascination for the exotic problems to the neglect of common but more serious genetic conditions, such as the XY karyotype that afflicts roughly half of the human race, including the writer.

Overwhelming statistical evidence indicates that the XY karyotype is associated with major social problems such as violent crime and war. If we are to provide medical and psychiatric assistance to XYY individuals, let us not neglect the XY's, who in aggregate present a much greater problem for the community.

MICHAEL MAGE
Laboratory of Biochemistry, National Cancer Institute, Bethesda, Maryland 20014

Protein Production

For a considerable amount of time we have been reading about the world food shortage and how the United States could be of assistance in solving the problem. Most often our agricultural methods of protein production are under attack. It has been stated that feeding grain to animals is an inefficient and wasteful means of raising protein. Moreover, it has been repeatedly expressed that we should raise more cereal for export and less for feedlot purposes. Rothschild (Letters, 6 Dec. 1974, p. 870) repeats these concepts.

Most statements regarding the conversion of grain to animal protein seem to be the result of armchair opinion, with little mention of where the protein that is responsible for our high standard of living should come from. One can only surmise that, instead of grain feeding, one would have to resort to grazing. However, the crux of the matter is overlooked. The amount of grain raised on 1 acre will feed six to eight times as many cattle as would 1 acre of grass in most places in the United States. In fact, on the intermountain plain and the high plateaus of the West, this ratio would be even higher. In addition, it takes nearly twice the amount of time to bring a calf to market weight when it is fed grass than when it is fed grain.

These are the economics of cattle raising and explain why animal protein is reasonable in price and available to most American households. Raising cattle on grass would not only increase the production cost, but would also reduce the available supply. This would result in greater price being demanded for animal protein that would be of poorer quality. Paradoxically, Rothschild's own "oxen" would be gored, and not those of the agricultural producer.

It is high time that the proposal that we not raise cattle in the feedlot be discarded as a false illusion and an unrealistic approach to solving the food shortage. Agriculture in the United States has proved to be the most efficient in the world; reverting to methods of the turn of the century will not solve the problem of hunger. A good point to consider is that a U.S. farmer can feed 61 people with his modern advanced methods, while a farmer in the Soviet Union can only feed 7 people. I agree that better education of the public with regard to nutrition is an aimable goal that deserves consideration, but also the adoption of successful U.S. agricultural methods should be seriously considered by other governments.

I know of no way other than by consuming animal protein that humans can obtain the amino acids they need, short of eating a large variety of cereals and legumes. There is simply not enough tillable land to meet this need. Only by producing sufficient animal protein can the world standard of living be raised and adequate nutrition supplied.

HORST KEHL
Route 4, Kirksville, Missouri 63501

Computer-Assisted Education

In her reply to Zelby's letter, Ruth M. Davis (Letters, 13 Dec. 1974, p. 975) says, "when computers . . . hold the questions, record the answers . . . [t]hen the real, comforting interactions can be between people." Indeed, but if the computer holds the questions, and the student is only exposed to the questions held by the computer, then a

valuable part of the educational process has been lost. I cannot argue against the utility of the computer in education to help convey more information in less time. The transmission of facts and their storage in student memory is a part of the educational process, but the development of judgment must be included if the process is to have its highest value. Since computers are finite machines, and programs for their use are even more limited, it is unlikely that programs that go substantially beyond the purveyance of facts will be numerous. Rational strategies for dealing with the anomalous, the unexpected, and the "variant normal" are what we hope our students will develop. I fear that, when the computers hold the questions, the immediate question suggested by material the student is working on—highly individual material, since specimens are never strictly "normal," whatever normal is—will never be asked. The unforeseen cannot be taken into account at the time it occurs if computers are entrusted with too large a share of course control. I plead strongly for a restriction of computer-assisted education to exactly that: computer assistance, not computer operation. It is my strong impression that canned courses are being delivered into the memory banks of machines, and that students are thereby being deprived of the chance to develop mature judgment along with their store of facts because instructors are out of sight and removed from participation in the learning process. When it is left too wholly to the machine, machine teaching tends to be a low-common-denominator style of hack work.

THOMAS W. EASTON
Department of Anatomy,
College of Medicine,
University of Iowa, Iowa City 52242

Preclinical Medical Education

I agree with John C. Rose (20 Sept. 1974, p. 1022) in his concern over the possible fate of the preclinical departments in medical schools, but I disagree with many of his conclusions.

There can be no doubt that preclinical education can be best served by a faculty whose members are good teachers, experts in their discipline, and who have a fair knowledge of the clinical significance of their discipline. However, I believe that the medical research being performed in preclinical departments must be considered as important as the teaching. While the present of medicine is in the clinic, the future still lies in the research laboratory.

Unfortunately, an M.D. has received no training in teaching or research, nor is he qualified as an expert in any discipline. Equally unfortunately, I recognize the widespread existence of the preclinical faculty member who has a Ph.D. degree but little knowledge of the medical significance of what he is expected to teach, even though his degree has provided him with training in both teaching and research.

It is my opinion that the Ph.D. can much more readily acquire the limited medical knowledge necessary for teaching than can the M.D. acquire the training necessary for teaching and research. I therefore recommend that the Ph.D. faculty member make use of some of the clinical teaching in his medical school and attend courses in pathology, pharmacology, and perhaps an introductory course in medicine. It would behoove the medical school's administration to provide some worthwhile incentives for such a plan, as it would not only improve the effectiveness of preclinical teaching, but would also improve the significance of preclinical research.

LARRY K. STEINRAUF
Department of Biochemistry,
Indiana University School of Medicine,
Indianapolis 46202

Steinrauf makes this an "all-or-nothing" proposition. It is not. My point (and that of the British preclinical department chairmen) is that *both* M.D. and Ph.D faculty members are needed to fulfill well the educational objectives of the medical school.

The M.D. degree does not confer an inability to teach or investigate. Full-time M.D. faculty members, and especially those in preclinical departments, have served as postdoctoral research fellows. Were Steinrauf to wander among the other departments of his school, he would find clinicians doing basic research.

What "incentives" could medical school administrations provide to get Ph.D. faculty members to attend clinically oriented courses? Even were this device feasible, it would result in a thin icing, perhaps enough to keep the teachers a few months ahead of the students. It would be better, by far, to foster an appropriate mix in preclinical departments of M.D. and Ph.D. faculty members who talk to each other and who work together on curriculum and in the laboratory. (The "significance" of the research done in such a setting will be related more to talent than to degrees.)

JOHN C. ROSE
Department of Physiology and Biophysics, School of Medicine, School of Dentistry, Georgetown University, Washington, D.C. 20007

Biochemistry Registry

The American Society of Biological Chemists has established a computerized Registry of Women and Minority Group Biochemists that includes Ph.D.'s with all levels of experience. It is hoped that this registry will aid women and minority group biochemists and simultaneously help chairmen of departments and other administrators find qualified individuals from these groups to consider for job vacancies and appointments to advisory groups.

Eligible individuals can obtain curriculum vitae forms from Registry-Forms, American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Maryland 20014. Some of the items on the completed forms are computerized and the remainder are filed. We would like eligible individuals to fill out a form even if they are not looking for a job. Those who are not considering leaving their current job can indicate this preference on the form; however, they might be interested in serving on a committee, editorial board, or in holding a similar honorific post.

Employers and administrators can use the registry to obtain the curriculum vitae of individuals with certain specifications. For instance, a department chairman seeking to hire an associate professor with a minimum of 10 years experience who is working on the replication of animal viruses could be sent the curriculum vitae of those who qualify. Detailed information on the use of the registry is available from Biochemistry Registry, c/o Information Engineering, 3401 Market Street, Philadelphia, Pennsylvania 19104.

LORETTA LEIVE
Committee on Women in Biochemistry, American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Maryland 20014