Letters

Sex Chromatin

In a recent article (*1*), I favored the view that the sex chromatin represents heterochromatic regions of the two X chromosomes of female cells. The assumption of somatic pairing of the X chromosomes is an unsatisfactory aspect of this hypothesis. Somatic pairing of chromosomes is well known in many species of insects and has been described in the newt and frog (*2*). But evidence for such a relationship between the X chromosomes or other homologous chromosomes in somatic cells of mammals is admittedly scanty and inconclusive. For example, Ohno *et al.* (*3*) found evidence in the mouse for somatic association of the X chromosomes in epithelial cells of ovarian follicles and the mammary gland, but not in other types of cells that were examined. A possible way out of the dilemma is suggested by two important observations that have come to my attention. They demonstrate, at any rate, that the precise relationship between the sex chromatin and chromosomes is an unsolved problem that challenges the resources of cytologists.

Kosin and Ishizaki (*4*) showed that the presence of sex chromatin in somatic-cell nuclei is a female characteristic in the domestic chicken. Since the female is here the heterogametic sex, the sex chromatin cannot in this instance be a derivative of homologous sex chromosomes. Further, it is stated that the sex-chromatin complex for the female chicken is ZO (*5*). It seems, on this basis, that the sex chromatin in fowl is a derivative of the single Z chromosome, unless it bears no direct relationship to the sex-chromosome complex.

Related to the foregoing observation is the study by Ohno *et al.* (*6*) on nuclei of regenerating liver in the rat. A distinctive chromocenter was seen in interphase nuclei of females but not of males. In prophase nuclei, neither the X nor the Y chromosome of the male seemed to demonstrate positive heteropycnosis. But in prophase nuclei of females the surprising observation was made that one X chromosome was positively heteropycnotic while the other X chromosome was isopycnotic with respect to the autosomes. Ohno and his collaborators suggest that the positively heterochromatic X chromosome may be of paternal origin. It was folded back on itself in early prophase nuclei; this could explain the occasional clearly bipartite appearance of the sex chromatin. Ishizaki (*7*) states that a bipartite structure has also been detected in the sex chromatin of the chicken.

Confirmation of this work, and particularly its extension to the nuclei of man, would be of first importance in interpretation of the chromatin pattern and sex-chromosome constitution of patients with anomalies of sex development. Exact knowledge of the basis of nuclear sexual dimorphism is also needed for an explanation of the female chromatin pattern that is found in some teratomas in male hosts (*8*). We are now passing from the descriptive to the more difficult analytical phase in the study of the sex chromatin. The work of cytogeneticists and students of chromosome morphology is likely to play a decisive role in establishing the basis of sexual dimorphism in interphase nuclei.

MURRAY L. BARR
Department of Microscopic Anatomy, University of Western Ontario, London, Canada

References and Notes

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Position of the Catholic Church

It is very distressing to a scientist who is a Catholic to see in your columns a review such as that given by M. Edward Davis to Sulloway's *Birth Control and Catholic Doctrine* [*Science* **130**, 559 (1959)]. This distress comes *not* from the fact that Sulloway, Huxley, and Davis agree that contraception is the best method of controlling the birth rate—a position with which I heartily disagree—but from the fact that evidently neither Davis nor the editors of *Science* understand the basis upon which a review of such a work must be written.

Assuming that Davis has correctly presented the facts as assembled by Sulloway, it is also evident that Sulloway is too deficient in philosophical and theological background to have undertaken the task he set himself. This, of course, is not the responsibility of Davis or of the editors of *Science*. It is your responsibility to see that your reviews do not give a distorted picture of the situation. In what follows I shall concern myself solely with the review.

The first question that must always be considered in reviewing a book like

(Continued on page 1362)

frequency range 25 to 1500 Mcy/sec. Standard mounts are available for measurements on transistors and for common-cathode measurements on seven-pin miniature tubes. The bride is passive; stability of calibration is dependent only on physical dimensions. Measurement ranges are: voltage and current ratios, 0 to 20; transimpedance, 0 to 1500 ohm; transadmittance, 0 to 600 mho; impedance, 0 to 1000 ohm; admittance, 0 to 400 mho. (General Radio Co., Dept. 221)

■ PHYSIOLOGICAL DATA TELEMETERING SYSTEM is a 20-lb. electronic package that measures blood pressure, heart rate, heart sounds, respiration rate and depth, skin temperature, and galvanic skin resistance. Intended for space research, the equipment is designed to operate in extreme environmental temperatures and under accelerations of several grav. (Gulton Industries, Inc., Dept. 219)

■ SUBCARRIER OSCILLATOR CALIBRATOR for FM telemetering calibration in field or laboratory is said to maintain accuracy of ±¼ percent bandwidth under all conditions of use. The panel meter reads directly in percentage bandwidth; meters for remote indication are available. (Wayne D. Patterson, Inc., Dept. 218)

JOSHUA STERN

National Bureau of Standards, Washington, D.C.

Letters

(Continued from page 1302)

Sulloway's, which purports to set out Catholic doctrine on some subject, is to determine whether the Catholic Church has actually taken a doctrinal stand in the matter. Unless she has, there *is* no "position of the Catholic Church," and writers may, and almost always do, argue pro and con.

The Church is considered to have taken a doctrinal stand in a matter when she has (i) made an infallible pronouncement by the head of the Church; (ii) defined by an Ecumenical Council; (iii) authoritatively proposed some creed, formula of belief, or matter of moral behavior.

Consider two examples, the first being the question of the geocentric and heliocentric theories of planetary motion. When the latter was first proposed in university circles by a Catholic, Copernicus, some Catholic writers were for it, but the great majority were against it. The Church, however, did not then, and never has since, taken a *doctrinal* stand in the matter. The fact that "Catholic authors" adopted this or that position does not have anything to do with the question.

For many centuries the majority of "Catholic authors" took the position that at the end of her earthly career the mother of Christ was taken up body and soul into heaven. There were, however, some "Catholic authors" who thought her body was not assumed. After 1 November 1950 the matter was closed by a formal doctrinal statement by the head of the church.

In the case of birth control the Church never has taken a doctrinal stand that "separation of intercourse and parenthood" is wrong. If she had, she could never have allowed marriage between those who are sterile, nor between those who, because of advanced age, have passed the time when conception can naturally take place. However, the legitimacy of the union and the rights of the partners to use their marital privileges have been recognized in these cases for centuries. Unfortunately, since Davis was unaware of these points, he was unable to point out that a major part of Sulloway's thesis is irrelevant.

The second question that must be considered concerns the nature of the Catholic Church.

It is certainly understandable that Sulloway, believing the Church both inconsistent and in error, would hope it would change its mind on (what he thinks is) its doctrinal stand. Your reviewer is apparently unaware that an *essential* claim of the Catholic Church is that when it *does* take a definite doc-

trinal stand it cannot be in error. This is because the Church believes it was founded by God and guaranteed by him against error in "faith and morals." Over a period of 20 centuries the Church has never made an essential change in any of its doctrines.

Two other points should be mentioned in connection with the review.

1) Davis believes that the method of birth control does not determine the morality of marital intercourse as long as the married couple "intends in good faith to have children and does have them." The Catholic Church, on the other hand, believes that the end does not justify the means, and that the use of bad means for a good end makes the act morally bad. While the end, limitation of the number of children, may be good in some cases, the means, artificial birth control, are always bad.

2) Davis does not make a proper distinction between the Church's philosophical and theological position and the *tactics* that may be employed by Catholics in certain instances. The *laws* against contraceptives were placed on the statute books of Massachusetts and Connecticut by Protestants in the latter part of the 19th century. It is only natural that, in opposing Margaret Sanger and her coworkers of 1914, Catholics should make use of existing laws. The "first line of defense" against a fire is an existing firehose.

Finally, I hope that in the future, when books of this type are reviewed, the editors of *Science* will insist on the same objectivity in presentation of the position of the Catholic Church that they would on any strictly scientific matter.

J. KENNETH O'LOANE
331 Seneca Parkway,
Rochester, New York

Moon Illusion and Age

Leibowitz and Hartman in their report "Magnitude of the moon illusion as a function of the age of the observer" [*Science* **130**, 569 (1959)] interpret the moon illusion "as resulting from a normal developmental process, namely the dependence of the magnitude of the size constancy correction on experience." This conclusion is not in conflict with the result of their outdoor experiment, where presumably there were objects of common experience in the horizontal plane which could provide the subjects with size standards and with landmarks for parallax distance determination. However, it is difficult on the basis of this "experience" theory to see how the same results could be obtained in a darkened theater. If the theater is darkened to the extent that