

SCIENCE NEWS OF THE WEEK**The Genetic Basis of Sex Determination**

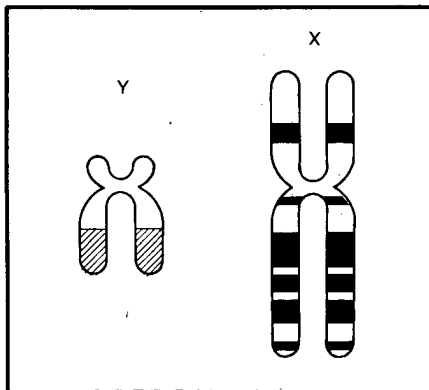
Human sex is known to be determined at the chromosomal level. If a fetus contains two X chromosomes in each cell, it will become a female. If it contains one X chromosome and one Y chromosome in each cell, it will become a male. However, it stands to reason that sex determination depends not just on the presence of a particular kind of chromosome, but on genes present on that chromosome. Research reported in the Nov. 20 NEW ENGLAND JOURNAL OF MEDICINE suggests that a major sex determinant gene may have been found.

Some years ago, investigators discovered that skin from a male mouse grafted onto a female mouse elicited an antibody response. Subsequently they found that the female mouse's antibodies were reacting to a particular antigen present on cells in the male mouse, but not in the female mouse. They named the antigen "H-Y" antigen, because it induced graft rejection. Last year, Stephen S. Wachtel of the Memorial Sloan-Kettering Cancer Center and his colleagues found that the H-Y antigen is present on the cells of the human male as well as on the cells of male mice, because male mouse antiserum to the H-Y antigen bound to male human cells. Consequently Wachtel and his colleagues decided to use a related serological technique to see whether the H-Y antigen might be coded by a gene on the human Y chromosome.

They took white cells from three men with abnormal chromosomal patterns—specifically two Y chromosomes instead of one in each cell. They put the cells in the presence of mouse antiserum to H-Y antigen. Then they put cells from men with the normal XY chromosomal pattern in the presence of the same kind of antiserum. The cells with the YY chromosomal pattern bound much more to the H-Y antibodies than did the cells with the XY chromosomal pattern, suggesting that the former contained more H-Y antigen.

The amount of antigen present on the cell surface is usually related directly to the number of determinant genes that are present. So in reporting their results, Wachtel and his team conclude: "The fact that human males possessing two Y chromosomes have excess H-Y antigen indicates therefore that a structural [gene] locus or positive regulatory locus for H-Y antigen is located on the Y chromosome in man. . . ."

The results of this particular study, in fact, are bolstered by several clinical observations Wachtel and his co-workers have made of women with a Y chromosome. These women had testes, and they had H-Y antigen on their cells.



Human Y and X chromosomes compared.

With one possible exception, this is the first gene to be assigned to the human Y chromosome. In an editorial in the same journal, Park S. Gerald, a physician at Children's Hospital Medical Center in Boston, hails the report as "a major event in human genetics." But even more intriguing and potentially important is the possibility that this gene may play a major role in sex determination.

Wachtel and his team explain why. During the past year or two, they have also found that the H-Y antigen is present in many different animal species, suggesting that the gene for this antigen has played a crucial role in evolution. What's more, they have found that the antigen is linked with sex within a species. For example, if the male in a species has the antigen, the female does not. If the female has the antigen, which is the case with birds and some amphibian species, the male does not. Now that they have found that the gene for the H-Y antigen is present on the human Y chromosome, they are all the more inclined to believe that it may be a major determinant of sex.

How might the gene determine sex? They speculate that the H-Y gene may be concerned with the development of the undifferentiated embryonic sex organs into either male or female sex organs, depending on the species. In humans, the H-Y gene would decide that the primitive sex organs become testes rather than ovaries.

Meanwhile, Wachtel and his co-workers want to learn more about the location of the H-Y gene on the human Y chromosome. They are studying the expression of the H-Y antigen in persons with structurally modified Y chromosomes to learn more about the precise location of the H-Y gene. For instance, they recently observed one woman with Turner's syndrome. She had both an X chromosome and a Y chromosome and the H-Y antigen. The Y chromosome, however,

appeared not to be a total chromosome, but only its short arms. If this was really the case, then the H-Y gene probably lies on one of the two short arms of the Y chromosome. They are now looking at a male patient whose Y chromosome consists of only short arms. If he too expresses the H-Y antigen, then they can be more confident that the H-Y gene resides on one of the chromosome's short arms.

Wachtel and his colleagues are also continuing to explore the H-Y gene's apparent role in sex determination. As Wachtel told SCIENCE NEWS: "We want to study strange animals, like the lemmings that dive into the sea. For some reason—it's not clear—the females of that species have both an X and a Y chromosome. They are normal females in every respect. They just happen to have a Y chromosome which does not make any sense in the context of what we understand about sex determination. But according to our theory, they should have no H-Y antigen, even though they have the Y chromosome. So far, we have looked at three of these lemmings, and none of them has the antigen." □

Requiem for a star— or baptism of fire

Out in the constellation Perseus a star is dying—or perhaps being born. Astronomers are not quite sure which, but there seems to be more opinion on the side of dying. Both births and deaths continually occur in the life of the galaxy. But the exact process under observation, which may be either the beginning of the formation of a planetary nebula (death throes) or the last stages of the implosion of an interstellar cloud (birth pangs), is estimated to last no more than 25,000 years in the several billion that the average star survives. So the chance of catching one in either act is rather slim.

The object is an infrared source called CRL-618. (CRL is for the Air Force Cambridge Research Laboratory's catalogue of infrared sources.) It was identified by William E. Westbrook, a graduate student at the California Institute of Technology, who died before his paper could be published in the Dec. 1 ASTROPHYSICAL JOURNAL (not yet received at the time of this writing). Westbrook found CRL-618 during a search of infrared sources discovered in an Air Force rocket survey.

Apparently CRL-618 consists of an invisible, hot, condensed object with a surface temperature above 32,000 degrees K. (the sun's surface temperature is about

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COVER: The caves of Qumran are where an ancient Jewish sect hid copies of the Scripture and other documents, now known as the Dead Sea Scrolls. Archaeology in Israel, such as the delicate work required here, has illuminated many previously obscure portions of the history of the Palestine area—the crossroads of the ancient world, along which passed conquering armies and innumerable caravans. See p. 361. (Photo: John H. Douglas)

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LETTERS**Retraction on Geller**

On the basis of further experience in the art of conjuring I wish to publicly retract my endorsement of Uri Geller's psychoenergetic authenticity ("Geller performs for physicists," *Off the Beat*, SN: 7/20/74, p. 46). In particular, I retract my statement in SCIENCE NEWS: "My personal professional judgment as a Ph.D. physicist is that Geller demonstrated genuine psychoenergetic ability at Birkbeck, which is beyond the doubt of any reasonable man . . ."

I have witnessed The Amazing Randi fracture metal and move the hands of a watch in a way that is indistinguishable from my observation of Geller's "psychokinetic" demonstrations. Also, I am advised of Randi's demonstration of causing bursts in a Geiger counter and of deflecting a compass needle as reported in a letter from Kings College, University of London (July 11, 1975) signed by Maurice Wilkins, F.R.S., and four other faculty associated with the Department of Biophysics. I am aware of the positive metal fracture tests of Geller reported by Wilber Franklin of Kent State, but I cannot evaluate them because I am ignorant of the art and science of metal fracture. I am also aware of positive reports of psychokinetic effects, *not* associated with Geller, reported by Dr. Ed May of San Francisco City College. Dr. May's research seems promising. Dr. Ronald Hawke of Lawrence Livermore Laboratory reports that Geller seems to be able to erase magnetic tapes psychokinetically. I cannot evaluate Hawke's report.

I do know that Geller's report of the Birkbeck tests in his book *My Story* is distorted to Geller's advantage. I do not think that Geller can be of any serious interest to scientists who are currently investigating parapsychological phenomena.

My own position is that the ambiguity in the interpretation of quantum mechanics leaves ample room for the possibility of psychokinetic and telepathic effects. I have personally experienced unusual "psychic" effects, but not under controlled and reproducible conditions.

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Decline in competence

Your reports about declining knowledge of everyday science and health in our in-

creasingly complex and incompetent society are really depressing. My own experience with many students in the past decade tells me that they do not challenge their mental abilities for solving nontrivial math and science problems. They take only those subjects in their study which require reading and writing with trivial math and science. Students spend more time in processing information rather than developing the operational character of their minds by trying harder math problems. The use of computational devices at early stages in the education process is contributing to the inability of balancing checkbooks without a calculator. It is frustrating to find a high school graduate working in a grocery store who cannot add correctly a list of prices on grocery items when IBM registers break down.

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Physics Department
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and State University
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Re: the Incompetent Society (SN: 11/8/75, p. 294), I believe the principal cause for decline in College Entrance Examination Board scores is *television*, particularly the commercial variety. No longer even a mixed blessing, TV may represent a national disaster.

Sandy Power
Santa Barbara, Calif.

Drug review feedback

The Domestic Council Drug Review Task Force is to be commended for recognizing the relative individual and social innocuousness of cannabis (SN: 10/25/75, p. 263); it is unfortunate that there is no mention of the most abused drug, which destroys more individuals and poses the greatest threat to society of them all—alcohol.

Nick Cramer
N. Hollywood, Calif.

Conference sponsors

In our articles on the Crop Productivity Conference held near Harbor Springs, Mich. (SN: 11/1/75, p. 279 and p. 281), we failed to mention that this was a special invitational meeting sponsored by the Charles F. Kettering Foundation and the Michigan State University Agricultural Experiment Station, with additional funds from the National Science Foundation.—Ed.

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