

perceptibly dimming the total brightness of the system. The dark companion is a possible candidate for a black hole (or a neutron star).

The size theoretically calculated for a black hole makes a difficulty, however. Alone it would be much too small to dim the brighter star perceptibly. In January (SN: 2/20/71, p. 129) A. G. W. Cameron of Yeshiva University suggested that such a black hole might be surrounded by a cloud of particles that revolved around it. This particulate cloud would do the eclipsing. He suggested that the binary star epsilon Aurigae might be constituted that way.

In September Edward J. Deviney Jr. of the University of South Florida suggested that beta Lyrae, one of the most famous of binary systems, might contain a black hole (SN: 10/2/71, p. 232). He suggests that the eclipsing is done by a disk of matter surrounding the black hole that the black hole ejected during collapse.

The Orbiting Astronomical Observatory has observed ultraviolet light from beta Lyrae. In the Dec. 17 NATURE, Robert E. Wilson of the University of South Florida reports that study of the changes in ultraviolet brightness as beta Lyrae goes through its revolutionary cycle supports Deviney's argument. From the data Wilson argues that the dark component is a very hot, very blue, highly condensed underluminous source lying in the center of a disk of matter. These are characteristics of a star that has collapsed to its gravitational radius, he says. That would make it a black hole or the next thing to it.

Another class of binary system is the spectroscopic binary. In this kind of system the two stars are so close together that no telescope can tell them apart. The binary nature is deduced from the behavior of spectral lines. The lines in the spectrum of the star shift toward the red as it goes away from the earth and toward the blue as it comes toward the earth. The cyclic nature of these changes indicates orbital motion on the part of the star. Some spectroscopic binaries are single-line, in which the spectrum of only one component is seen; others are double-line, in which both spectra are visible.

The single-line spectroscopic binaries, in which one component is invisible, are also candidates for black holes. In the Aug. 13 NATURE G. W. Gibbons and S. W. Hawking of the University of Cambridge in England suggested that three of them (HD 176318, 201 G Sgr and HD 194495) might bear further investigation as possibly having black holes.

The suggestion is based ultimately on eccentricities in the orbits of the stars. In swiftly revolving binaries (periods less than five days) any eccentricities in the orbit should be damped

out very quickly after formation of the binary, and the orbit should settle down to being a circle. If later one of the components becomes a black hole it might lose a great deal of mass very quickly during collapse. This would reintroduce eccentricity into the orbit. This eccentricity too would gradually be damped away, but if one happened to observe the binary shortly after formation of the black hole, the eccentricity would betray it.

It was thus necessary to search for short-period binaries with eccentric orbits, whose spectral classification showed them to be late in their evolutionary career. The three cited, say Gibbons and Hawking, are such.

In the Dec. 10 NATURE A. H. Batten and R. P. Olowin of the Dominion Astrophysical Observatory in Victoria, B. C., object that the measurement of eccentricities in spectroscopic binaries is unreliable. They also object to the statistical argument of Hawking and Gibbons that the greater incidence of high eccentricity in single-line binaries compared with double-line binaries indicates that there is something unusual in those high eccentricities, something the single-line binaries have that the double-line ones do not. Batten and Olowin say there may be some selection effect that makes it easier to find high-eccentricity single-line binaries, and that the sample is therefore not random.

In reply, in the same issue, Hawking and Gibbons accept the objection to the measurement of eccentricities and say that it seriously weakens their argument but they cannot see how the proposed selection effect could be important.

Meanwhile J. Richard Gott III of Princeton University, also in the Dec. 10 NATURE, argues further support for Hawking and Gibbons. He acknowledges recent developments that throw doubt on the measurement of the eccentricities of some single-line binaries, but that does not dismay him. Gott points out that the ejection of mass postulated by Gibbons and Hawking would also increase the radial velocity of the binary system (its velocity in the line of sight from earth). Since basic physical laws require that the momentum of the system remain the same, loss of mass entails an increase in velocity. Therefore binaries with black holes should have greater than average radial velocities.

In fact this turns out to be the case, Gott says, for two of the systems cited by Gibbons and Hawking. The light curves (graphs of intensity against time) of the spectroscopic binaries allow their radial velocities to be accurately deduced, he says. Leaving out 201 G Sgr, whose previously quoted eccentricity is now considered totally unreliable, he finds unusually high radial velocities for HD 176318 and HD 194495. □

Freedom and funding: Skinner support queried

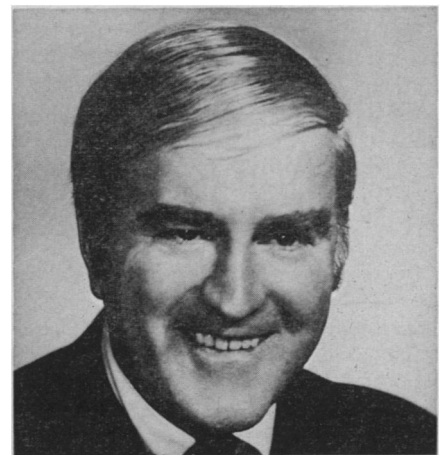
In 1964 B. F. Skinner was awarded a 10-year continuing grant by the National Institute of Mental Health. While receiving this Federal money he wrote and published *Beyond Freedom and Dignity*, a best-seller that has stirred controversy far and wide (SN: 8/7/71, p. 96). This controversy has now reached the floor of Congress.

In a speech to the House last week Rep. Cornelius E. Gallagher (D-N.J.) said that NIMH has granted to Skinner "the sum of \$283,000 for the purpose of writing *Beyond Freedom and Dignity*." Gallagher then questioned "whether he [Skinner] should be subsidized by the Federal Government especially since, in my judgment, he is advancing ideas which threaten the future of our system of government by denigrating the American traditions of individualism, human dignity and self-reliance."

This attack on Skinner's principles of behavior modification was apparently designed to gather support for Gallagher's proposal to create a Select Committee on Privacy, Human Values and Democratic Institutions. The proposal has been approved by the Committee on Rules and will be brought to the floor in January. It is "designed to deal specifically with the type of threats to our Congress and our Constituents which are contained in the thoughts of B. F. Skinner."

This committee, says Gallagher's office, would be investigative. It would report to Congress on where Federal research money is going and it would provide a public forum for the evaluation of ideas such as Skinner's. And if it did not have direct control over Federal grants, it would probably have influence on future grants.

A committee like this would not be new to Gallagher. For seven years he headed the Special Subcommittee on



Gallagher: Questions Skinner grant.

Invasion of Privacy (defunct since March of this year). During that time Gallagher held hearings on the proposed National Data Bank and raised concern over the computer and invasion of privacy. He initiated Congressional consideration of the credit reporting industry and disclosed that at least 250,000 grammar-school children were being given behavior modification drugs (amphetamines). In addition, he led the fight to discredit the proposal of Arnold F. Hutschnecker to give every child predictive psychological tests to determine his future criminality. And he objected to a social scientist's plan to bug each room of a federally financed low-cost housing project in an attempt to discover why some people remain at a poverty level.

The attempt to discredit Skinner's ideas however might, as Gallagher himself predicts, be criticized as naive and anti-intellectual. It was. Kenneth B. Little, executive officer of the American Psychological Association, said, "It seems unfortunate that a misunderstanding of the scope and goals of psychological research can lead to misguided attacks such as Rep. Gallagher has made." Little explained that Skinner is not proposing behavior control that does not already exist. Rather, "he is urging that behavior control principles be understood so that they may be used in the best interest of society instead of by a small number for their own self interest."

At NIMH there was no official reaction to Gallagher's statements. All grants are screened by an outside review committee. And NIMH feels that it is following the rules laid down by Congress in distributing the money provided by Congress. But NIMH has been questioned on its connection with the ideas expressed in *Beyond Freedom and Dignity* and authorities there are in the process of preparing an official statement. They will explain that the type grant Skinner received—Research Career Award—was phased out in 1964. The grant goes directly to Harvard University and is used to pay Skinner's salary according to the Harvard scale. It is not in addition to his salary. And furthermore, an NIMH spokesman says, "the award to Skinner was not given particularly for the preparation of his recent book, but recipients of any award are encouraged, as are university professors, to publish the results of their experiments and scholarly works. In Skinner's case it is quite evident that his formulations are controversial. Whether or not NIMH, the academic world or the general public agree with him, the whole concept of academic freedom requires that Skinner be accorded the right to draw his own conclusions from years of academic research and study." □

Health manpower: Buying off the care crisis

Generally speaking, the American health care crisis can be lumped into two camps: inadequate or duplicated care facilities, and a vast shortage of physicians, nurses and dentists (the current need is put at 220,000 at least). Because of these shortages, millions of Americans have been receiving less than the best medical care. Medical costs have also skyrocketed in the past decade or so (the old law of supply and demand at work).

To counter the problem of facilities, the Federal and state governments are trying to give hospitals and nursing home planning more rationale. During the past year, for example, Health Services and Mental Health Administration grants have been directed toward building neighborhood health centers rather than hospital outpatient departments. Financial incentives are also being provided by HSMHA to encourage hospitals to share equipment. Now Congress has passed, and the President has signed, a bill that could go a long way toward easing the health manpower shortage in this country. Funds to be made available under the act for fiscal 1972 have been decided by Congress and are now before the President for approval.

These funds were not arrived at without the usual cat-and-mouse game between Congress and the Administration's sidekick, the mighty Office of Management and Budget. What happens is that Congress usually authorizes so much money, expecting the OMB to set appropriations requests below this figure; then, if Congress likes the cause enough, it will reinstate some of the funds OMB slashed. The result, according to John Zapp, deputy assistant secretary of Health, Education and Welfare, is that bills are "seldom fully funded." In any event this is what happened with money for the Health Manpower Act. Congress authorized about \$643 million for fiscal 1972. The OMB appropriation request was only about 50 percent of that. Congress then appropriated about 65 percent of the authorization.

Spokesmen for the Association of American Medical Colleges, the American Nursing Association and the American Dental Association all term the act landmark legislation. Previously the Government has given medical, dental and nursing schools piecemeal handouts for construction, project grants and scholarships. Yet this is the first time the Government is providing across-the-board money for financial distress and for capitation (so much money for each student enrolled). Thus the act will provide money for expansion of present facilities, for en-



Cooper: Landmark health legislation.

rolling more students and for building new schools.

On the whole, the AAMC, ANA and ADA are pleased with the act, but they feel the funds approved for 1972 fall considerably short of what is needed if the goal of the act—to close the manpower gap by 1975 or 1980—is to be met. And chances are strong that the Administration will not even spend all of the 65 percent Congressional authorization. The latest word is that the Administration will allocate all the money approved for capitation, but not all the money approved for construction. Thus, the schools will be put in a bind: They will be given financial incentives to expand enrollment, yet will probably be held up in constructing the facilities to take in more students.

Even with these inequitable cutbacks, though, the Health Manpower Act is bound to benefit recipient schools and qualified persons requesting entrance. Only about a third of the 45,000 applicants to medical schools get accepted annually. Some schools have as many as 5,000 applicants and only 200 seats. And hospitals and nursing homes desperately in need of personnel are bound eventually to profit. Yet from a philosophical vantage point, the act raises this question: Should the Government pick up the tab for medical education?

Since World War II especially, the Government has been assuming more and more medical financial costs—but the vast funding has been for research. In the health care delivery arena, though, the Government started assuming costs of hospital construction under the Hill-Burton Act. During the 1960's the Government took on Medicare and Medicaid. Meanwhile it was underwriting various medical education costs, and now that the Health Manpower Act has been enacted it will give across-the-board funds to medical schools.