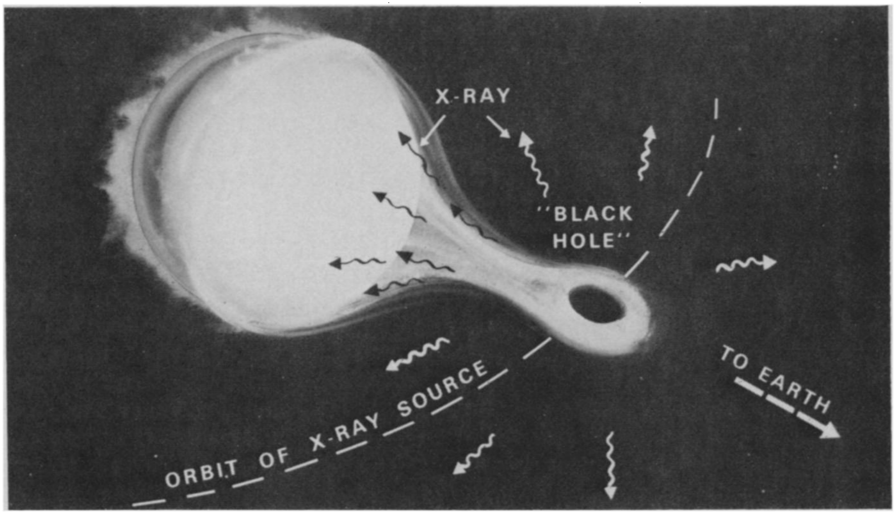
attract each other and stick together. Some of these could be carrying organic compounds. When the polarized particles formed a body of about 100 kilometers diameter, gravitation would take over and drag in more matter until a planetary size was reached. Evidence in favor of this hypothesis is the discovery by Arrhenius and his colleague S. K. Asunmaa that dust particles brought back from the moon, where they are subject to cosmic-ray bombardment, are indeed polarized and do stick together.

All in all, though there is still likely to be much controversy over the details of compound formation and the aggregations of planets and meteorites, there seems to be more and more belief in the general proposition that the first production of organic matter took place outside the earth. □

The case for a black hole in Cygnus X-1



NASA

The suggestion that the X-ray source Cygnus X-1 is a black hole has been around for at least a year (SN: 1/13/73, p. 28). To command the belief of astronomers and specialists in general relativity it requires evidence. Three new pieces of evidence have just come forth. One involves X-ray observations with the Copernicus astronomy satellite, two are independent distance estimates made at the Lick Observatory.

The black-hole model of Cygnus X-1 associates it with the binary star system HDE 226868. One component of the binary is a visible star. The other component is not luminous and is supposed to be the black hole. Matter is continually leaving the luminous body and falling into the black hole. As it falls, the matter emits X-rays.

A group of British observers from University College, London, under the direction of R. L. F. Boyd, with direct observations and data reduction by Peter Sanford, has used the Copernicus satellite to confirm the identification of Cygnus X-1 with HDE 226868. They have also observed the way the X-rays are absorbed as they pass through the atmosphere of the visible star. From this they conclude that the invisible object is very small and very massive. The result leads Sanford to say: "It's a black hole."

Two groups at the Lick Observatory sought to determine the distance to Cygnus X-1 in order to determine the spectral class of the visible object and so to calculate its mass and that of the dark companion. The technique is to compare the extinction by interstellar dust of the light from HDE 226868 and that of other nearby stars. This establishes a relation between distance and extinction. The relation could then be used to decide whether HDE 226868 is a nearby system without a black hole or a distant one with a black hole.

The first group (Bruce Margon, Stuart Bowyer and R. P. S. Stone) measured 50 stars. The second group (Jesse Bregman, Dennis Butler, Edward Kemper, Alan Koski, R. P. Kraft and Stone) measured 42. They came to about the same conclusion. The system is distant, 8,000 light-years or more, and the dark body is very massive. The second group estimates the visible star's mass at 30 times the sun's mass and the dark companion's at six times the solar mass. Any such dark body over about three solar masses is expected to be a black hole. Thus it begins to look more and more as if there really is a black hole there. □

Overweight mice and the genetics of obesity

Insatiable appetites can lead to obesity, and in predisposed individuals, to diabetes. Recent research on two types of "fat" mutant mice at the Jackson Laboratory in Bar Harbor, Me., indicate that obesity may be linked to inherent gene mutations that affect the animals' eating control centers.

Two mutants—one obese and one diabetic—were discovered in different mouse stocks at Jackson Laboratory in 1950 and 1967, respectively. The characteristic traits of each mutant are produced by genes termed *ob* and *db* and are located on different chromosomes. Yet when they are placed on the same genetic background, by cross and intercross breeding, they produce identical syndromes—overeating, obesity, excess blood sugar and a diabetic condition.

In an attempt to better understand obesity, biochemist Douglas Coleman joined together diabetic, obese and normal mice by a surgical technique called parabiosis. The technique allows two animals to share a common system of body fluid such as blood.

When Coleman joined diabetic mice to normal ones, the normal mice stopped eating, lost weight and eventually died. The diabetic partners continued to gain weight. Coleman explains that the normal partners ceased eating because they received a large dosage of the satiety factor, the signal to stop eating, from both themselves and the diabetic mutants. Apparently, the diabetic mice were unable to react to the signal.

The same situation occurred when diabetic mice were linked to obese mice but, in this instance, the obese mice died. This led Coleman to conclude that the recognition factor in obese mice is functional.

Finally, fat mice and normal mice were joined together. Both reduced their food consumption moderately. After separation, the fat partners once again gained weight. This suggests that the obese mice cannot produce a satiety factor of their own though they do have the ability to respond to one. Coleman stresses that there may be other interpretations to these results but these are the simplest to date. The investigation does confirm that the cause of growing fat in the animals is not a metabolic one.

"Our next step," says Coleman, "is to study the satiety factor, isolate it and find how it acts—obviously it has important consequences. For instance, it may affect the pancreas and prevent insulin release. Insulin causes hunger. If it prevents insulin release, this may be what the factor is." □