atom in the six-membered glucose ring structure. The compound, they found, inhibits the active transport of glucose across the cell membrane and thus deprives the interior of cells of this carbohydrate.

The link between the analogue and fertility control is this: The male testes require proportionately more sugar and are more susceptible to sugar deprivation than any other tissue in the body. When the sulfur sugar analogue is fed to mice, sugar is not transported into the sperm-producing cells and sperm production is arrested. The cells switch over to burning fat and protein for energy and this leads to another of the compound's interesting effects—moderate weight loss.

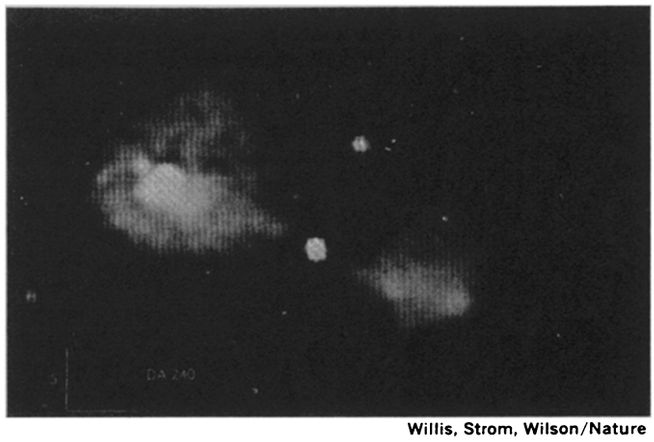
"At first," Whistler says, "we thought we had discovered a reducing drug. With a compound that could shut down a person's uptake of glucose, theoretically, a person could eat all of the carbohydrates—spaghetti, bread, etc.—that he wanted, then after dinner take a dose of this analogue" and he would not absorb the sugar or calories. Whistler's team experimented with this idea and found that mice did indeed lose weight. But further investigation showed that a slight elevation in blood sugar was occurring and this led to a loss of hunger and the subsequent weight loss.

But the team is concentrating their energies on the analogue as a sperm control agent. They fed it to mice for up to two months and found in every instance that sperm production was halted at doses at or above 33 milligrams per kilogram of body weight. Sperm production is reinitiated about four weeks after withdrawal from the chemical, and the mice can then successfully inseminate and impregnate females. The offspring, monitored for three generations, were completely normal. Also the analogue did not affect mice libidos.

"This represents the first time male fertility has been under the control of a chemical which is not a hormone or a toxic substance," Whistler says. The idea is not totally new, however, because other researchers have shown that diabetes in the human male can markedly affect sperm production. Sugar levels in the blood do rise slightly in the test animals after analogue ingestion but decrease after the chemical is metabolized and excreted.

Whistler has informed several pharmaceutical companies, which were "very interested" in pursuing the chemical as a sperm-control and perhaps a weight-control agent. Says Whistler: "You must understand that this is an extremely preliminary investigation. Something may turn out to be wrong with it as happens with so many hopeful things. But it is interesting and exciting and we are pursuing it as rapidly as we can." □

The largest objects in the universe



Willis, Strom, Wilson/Nature

DA240 in a "radiophotograph." This is an image constructed to show what the object would look like if radio waves were light. It gives some idea of the extent and brightness variations.

Much of recent progress in astronomy consists of elucidating ever finer details of small compact sources. This is especially true in radio astronomy, where quasars and pulsars have been major topics, and larger and larger arrays of radio telescopes are built in the hope of resolving the internal structure of such objects. Yet the opposite question is important too. How large can a radio source be? How much space can be occupied by a collection of matter that is physically and dynamically interconnected?

The answer is not as obvious as it may at first seem because there is a problem of distinguishing the forest from the trees in a question like this. It is hard for telescopes to see very large objects whole and to separate them from the confusion of unrelated sources that may be near them or behind or in front of them. An answer to the question is important for at least two large reasons: It could help determine what the mechanism is that replenishes the energy radio sources send out, and it could indicate whether there is any large amount of matter in the space between galaxies and clusters of galaxies. Data on the latter point could help select among the various cosmological theories that propose to describe the history and future of the universe.

The answer is that radio sources can be bigger than anybody used to think. It is one of the first fruits of a survey undertaken with the Westerbork Synthesis Radio Telescope located at Westerbork, the Netherlands, by A. G. Willis, R. G. Strom and A. S. Wilson of the Leiden Observatory. In the Aug. 23 NATURE they report two sources whose size goes well beyond the one megaparsec that used to be considered the upper limit.

The biggest is denominated 3C236. Located in the constellation Leo Minor, it is 5.7 megaparsecs (almost 19 million light-years) across, bigger than a cluster of galaxies. (For comparison the longest dimension of our galaxy is about 100,000 light-years.) The second that the Leiden investigators have so far found is somewhat smaller, two megaparsecs (7.5 million light-years) across. It is called DA240 and is in the constellation Lynx.

Contour maps reveal that the sources are complex objects with compact bright spots surrounded by fainter material. The ratio between the brightest and faintest parts of 3C236 is more than 1,000 to 1. Although their densities are small, on the order of a few particles per hundred thousand cubic centimeters, their enormous volumes, assuming that they are about as deep as they are broad, give the objects significant masses. Just two parts of DA-240, the "intense eastern compact component" and the "extended eastern low brightness area," are estimated at 800 million and 100 billion times the mass of the sun respectively.

Objects of this sort tend to take the shape of lobes on either side of a central optical object, usually a galaxy. Theories generally regard the radio sources as matter ejected by the central object. Various models have been put forth to explain their development and whether and how much their expansion is hindered or stopped by the counter-pressure of supposed intergalactic gas. As a result of these findings some parts of those models may have to be dropped, others perhaps retained or revised. The question is still in flux because it is not yet known whether these two sources are anomalous or typical of the class.

The search for others continues. ". . . It seems most improbable that these two are the only radio sources of moderate strength whose large-scale structure has been overlooked," the three observers conclude. "Before long we may know if 3C236 is atypical, or whether it must relinquish its distinction of being the largest known object." □