In past female-to-male operations, sexual function of an artifical penis was attempted by inserting a permanent semirigid prosthesis in it. This approach was not always successful. Puckett and Montie reached a more satisfactory solution by inserting an inflatable prosthesis in their patient's sculpted penis. The patient is thus able to have intercourse, although ejaculation is not possible. The device, developed about three years ago at Baylor University in Texas, has been used for men impotent because of disease or surgery.

A liquid-filled reservoir in the patient's abdomen is connected to two small cylinders in the penis. Erection is achieved when a small bulb in the scrotum is pumped and the cylinders are filled with liquid. Pressing a valve in the scrotum refills the reservoir in the abdomen and deflates the penis.

In similar operations, the urinary tract has been rerouted. In this case, the doctors decided against it because of risk of infection and possibility of interference with the implanted cylinders.

The value of the procedure in transsexual operations is obvious. But the doctors say the techniques are also adaptable for treating men whose organs have been amputated, disfigured or injured. □

RNA tumor viruses: More insights

Because tumor viruses cause various kinds of cancers in animals and may possibly do so in humans as well, there is great need to learn more about how they can trigger disease in cells. For instance, during infection of a cell, an RNA tumor virus (a virus with a core of RNA as its genetic material) makes a DNA copy of its RNA. This DNA then becomes a closed circle and integrates into the cell's DNA before the life cycle of the virus can continue. A crucial question is: How can a linear RNA result in a circular DNA molecule?

A partial answer is provided in the March PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by two separate research groups at Harvard Medical School and Harvard University. The investigators are William A. Haseltine, Allan M. Maxam and Walter Gilbert, and Dennis E. Schwartz, Paul C. Zamecnik and H. Lee Weith. They have found that the bases (chemical building blocks of nucleic acids) at both the left and right ends of viral RNA are virtually identical. Such identical sequences may help explain how a DNA copy of RNA can become circular.

When an RNA tumor virus enters a host cell, it carries two copies of linear viral RNA and several copies of the reverse transcriptase enzyme that it needs to make DNA copies of its RNAS. Also, attached to the left end of each RNA to help in transcription is a host-cell transfer RNA. As an enzyme starts to transcribe a viral RNA strand into a DNA copy, the tRNA primer is elongated into DNA. Then the enzyme goes on to make a DNA copy of some 100 bases at the extreme left end of the RNA. Using a new method that Maxam and Gilbert designed (SN: 4/2/77, p. 216), Haseltine, Maxam and Gilbert determined the sequence of this 100-base stretch. Meanwhile, Schwartz and his colleagues determined the sequence of bases at the right end. It turns out that the 21 bases at the extreme left end are also at its extreme right end. The only difference is that the stretch at the right end is followed by several A (adenine) bases.

So how do these identical ends help a linear DNA copy of a viral RNA to become circular? When DNA copying begins at the left end of the viral RNA, only one percent of the RNA is made into DNA. So how is a DNA copy of the other 99 percent made, since it must be made from the right, not from the left, end? Because the DNA transcription starts at the left end, the growing DNA chain must jump to the right end and then continue copying the rest of the RNA. And this is where the identical bases at the left and right ends probably come into use.

For instance, the growing DNA chain could float away from its RNA at the left end and pair up with another viral RNA at the right end for further elongation. Or a reverse transcriptase enzyme might digest some of the RNA from the RNA-DNA hybrid containing the 100 bases at the left end, revealing that DNA so that it can pair with the repeated sequence at the right end. Thus, as the DNA is brought around from the left end of the viral RNA to the right end, it also creates DNA circles. □

Astronomers urge 25-meter telescope

The largest optical telescope in the world, located in the Crimea, has a mirror 6 meters in diameter. The next largest is at Mt. Palomar in California (5 meters or 200 inches). These represent about the ultimate technological limit for the casting of a single mirror.

These large single telescopes give a view that goes billions of light years into the distance and past of the universe and records objects as dim as 23rd magnitude, but they have been surpassed in distance and discrimination by the antennas of radio astronomy. Optical and radio astronomy work in tandem, and for best results astronomers would like to have optical equipment that can match the best available for radio, which in the not too distant future will be greatly improved by the Very Large Array now under construction in New Mexico. And so a study group assembled under the aegis of the Kitt Peak National Observatory and led by KPNO staff members Donald N. B. Hall, R. C. M. Learner and L. D. Barr now proposes a ground-based optical telescope with a 25-meter aperture.


Kitt Peak National Observatory

One of four concepts for giant telescope.

Consideration of such a project is made possible in general by two recent developments. Work on multiple-mirror telescopes has shown that it is possible to coordinate the movement of a number of separate mirrors (by using reflected laser beams) so that they all throw their image to the same point. The development of speckle interferometry, a technique whereby numerous snapshots of a given object are combined by computer into an image that has the effects of atmospheric turbulence (twinkling) removed, has circumvented what was the effective limitation on the resolving power of optical telescopes.

A 25-meter telescope would thus be made of a number of separate mirrors. At least four possible designs are under consideration; the optimum one from an engineering and economic point of view remains to be chosen. A telescope of this size would have 25 times the light-gathering power of the big one on Mt. Palomar. Its limiting magnitude would be about 27 for fairly wide band (1,000-angstrom) observations and fainter for certain narrow portions of the spectrum.

If such a scope were built in a dry location it would be particularly useful for infrared observation.

This kind of a telescope could see faint and small objects and effects such as dark dwarf stars, planets around other stars, stellar motions in other galaxies and weather changes on large planets of the solar system. Because of its complexity the telescope would require more technical support than most. Hall says the siting would probably be a trade-off between dryness and support. Kitt Peak is one obvious choice; Mauna Kea is another possibility. Cost would run to about $250 million, about as much as the current generation of particle-physics laboratories or a quarter of an aircraft carrier. □