

his point. Ironically, few people outside Arkansas and Mississippi—the two remaining states with anti-evolution laws—seem to care anymore. Tennessee has repealed its anti-evolution statute. A key question now is whether the high court will rule on basic constitutional grounds or will take a more technical tack in the case.

Arkansas' 1928 statute forbids the teaching of any theory holding that man has descended from a lower order of animals. It was challenged in 1965 by Mrs. Susan Epperson, at that time an 11th grade biology teacher, backed by the Arkansas Educational Association.

In 1965 the association began a drive to overturn the law. It publicly attacked the statute and passed word it was looking for a teacher to make a legal challenge. Susan Epperson, a 24-year-old teacher at Central High School in Little Rock, decided to pick up the challenge. That December she filed a petition in Arkansas' lower court asking that the law be declared unconstitutional. She had not as yet taught evolutionary theory, but was prepared to do so.

Unlike *Scopes*, Mrs. Epperson won her original case; when she taught evo-



Mrs. Epperson: latter-day *Scopes*.

lution, it was legal. The state then appealed the ruling to Arkansas' high court, where it was reversed. In a two-line decision, the court simply stated that determining school curricula is a valid state exercise. It declined to define teaching, and offered no opinion as to whether evolution could be discussed in school, even if it was not taught as fact.

During the 35 minutes the U.S. Supreme Court spent on the case Oct. 16, Associate Justice Thurgood Marshall

suggested that since the Arkansas court had disposed of the case in two sentences, perhaps the Supreme Court could settle it in one. Which one, he didn't say.

The final decision, expected in November or December, could be determined on several grounds. Mrs. Epperson's attorney, Eugene R. Warren, is basing his case on both the First Amendment guarantee of free speech and the 14th Amendment's due process clause.

The law violates due process, says Warren, because of its vagueness. Teachers are uncertain as to whether they are forbidden to discuss the matter or to permit classroom discussion. Moreover, they are almost certain to violate the act since it also bars the use of textbooks containing evolutionary theory.

"There is no biology text without some explanation of the theory of human evolution," Warren told the Supreme Court.

Typically, Arkansas teachers skip those chapters or tell their students it is illegal to read them, thereby assuring

that they will be read. In many places, the law is simply disregarded. No teacher has been prosecuted under it. However, rural areas can and have used the statute to threaten teachers disliked for other reasons.

Should the Supreme Court rule against the law on the basis of the 14th Amendment, it might find some precedent in a 1923 Nebraska case. The Nebraska law, aimed at foreign language schools, particularly German schools, barred teachers in both private and public schools from teaching any subject in any language other than English (a hangover from World War I). Languages themselves could only be taught after the eighth grade in Nebraska schools.

In striking down that law, the Supreme Court ruled that it violated due process.

A decision based more directly on freedom of speech, which is also possible, would put the court into the controversial area of state employe rights. It has in the past extended constitutional guarantees to state employes through the 14th Amendment.

RADIATION PROTECTION

Law first; the muscle later

A Federal effort to protect the public from harmful man-made radiation was signed into law last week, amid some debate over its regulatory strength. Strong or not, it gives the Federal Government its first direct role in the regulation of medical and dental X-ray equipment.

The radiation protection act authorizes the Secretary of Health, Education and Welfare to set standards for permissible radiation in electronic products such as color television sets, microwave ovens, lasers and diagnostic X-ray machines.

Since the legislators were convinced that not enough is known about the harmful effects on humans of man-made radiation, the bill also directs HEW to conduct research to find out specifically what the biological effects are, and at what levels, and for what products. As this data is generated, HEW will further refine its regulatory standards.

Whenever the standards are set, the law provides, for non-complying manufacturers, penalties ranging from \$1,000 to \$300,000.

The debate over the regulatory effectiveness of the bill centers largely around two provisions that were stripped from the Senate version in conference with the House. These provisions would have given the Government power to seize products deemed dangerous by HEW, and for HEW to

conduct in-plant inspection of products at any time, rather than wait until after a violation had been proved. During hearings on the bill, industry objected strenuously to these two provisions.

Senator E. L. Bartlett (D-Alaska), who sponsored the Senate version, considers plant inspection vital to the radiation control program and plans to introduce an amendment to provide for it in the next session of Congress.

While concern over the possible damage to humans of man-made radiation—largely from clinical equipment—has been around for some time, responsibility for control was in relation to use, not manufacture, and was a state responsibility. It took a well-publicized incident with color television sets last year to spark Congress into action.

In early 1967 it was discovered that some 150,000 of General Electric's large screen color TV receivers were emitting excessively high levels of X-radiation because of an improperly shielded voltage regulator tube. To reduce X-ray emissions of high voltage tubes to safe levels, manufacturers equip the tubes with metallic shields that absorb most of the radiation. Because of a manufacturing error, the shields inside many of the GE tubes were misaligned. As a result, part of the X-rays emitted could leak through the bottom of the tube. The company recalled all the sets, but the resulting

publicity over possible health effects of exposure to excessive levels of X-radiation—such as genetic damage which wouldn't be discernible for 10 years or more—caused a wave of concern.

In the Congressional hearings that followed, J. Edward Day, Postmaster General in the Kennedy cabinet and now a representative of the Electronics Industries Association, said that the GE sets' emissions were "hundreds or more times" above the standard that the industry voluntarily goes by, but that standard (0.5 milliroentgens per hour at 5 centimeters) is 10 to 20 times below a dangerous level.

Radiation from TV sets is directly related to the voltage used. This made only color TV sets a problem since they operate at much higher voltages than black and white.

While color television has received the most radiation-scare publicity, it is actually a minor part of the overall problem. The big worry is medical and dental X-ray machines which produce about 90 percent of all man-made radiation. For this reason, HEW is expected to move quickly in the diagnostic X-ray area, now that it has the authority.

SURGERY

Other things at heart

History's first human heart transplant last December began an unprecedented ferment in the field of surgery. Never has there been such public excitement over the doings of surgeons.

Suddenly the doctors' professional ethics were a matter for street-corner discussion, and diagrams of surgical techniques appeared on front pages. It might seem logical in view of all this that the 54th annual clinical congress of the American College of Surgeons in Atlantic City, N.J., would have had a lot to talk about.

It did. Curiously enough, however, a surprisingly small amount of the talk was directly concerned with human heart transplants. A session at the close of the congress entitled "What's New in Surgery" was presided over by Dr. Owen H. Wangenstein, teacher of several of the pioneer heart transplant surgeons. But transplantation developments took their place alongside news in otorhinolaryngology and nine other fields, and they were discussed by kidney transplanter Dr. David M. Hume of the Medical College of Virginia.

One session of research papers was given over to cardiac and lung transplants. It was moderated by Dr. Norman Shumway of Stanford University Medical School, who with Dr. Richard Lower of MCV developed the surgical technique used in the first transplant. Even in this session there was more

emphasis on lung transplantation research being carried out with dogs than on heart transplants, on which only three papers were presented.

The general impression to be gained, in fact, was that attending surgeons had other things on their minds.

One such thing concerns what most surgeons think is the wave of the future in the surgical correction of failing hearts—artificial hearts. Dr. John C. Norman of Harvard Medical School reports that nuclear fuel capsules capable of powering an artificial heart can be implanted in dogs without harm.

The nuclear fuel is plutonium 238—similar to the metal used in atom bombs. A capsule containing 33 grams of the fuel is attached to a titanium tube. The surgeon removes the dog's descending thoracic aorta, the main artery leading from the heart to the lower part of the body, and replaces it with the titanium tube. Heat from the capsule is conducted to the tube, warms the blood slightly, and is distributed to the body for dissipation by the skin.

In practice the capsule's heat would be used to drive a miniature steam engine which would provide power for a totally implantable pump. Such a pump is under development, though it may take seven more years to perfect.

Out of the heart field altogether, a University of Chicago group reports development of an artificial lung which may be of benefit in the treatment of hyaline membrane disease. Some 24,000 babies are born every year with this often fatal disease.

Previous artificial lungs, the kind usually found in heart-lung machines, are useful only for short periods, and then rarely in infants. Their pumping action damages the blood, leads to clots, and may leave tiny bubbles in the blood. If the pump is used enough to allow cure of the membrane disease the damaged blood injures the lungs.

The system reported by Dr. Robert L. Replegle avoids pump-caused damage by mimicking the action of the lungs. The blood flows across one side of a semi-permeable membrane. On the other side is oxygen. Carbon dioxide diffuses from the blood to the oxygen side; oxygen diffuses in the other direction. Blood pressure moves the blood across the membrane.

A team from Louisiana State University reports that tiny radioactive spheres injected into the abdominal cavity control the spread of cancers.

Dr. James B. Heneghan reports that the spheres, about 15 microns in diameter, are loaded with radioactive yttrium 90. In a series run with rabbits a dose of the spheres was injected along with cancer cells. After a month, 11 of 16 controls had cancer, compared with six out of 32 getting the yttrium.

LEM TO COME

Apollo 8 looks good for moon

"The moon for Christmas" has become a popular slogan around the Manned Spacecraft Center in Houston. Despite some 50 acknowledged mishaps, three nagging colds and an upside-down landing, space agency officials have declared the flight of Apollo 7 to be a "more than 100 percent success." The spacecraft landed safely in the Atlantic Ocean on Oct. 22 after making 163 revolutions around the earth in a little less than 11 days.

Barring future difficulties, it will take troubles which either have not yet been made public or turn out to be worse than presently believed to keep Apollo 8 from heading moonward in December.

If the moon is the word, Astronauts Frank Borman, James Lovell and William Anders will either simply swing around the moon and head home, or settle into a lunar orbit for as many as 10 revolutions.

The problem child, if there is one, will be Apollo 9, now planned as the first manned flight to include the much-troubled lunar module. Apollo 9 won't go to the moon, but it will give Gemini 4 veteran James McDivitt a chance to be the first pilot of what has been one of the most headache-producing pieces of equipment in the Apollo program.

On the actual lunar landing mission, the LM (known as "Lem" to almost everyone in the space program) will be the vehicle that ultimately carries two of the three astronauts in the crew down to the lunar surface, then brings them back up to rendezvous with their comrade waiting in orbit around the moon. On Apollo 9, however, it will simply get a stiff workout, including practice of the turns and docking maneuvers planned for the real thing.

Only one LM has ever been in space. That one was only a qualified success last January when its descent engine—the one that will lower it down to the moon—fired improperly. Mission controllers changed the flight plan on the spot, and made up the difference in ground tests later, but there have been other difficulties, including troubles with major engine components (unrelated to the descent engine misfiring). A particular woe is weight. The LM was to have weighed 32,000 pounds, including fuel, but is now so heavy that it may have to leave as much as 2,200 pounds of fuel behind for Apollo 9.

McDivitt, however, is confident. After a recent ground test he declared that it came through like no other spacecraft.

"My confidence level has gone up a lot," he said. "I just hope it flies as well as it performed in tests."