"In the interests of scientific honesty, God and Darwin got their days in court last month" – the U.S. District Court for the Eastern District of Arkansas.

OF GOD & DARWIN

BY JANET RALOFF

"The theory of evolution by natural selection was certainly the most important single scientific innovation in the nineteenth century. When all the foolish wind and wit that it raised had blown away, the living world was different because it was seen to be a world in movement... Unlike physics, every generalization about biology is a slice in time; and it is evolution which is the real creator of originality and novelty in the universe."
Jacob Bronowski, *The Ascent of Man,* 1973

LITTLE ROCK, ARK. — It's been called Scopes-2 — a "monkey trial." But what the case of *Mclean et al.* vs. *Arkansas Board of Education* really proved to be was a forum for arguing three constitutional issues surrounding how to teach theories involving the origins of the universe and living things within it. What's ironic is that while its ultimate outcome will affect how science is taught in public schools throughout Arkansas—and presumably the nation — the question of whether "creation science" truly constitutes science was not the legal issue.

" ... God save us and this honorable court."

Those words were used to open each day's session of the trial here. However, while the recognition of God is allowed in courtrooms, and receives at least lip service in the Pledge of Allegiance ("...one nation, under God..."), it is prohibited from the teaching of science, the humanities and other courses in public schools throughout the nation. And that's why the American Civil Liberties Union initially filed suit against the State of Arkansas last May. Arguing in court December 14-24 on behalf of 23 plaintiffs (including a dozen church leaders), the ACLU contended that enactment this fall of the State's "Balanced Treatment for Creation-Science and Evolution-Science Act" would infringe upon three separate rights guaranteed under the U. S. Constitution.

The first is separation of church and state guaranteed by the First Amendment. To establish that Arkansas' Act 590 would bring religion into the schools, the plaintiffs had to demonstrate that the *purpose* of the law was to advance a religious belief, that the *effect* of the law was to advance a religious belief, or that implementation of the law would require excessive "entanglement" of religious groups with the schools.

The second constitutional issue concerns another First Amendment right, academic freedom. Bruce Ennis, one of six lawyers who argued the case in Little Rock for the ACLU, explains that since the federal government requires that students be educated, the courts have "worried" about whether government prescriptions on not only what to teach but also how to teach might "cast a pall of orthodoxy over the schools." As a result, the courts have established a precedent requiring that how a course is taught be left to the discretion of a teacher.

Finally, there is the issue of vagueness. Ennis notes that this is "basically an extension of the Fourteenth Amendment's guarantee of fair notice under due process." He says that because Act 590 is so "incredibly vague," it would be easy for teachers or even whole school systems to misinterpret what is required for compliance with it. For instance, creation science as defined by the law (see box) includes the concept that since the moment of creation, changes have occurred "only within fixed limits of originally created kinds of plants and animals." Ennis asks, what constitutes "fixed limits?" Even more difficult, what are the "kinds?"

In cross examining the State's witnesses, the ACLU established that even those proponents of the act did not know what "kinds" was meant to connote; were they species, genera, families, orders or classes? Since it contends that an incorrect reading of the act could result in a lawsuit filed against the school or the dismissal of a teacher, the ACLU claims the Arkansas law jeopardizes a constitutional guarantee of due notice.

The ACLU need only prove a single ground "to win" — to have the law struck down as unconstitutional. However, so confident were Ennis and colleagues in their court presentations that by midway through the second week of the trial, Ennis told SCIENCE NEWS, "I think we have proved all three."

The State saw it differently. "We feel very strongly that we put into the record and before the judge scientific evidence supporting a creation science model," says David Williams, Deputy Attorney General for the State and one of the trial attorneys defending the law. To defend the State against the ACLU's first charge, "We need only show the act has a secular purpose," Williams says. And he claims, it does: expanding the range of scientific ideas to which a student is exposed. Williams discounted the ACLU's hope of proving the second charge, stating that "academic freedom is really on our side. The plaintiffs have placed themselves, whether they like it or not, in a position of trying to censor from the public-school classroom a theory or model of origins that is apparently contrary to their own philosophical or religious beliefs. But to say there is no scientific evidence for creationism simply is not true."

Most scientists would probably disagree with that statement because it is generally believed that Darwinian evolution presents the best scientific explanation for interpreting the fossil record, the adaptation of species to their environments and the biochemical similarities between earth's varied lifeforms.

But the state marshaled a host of scientific witnesses who said that there are scientific data that support a creationism model and refute an evolutionary one. The crucial word, however, is *support.* Among those who testified for the defense, only astronomer N. Chandra Wickramasinghe of the University of Wales cited data suggesting a scientific basis for creationism. Most of the other scientists called by the state reported on research "consistent with a creationist model" but based on the assumption that the biblical account of creation is accurate.

Wayne Frair, a biochemical taxonomist from The King's College in Briarcliff Manor, N.Y., discussed some of his studies of reptiles — mainly turtles. An evolutionary model of animal origins would give all turtles a common ancestor. But Frair says his research, based on biochemical comparisons, does not support the grouping of all turtles onto a common family tree. Instead, he says, it appears as though turtles descend from as many as four "original kinds" — the same nonspecific kinds referred to in Section 4a(3) of Act 590 (see box).

"Some of my best friends are evolutionists," Frair admitted with a chuckle during testimony on December 14. He added, however, that, "as a result of Darwinism, a lot of time has been wasted on

[developing and mapping] unidentifiable family trees." While he believes some form of "microevolution" occurs on the species level, he says it cannot account for the radial development of different families of animals from a common ancestor.

The concept of a single family tree relating all earth's living beings is an extrapolation from Darwinian evolution that even Darwin would probably have trouble justifying, Frair says. Noting a lack of "transitional forms in the fossil record," he claims that even "Darwin had trouble with intermediates." As a result, he says, "I feel that if Darwin were alive today, he'd be a creation scientist."

Margaret Helder, a former research biologist in Canada, testified about her difficulty in relating green algae to other freshwater plants. She suggests the reason may be that green algae descend from one or more of their own original "kinds." Donald Chitteck, a physical chemist who had taught at George Fox College in Oregon, described a rapid-transformation process to convert fresh biomass into "fossil fuels." His work suggests the chemistry of minerals would differ depending upon whether they were transformed in a matter of hours or millions of years.

And he told the court it "is likely" nature actually employed such a "rapid physical chemistry" process. Robert Gentry, a visiting scientist at Oak Ridge National Laboratory for the past 12 years, reported on research involving radioactive halos (SN: 8/19/78, p. 121). He says it calls into question the accuracy of radiogenic-dating estimates of rock.

Both Gentry and Chitteck said their work provides credence to the creationist belief in the earth's "relatively recent inception." In fact, most of the State's witnesses said their support for creationism was based on their trust in the accuracy of biblical accounts, but shored up scientifically by the existence of apparent flaws or deficiencies in the ability of the evolutionary model of creation and the development of life to explain certain research data.

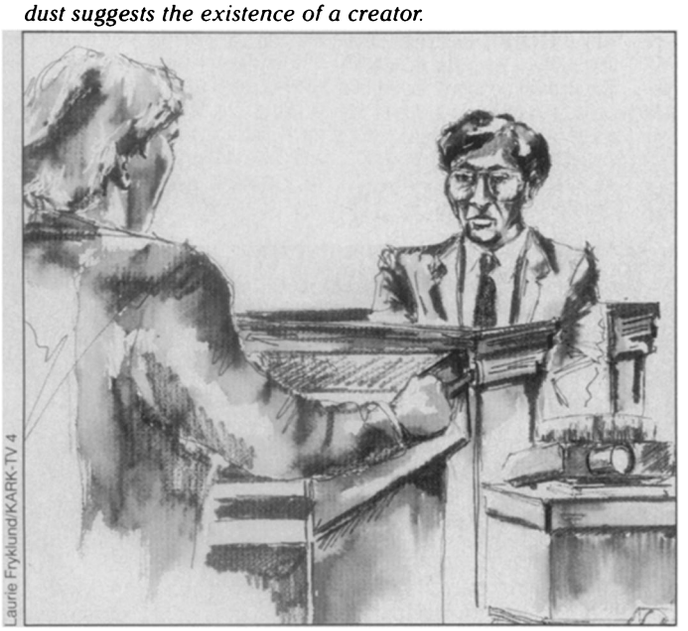
After hours of such testimony, a frustrated Judge William Overton was forced at one point to break into the direct examination of one witness and announce: "I'm sure there are plenty of scientists who question the validity of evolution and I'm glad they do." But what has that to do with creationism? "I still can't see why [scientific data challenging evolution] couldn't be used in schools today without [Act 590]." Explained David Williams, "The State contends that if there are only two theories [which it does] and they are mutually exclusive, then evidence against one is evidence for the other." As the trial ended Dec. 17, it was unclear whether Judge Overton would accept that explanation. Only one week earlier, the ACLU's witnesses challenged that assertion, saying that whether one chose to become an evolutionist or creationist was not merely an either/or proposition.

Testimony by Wickramasinghe, a close collaborator with Sir Fred Hoyle, fell into a category by itself. He offered what might be interpreted as a scientific *basis* for belief in a creationist model of origins—one directed by a supernatural creator. At the trial, Wickramasinghe reported that he was initially swayed, as are most scientists, by the "seductive and compelling logic" of Darwinian evolution. But the appearance of "cellulose-like" molecules in the interstellar dust he was studying suggested life may have developed in space, later to be carried earthward by comets or meteorites. Subsequent statistical analyses suggested to him that there are not enough atoms in the universe to have randomly shuffled into an order that now characterizes earth's living systems—unless, that is, the universe is considerably older than the 15 billion years to 20 billion years now commonly accepted. And it is the statistical improbability of the origin-by-random-shuffling theory that forces him to consider existence of a creator.

All this calls into question the role of science in the trial. Explains Ennis, "Establishing that creation science isn't science wouldn't win this case," because there's nothing unconstitutional about teaching "bad" science or even non-science. But he says that if the plaintiffs can convince the court that creation science is not science — something many ACLU witnesses testified to in the early days of the trial—then making a case for creationism as religious dogma (as several theologians had testified) will be that much easier. Ennis emphasized there is nothing unconstitutional about teaching religious beliefs, especially in a course on anthropology, "but [public] schools can't teach religion under the guise of something else."

A ruling on the case by Judge Overton is expected soon. But since both the ACLU and State have announced their intent to appeal an adverse ruling, the question of whether "creation science" has a place in public schools will be likely to hang in limbo until the Supreme Court decides either to take up or to reject the case. In the meantime, the ACLU has filed suit against the State of Louisiana over a law—similar in most respects to Arkansas' Act 590—that passed there last July. □

University of Wales astronomer N. Chandra Wickramasinghe testified that his own interpretation of the structure of interstellar dust suggests the existence of a creator.



Laurie Fryklund/KARK-TV 4

EXCERPTS FROM ARKANSAS' ACT 590:

SECTION 1. Public schools within this State shall give balanced treatment to creation science and to evolution science. Balanced treatment to these two models shall be given in classroom lectures taken as a whole for each course.

SECTION 2. Treatment of either evolution science or creation science shall be limited to scientific evidences for each model and inferences from those scientific evidences, and must not include any religious instruction or references to religious writings.

SECTION 4. (a) "Creation science" means the scientific evidences for creation and inferences from those scientific evidences. Creation science includes ... evidences and related inferences that indicate: (1) sudden creation of the universe, energy, and life from nothing; (2) the insufficiency of mutation and natural selection in bringing about development of all living kinds from a single organism; (3) changes only within fixed limits of originally created kinds of plants and animals; (4) separate ancestry for man and apes; (5) explanation of the earth's geology by catastrophism, including the occurrence of a worldwide flood; and (6) a relatively recent inception of the earth and living kinds.

SECTION 5. This Act does not require any instruction in the subject of origins, but simply requires instruction in both scientific models (of evolution science and creation science) if public schools choose to teach either. This Act does not require each individual textbook or library book to give balanced treatment ...

SECTION 9. If any provision of this Act is held invalid, that invalidity shall not affect other provisions than can be applied in the absence of the invalidated provision.