SCIENCE NEWS®
The Weekly Newsmagazine of Science

A Science Service Publication
Volume 141, No. 25, June 20, 1992

SCIENCE NEWS (ISSN 0036-8423) is published weekly on Saturday, except the last week in December, for $39.50 for 1 year or $68.00 for 2 years (foreign postage $6.00 additional per year) by Science Service, Inc., 1719 N Street, N.W., Washington, DC 20036. Second-class postage paid at Washington, DC, and additional mailing office. **POSTMASTER:** Send address changes to SCIENCE NEWS, 231 West Center Street, Marion, OH 43305. Change of address: Four to six weeks' notice is required — old and new addresses, including zip codes, must be provided.

Editorial and Business Offices:
1719 N St., N.W., Washington, DC 20036
(202-785-2255)

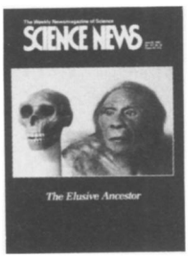
Subscription Department:
231 West Center Street, Marion, OH 43305
For new subscriptions only, call 1-800-247-2160.
For customer service, call 1-800-347-6969.

This Week

Research Notes

Articles

Cover: A reconstruction of *Homo erectus*, the immediate ancestor of modern humans, stands next to a cast of the skull on which it was based. Some anthropologists argue that *H. erectus* was a single species that spread across Africa, Asia and Europe; others see more than one species in fossils usually assigned to *H. erectus*; and a third group contends that *H. erectus* fossils actually belong to an ancient line of *H. sapiens*. (Photo: Bill Munns/*Other Origins* [R. Ciochon, J. Olsen and J. James, 1990, Bantam Books])



Departments

Letters

Twisted time travel

J. Richard Gott III's time-travel scenario ("Timely Questions," SN: 3/28/92, p.202) indeed looks inviting if twisting space-time can in some way contain closed "time-like curves," correctly pointed out by Stanley Deser to be nonphysical.

Stephen Hawking is closer to solving this conundrum by suggesting that if we could imagine our universe in only two dimensions and curved like the surface of a torus, one would have to travel along an inner edge of the ring to get to the opposite side. But if one could travel in three dimensions, one could cut straight across the inside of the torus — in other words, take a shortcut through an added dimension, A to B.

But let us for a moment suppose that the universe is an *inverted* torus, or what we might view as a three-dimensional Möbius strip. (To better visualize this, cut a 3-foot section of garden hose, twist one end clockwise 180° and seal the two ends together.) You can easily demonstrate that taking a shortcut across the inside of this inverted torus will take you beyond the interior dimension to its *other* side, A to C. Point B now is the long way home.

Finally, picture if you will an enormous black hole at the very center of this Möbius ring of galaxies we call our universe. What we assume to be ever-expanding galaxies may simply be a space-time illusion: galaxies simply revolving along with ours as we look across this entropic carousel.

G.F. Gravenson
Seattle, Wash.

"Timely Questions," with all its attendant paradoxes, brought to mind an elective I took in college in the early 1970s called "The Physics of Science Fiction." The professor offered a way around these problems by challenging an assumption implicit in almost every discussion of time travel I have ever seen: the idea that *the* past is *our* past.

We were asked to imagine a Flatland-style simplification in which our current expanding universe was confined to the surface of an inflating bubble. The point of origin of our universe, the place where the Big Bang occurred, is the center of the bubble — a place toward which we cannot point. (To do so correctly, we would have to poke our finger into "yesterday.")

Scientists do not believe in predestination. The present macroscopic state of our universe is the product of random (but physically allowable) events that trace a unique lineage back to the beginning of time. All future effects are determined, as much as possible, by current causes.

Therefore, if we imagine not a "bubble" model but an "onion" model (i.e., a multitude of nested, expanding universes), then each one must have its own individual, random se-

Letters continued on p. 411

drogen clouds (SN: 5/25/91, p.326).

No one knows the dimensions of any of these mysterious clouds, which could represent material that somehow failed to coalesce into galaxies. But the lensing properties of BR0952-01 may allow astronomers to gauge their size.

McMahon suggests that Hubble, and perhaps some ground-based telescopes, could analyze the spectrum of light from each quasar image. Light from each image stems from a different part of the quasar and takes a slightly different path to Earth. So, if light from both images carried the same fingerprint – the same absorption line – this would indicate that the hydrogen cloud was wide enough for both beams to pass through it. Similarly, if light from only one image contained a particular absorption line, it would mean that the cloud was smaller than the separation between the images. While arduous, such measurements promise to shed new light on the structure of these intriguing clouds, McMahon says.

In the meantime, he and his co-workers plan to extend the lensing survey to include their entire list of distant quasars. They expect to find that only a few additional quasars undergo lensing.

For McMahon, the cosmological implications of the study remain paramount. "We're detecting a universe that was much more lumpy [early on] than people had hypothesized," he says. □

Letters continued from p. 403

quence of evolution since the Big Bang. If we do not believe that events one hour hence are unalterably occurring "somewhere," why should we believe that the events of one hour ago are still "out there," controlling the future for the folks *two* hours ago? Each time span since the beginning has its own history – its own totally different universe.

It may be disheartening to accept that there is no place "over the rainbow" we might get back to where JFK is still alive or the Titanic sails the seas, and it is perhaps a little frightening to realize that, were we to slip a microsecond in time, there would be no United States, no Earth and no Milky Way (I think), but it sure solves a lot of time travel paradoxes. I will defer to larger brains to explain how time dilation fits into this model, and whether or not it works at all in non-Big Bang universes.

Charles D. Feldman
Lindenhurst, N.Y.

The laws of physics are descriptive, not prescriptive. They do not "allow" anything. Time travel to the past is not possible because time's arrow runs forward only. Because chemical and nuclear reactions can be reversed or because equations can be solved in either direction does not mean time goes in both directions. Just because with language (math or words) we *can* express truths does not mean language *must* express truths.

A solution to an equation is sensible only if it describes what actually is. We sometimes tend to forget this fact about "laws" of nature.

P.M. deLaubenfels
Corvallis, Ore.

Arsenic on tap

A recent assessment by the California Environmental Protection Agency ("Arsenic in water: Bigger cancer threat," SN: 4/18/92, p.253) revealed that the current federal guideline of 50 parts per billion of arsenic allowed in drinking water has a 1 in 100 chance of causing cancer. The study also indicated that this environmental hazard is just as serious as being exposed to radon gas or secondary cigarette smoke. The researchers believe that the current standard should be lowered. I most definitely agree.

The current U.S. EPA standard, established in 1976, is apparently outdated because it claims that the risk of developing skin cancer from our drinking water is 2.5 in 1,000. I hope the U.S. EPA will enact new guidelines immediately. If they do not respond soon, our population will continue to be exposed to harmful substances such as arsenic. The most obvious outcome is a major rise in the cancer rate.

Sheila A. Edwards
Sacramento, Calif.

Michael N. Bates and his co-workers at the University of California, Berkeley, have completed a new risk assessment for the ingestion of arsenic-contaminated water. Primarily on the basis of studies of people living on the southwest coast of Taiwan, they conclude in the March 1 AMERICAN JOURNAL OF EPIDEMIOLOGY: "... daily consumption of 1 liter of water containing arsenic at the current U.S. maximum contaminant level [50 ppb] might be associated with an increased lifetime cancer mortality risk of up to 1 in 100." – J. Raloff

Continued from p. 409

Rightmire's contention that a measurable split occurs between *H. erectus* and *H. sapiens*. Leigh examined 20 *H. erectus* skulls from Africa, China and Indonesia that span a broad time range, as well as 10 early *H. sapiens* skulls. Significant expansion of brain size from the oldest to the most recent specimens occurs in the latter group, whereas the three regional samples of *H. erectus* show no such increases, Leigh reports in the January AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY.

However, analysis of the Chinese and Indonesian skulls reveals substantial brain-size increases that do not necessarily coincide with Rightmire's view of an anatomically stable *H. erectus* inhabiting the entire Old World, Leigh points out.

The single-species view gets further ammunition from another study of 70 hominid craniums, mainly *H. erectus* and *H. sapiens* specimens. The seven derived features considered unique to Asian *H. erectus* by Peter Andrews also appear on many African fossils attributed to *H. erectus*, as well as on a significant number of *H. habilis* and early *H. sapiens* specimens, according to Gunter Brauer of the University of Hamburg, Germany, and Emma Mbua of the National Museums of Kenya in Nairobi.

Although additional anatomical features need study, cladistic procedures mistakenly assume that unique derived traits are either present or absent in all members of a species, Brauer and Mbua contend in the February JOURNAL OF HUMAN EVOLUTION. They emphasize Tattersall's point that the same derived features may occur to a greater or lesser extent in different hominid species. Investigators need better data on variations in the skeletal anatomy of living primates and fossil hominids, they conclude.

Some anthropologists take a dim view of the entire controversy surrounding hominid species. "These fights over species classification are somewhat of a waste of time," says Alan Mann of the University of Pennsylvania in Philadelphia. "Most researchers see *Homo erectus* as a single species that evolved into *Homo sapiens*."

Others argue that fossil bones provide too little evidence for teasing out hominid species.

"Fossil species are mental constructs," contends Glenn C. Conroy of Washington University in St. Louis, who directed an expedition that recently found an approximately 13-million-year-old primate jaw in southern Africa (SN: 6/29/91, p.405). "Cladistic approaches try to separate species out of a vast array of biological variability over a vast time range, and I don't think they're capable of doing that."

Conroy prefers to group hominid fossils into "grades," or related groups tied together by general signs of anatomical unity with no evidence of sharp breaks between species. Thus, an *Australopithecus* grade (which includes the more than 3-million-year-old "Lucy" and her kin) merges into a grade composed of *H. erectus* fossils and then shades into a *H. sapiens* grade, in Conroy's view.

"I'd put our limited funding into looking for new fossil primates or studying living primates, rather than pushing cladograms or arguing about the number of *Homo* species," he asserts.

But anthropologists wrangling over *H. erectus* and other hominid species find room for optimism amid their discord.

"The really interesting question isn't whether *H. erectus* existed," remarks William H. Kimbel of the Institute of Human Origins in Berkeley, Calif., a proponent of phylogenetic analysis. "For the first time in years, we're taking a step back and asking about the theories that underlie our work and the units we use to establish evolutionary relationships. It's a healthy sign that we're debating these questions vigorously." □