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Letters

Wrangling over the Bang

"State of the Universe" (SN: 4/13/91, p.232) is a very nice, succinct summary of our present knowledge of the universe. It is heart-warming to see the material presented in a correct, factual way. Ralph Alpher and I were especially pleased to see proper recognition for our very early work on the Big Bang.

Robert Herman
Astrophysicist
University of Texas
Austin, Texas

Ivars Peterson's article illustrates once again that explanations of the steady-state model are clear and demonstrable, while those of the Big Bang are incoherent and shrouded in mystery.

Scott Nicholson
Bradenton, Fla.

When Big Bang proponents make assertions such as "an expanding universe . . . very

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Cover: That smoky, charbroiled flavor adds zest even to the lowly hamburger. But environmental scientists have now indicted grilled meat — independent of the fuel used to cook it — as a significant and largely ignored source of the tiny, visibility-robbing particles that pollute urban air. (Photo: Janet Raloff)



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well verified observationally," "a whole bunch of observations that hang together" and "the evidence taken together . . . hangs together beautifully," they overlook observational facts that have been piling up for 25 years and that have now become overwhelming. Of course, if one ignores contradictory observations, one can claim to have an "elegant" or "robust" theory. But it isn't science.

One point at which our magicians attempt their sleight-of-hand is when they slide quickly from the Hubble, redshift-distance relation to redshift-velocity of expansion. There are now five or six whole classes of objects that violate this absolutely basic assumption. It really gives away the game to realize how observations of these crucial objects have been banned from the telescope and how their discussion has met with desperate attempts at suppression.

The alternative to the Big Bang is not, in my opinion, the steady state; it is instead the more general theory of continuous creation. Continuous creation can occur in bursts and epi-

sodes. These mini-bangs can produce all the wonderful element-building that Fred Hoyle discovered and contributed to cosmology. This kind of element and galaxy formation can take place within an unbounded, nonexpanding universe. It will also satisfy precisely the Friedmann solutions of general relativity. It can account very well for all the facts the Big Bang explains — and also for those devastating, contradictory observations which the Big Bang must, at all costs, pretend are not there.

Halton Arp
Astrophysicist
Max Planck Institute for Astrophysics
Munich, Germany

Cosmologist David Schramm has his analogies a bit mixed up when he says that the new discoveries of huge superclusters of galaxies cause no more problems for the Big Bang than our inability to predict tornadoes causes for

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Quarter-pound hamburgers fried until medium to well done spewed into the air roughly 7 milligrams of cholesterol per kilogram of meat. Extra-lean burgers charbroiled on the gas grill to the same doneness emitted roughly four times more cholesterol, and broiling the fattier meat released 72.7 mg/kg of airborne cholesterol — 10 times more than the fried hamburgers.

To arrive at a ballpark estimate of how this might translate into urban air pollution, the investigators went back to the 1979 EPA report. At that time, an estimated 9 percent of restaurant meats were charbroiled. Cass' group assumed that this percentage would also apply to Los Angeles restaurants and home cooks in 1982, when a Caltech student had collected the air samples they were studying. To keep things simple, the researchers assumed that all meat cooked in the Los Angeles area was ground beef.

By marrying their meat-smoke emissions data with published estimates of meat consumption in the metropolitan area, the team projected that fried and broiled meat released 25.6 to 30.4 kilograms of tiny cholesterol aerosols into the atmosphere daily over a highly urban 6,400-square-kilometer region centered on Los Angeles. When they went on to assay the cholesterol in their October 1982 air samples, they found concentra-

tions of 14.6 nanograms per meter cubed — or about double their ballpark prediction of what should be there.

That's actually a remarkably small difference, says Cass, especially when one considers that the October air sample was chosen for the comparison because it featured the biggest, clearest cholesterol "signature."

Cass, currently on sabbatical at the Massachusetts Institute of Technology, is studying the meat smoke's effects on bacteria as an initial rough gauge of its potential toxicity and mutagenicity in humans. While he has no findings yet, studies reported earlier this year by EPA epidemiologist Joel Schwartz indicate that fine particulates can play an important role in aggravating respiratory disease (SN: 4/6/91, p.212). Schwartz' analyses of data from five U.S. cities show that nonaccidental death rates in each of these cities tended to rise and fall in near lockstep with daily levels of fine particulates — but not with other pollutants.

Los Angeles' new lighter-fluid rule aims not at reducing particulates but at halving the emissions of hydrocarbon gases from backyard grilling, which contribute about 4 tons of hydrocarbons per day to the metropolitan area's seemingly intractable smog-ozone problem — the worst in the nation. However, the South Coast Air

Quality Management District may extend its hydrocarbon-control program to restaurant charbroiling operations, and may tack on requirements for filtering out particulates 10 microns and smaller, says Claudia Keith, an agency spokeswoman.

The Caltech group's June report may also give environment-minded carnivores an impetus to explore alternative hot-weather cooking methods, such as microwaving. Some might even decide to forgo broiled and fried meats altogether.

How about tabouli, cold poached salmon and perhaps a carrot salad lightly dressed with an olive-oil vinaigrette? □



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the idea that the Earth is round. The problem with the large-scale structure found in the universe is that it is clearly 10 times *older* than the 10 or 20 billion years the Big Bang theory allows for the age of the whole universe.

The vast ribbons of galaxies recently observed are separated by nearly a billion light-years of space. So to form them, matter has to travel half that distance, if the universe was originally smooth. But galaxies are observed to travel at only about 1/600th the speed of light, so the huge structures must have taken at least 200 billion years to form. Having 200-billion-year-old structures in a 20-billion-year-old universe causes the same sort of problems as having millions-of-years-old mountains in a biblical 6,000-year-old Earth.

*Eric J. Lerner
President, Lawrenceville Plasma Physics
Lawrenceville, N.J.*

Our continuing search for a beginning of the universe and for spatial boundaries, however remote, strongly suggests to me that man is inherently unable to understand and accept infinity. If we could do so, then I believe we could accept the idea that there was no beginning, no Big Bang, and that all of it has always been there. And that there are no limits.

*James Hartley
Columbus, Ind.*

When we discard the unnecessary assumption that the beginning had to occur at a single point in a finite space, we are left with the rather obvious alternative that the beginning actually occurred everywhere. If we conceive

of a "Super Bang" cosmology that occurs all at once, everywhere, we find that the change in perspective can explain all our observations without the problems of Big Bang theory.

*Tom Mandel
LaGrange, Ill.*

What if the Big Bang is really the Big Bust? Perhaps we need to view the evidence from the outside in. Maybe what we're seeing isn't a shock wave rolling outward but a transition front between a region of higher order and one that is more entropic. It might be that the redshifting of galaxies should be viewed as the deceleration of congealed energy into our three-dimensional universe rather than as the rapidly moving outer edge of an explosion.

*Paul A. Daugherty
Brandon, Fla.*

Could not the same linear distance-redshift relationship known as Hubble's law exist in the case of a contracting universe if the rates of contraction were exactly reversed from those assumed under the Big Bang theory?

*M.E. Renshaw
Portage, Mich.*

A Big Bang followed by a series of "after-shocks" might account for the lumpy structure of the universe. It's hard enough to detect the effects of the Big Bang with any kind of certainty; "Little Bangs" would surely be lost in the general background information.

*William E. White
Miami, Fla.*

It sounds to me like the conditions at the early stages of the Big Bang universe (a lot of

stuff in a small amount of space) are identical to the requirements for a black hole.

Supposedly, there is no explosion powerful enough to blast its way out of a black hole. Therefore, I suppose, we are living in a black hole.

*Tom Paskal
Montreal, Quebec*

The recent calls for a replacement to the Big Bang hypothesis at international conferences on plasma science and on magnetic fields in galaxies suggest that, for the first time in 30 years, the number of researchers working on alternative scenarios actually exceeds those actively working on the Big Bang. The latter, however, seem ignorant of this work.

*Anthony L. Peratt
Plasma Physicist
Los Alamos National Laboratory
Los Alamos, N.M.*

I was struck by a singular omission in your excellent article on the Big Bang controversy: There was no mention of the late George Gamow.

As a minor player in the cosmic-ray research of the 1950s, I can remember when Gamow, with his "Big Bang" theory, was the radical physicist scorned by most astrophysicists. Today's "elderly radicals" were then the Establishment, riding high with their "steady-state universe," as evidenced by the many papers by "Burbidge, Burbidge, Fowler & Hoyle." The Big Bang was pooh-poohed, and Gamow was characterized as "a writer of comic books."

*Robert E. McDaniel
Las Cruces, N.M.*