

# First Crisis In Cosmology Conference

## CCC-I

### Moncao, Portugal June 23-25

#### New Results Challenge Big Bang theory at Portugal Conference

For Immediate Release

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Three dozen physicists and astronomers reviewed the evidence for and against the Big Bang theory of the universe and alternatives to it at the first Crisis in Cosmology Conference in Moncao, Portugal, June 23-25. The conference, organized by the Alternative Cosmology Group, was a response to a flood of new observations that challenge the predictions of the Big Bang, the dominant theory of cosmology, and that have led increasing numbers of astronomers to think that the field has entered a crisis.

Important new data was presented at the conference for the first time. Observation on globular clusters analyzed by Riccardo Scarpa of the European Southern Observatory cast doubt on the existence of dark matter, a key component of the Big Bang theory. In the theory, dark matter, different from any observed on earth, is needed because the gravitational field provided by ordinary matter is too small to create the galaxies and clusters of galaxies observed in the 14 billion years since the Big Bang is supposed to have happened. The main evidence for dark matter is in the measurements of the rotation speeds of galaxies. These speeds, it is argued, imply the existence of more gravitating matter than can be accounted for by ordinary matter.

But Scarpa showed that in globular clusters of stars, where the Big Bang theory says there should be no dark matter, the same excessive velocities occur among the cluster stars. What's more, the deviation from the expected velocity always occurs when the acceleration due to gravity is at a certain critical value. "The results are much more consistent with the idea that there is some modification of gravitational force, than with the existence of dark matter," Scarpa concludes.

The very basis of the Big Bang, the expansion of the universe, was called into serious question by data presented by Eric Lerner of Lawrenceville Plasma Physics, the conference chair. The Big Bang theory produces strange predictions about the apparent size of objects, very different from those produced by a non-expanding universe. In ordinary, static space, objects appear smaller in proportion to their distance, and their surface brightness—brightness per unit area—appears to be a constant no matter how far away they are. But in the expanding universe, objects at large distance actually appear larger not smaller, and the surface brightness falls sharply with distance. Since the redshift of light is known to be proportional to distance, at least at low redshifts, the two predictions can be tested by comparing the surface brightness of galaxies at high and low redshift.

Lerner made this test using new data from the Hubble Ultra Deep Field images, which show the most distant known galaxies, up to a redshift of 6. The data showed that surface brightness was a constant with increasing redshift within small statistical uncertainties of a few percent, exactly in accord with the prediction of the non-expanding universe model. The Big Bang predictions that distant galaxies would appear to have hundreds of times less surface brightness was completely contradicted. "The data clearly show that the universe is not expanding, and that the redshift of light must be due to some other cause, perhaps in the properties of light itself", comments Lerner. "This also means that the universe that we can see is not limited in space or time—the most distant galaxies we see right now are 70 billion years old, much older than the supposed age of the Big Bang, and we will be able to see older and more distant ones with future telescopes."

A third new result also contradicted the idea that the universe is expanding. Astronomers have used supernovae as "standard candles" to measure distances and thus to measure the expansion of space itself. The idea is that by measuring the apparent brightness of supernovae at different redshifts, we are measuring the distance to supernovae at various times, thus measuring universal expansion. But Thomas Andrews, a retired engineer, compared the supernovae data, with data measuring the luminosity of the brightest galaxies in cluster of galaxies, a "standard candle" which had been widely used in astronomy up to fifteen years ago. He found that distance determined by supernovae and by the

brightest cluster galaxies contradicted each other if the expansion of the universe was assumed. The problem, Andrew found, lay in the basic assumption that pulses of light spread out as they traveled in an expanding universe, making distant events, like a supernovae explosion appear to take longer. When the data was re-analyzed without this assumption (assuming a non-expanding universe), the discrepancy between the distance determined with galaxies and supernovae disappeared.

Other scientists at the conference reviewed recently announced results that posed other serious challenges for the Big Bang. Francesco Sylos-Labini of the Enrico Fermi Institute showed how the ongoing Sloan Digital Sky Survey (SDSS) had found large scale structure so galaxies on scales up to 70 Mpc (210 million light years). With typical galaxy velocities being only 1/1500 the speed of light, it is very difficult to see how such large structures had time to form in the time since the Big Bang—they appear to be far older. One of the firmest prediction of the current “inflationary” Big Bang is that the fluctuations in the intensity of the cosmic microwave background at different points into the sky should be random. Yet a presentation by Glenn Starkman of Case Western Reserve University reviewed detailed analyses that demonstrate the fluctuations are far from random and are in fact aligned with structures in the nearby universe such as the local supercluster of galaxies and perhaps even with the plane of the solar system. Such alignments would contradict the concept, central to the Big Bang, that the background radiation originated in universal fireball and has been unchanged since then. Tom Van Flandren of Meta Research pointed out the growing gap between observations and Big Bang predictions of light element advances, another key test to the theory.

A second session of the conference dealt with conceptual and methodological difficulties in the conventional approach to cosmology. The Big Bang theory has long been characterized by an increasing array of hypothetical entities, like dark matter and dark energy that have been added to overcome contradictions with observation. Mike Disney of Cardiff University traced the history of the theory, demonstrating that the number of adjustable parameters in the theory always equaled or exceeded the number of measurable quantities, so that the theory makes few or no meaningful predictions. In a poster presentation, Geoffrey Burbidge of University of California, San Diego elaborated on the same point showing that at critical junctures, evidence claiming to verify Big Bang predictions in fact did not. Part of the problem, in the view of Timothy Eastman of Plasmas International, is the deductive methods used in cosmology that attempt to derive new “laws of the universe” mathematically, rather than focusing on what can be learned from observations with instruments that today return vast quantities of data. Another methodological problem highlighted by Donald Scott is that most cosmologists do not understand or correctly apply the physics of plasma—electrically conducting gases that constitute nearly all the matter in the universe.

Given the difficulties of the Big Bang, what are the alternatives? The third session of the conference turned to this topic, including a spirited defense of the Big Bang by Alain Blanchard of the Astrophysical Laboratory of Tarbes and Toulouse. Among the main alternatives presented were plasma cosmology, which postulates an evolving universe without a beginning in time, where electromagnetism is equally important to gravitation; various versions of steady-state, non-evolving universes; and expanding universes in which all objects, even small ones, expand together, so the universe never goes through a hot dense period. Many of these alternative models can explain and predict such key phenomena of the universe as large scale structure, the abundance of light elements, the cosmic microwave background and the Hubble relationship between redshift and distance. In discussion periods, a number of observational and laboratory tests were posed to distinguish between the models.

A final session of general discussion led to a lively debate on several points. One thing that became clear during the conference was that few participants were familiar with the all the fields needed to comprehend modern cosmology: plasma physics, general relativity and rival theories of gravitation, and the major facts of extra-galactic observations. Participants intensely discussed how the pervasive fear especially young researchers face in criticizing the Big Bang can be overcome, and the related problem of how funding, long denied to alternative cosmology research can be provided. The Alternative Cosmology Group will be attempting to raise money itself for funding selected research projects.

Some specific scientific questions also entered into the final discussion. For example participants argued over whether black holes could exist and one pointed to Einstein’s own reasoning that such objects would need an infinite amount of time to form, so could not exist in the real world.

There was general agreement that a similar, possibly larger conference should be planned for next year.

The conference received financial support from the University of Minho, The Institute for Advanced Studies at Austin, Domingos Silva Teixeira, the Fundação para a Ciência e a Tecnologia and the Luso-American Foundation. Details and program are available at <http://www.cosmology.info/2005conference/>.

Articles on the conference research will appear in New Scientist and Physics World, publication of the British Institute of Physics, among other publications. The proceedings of the conference will be published by the American Institute of Physics.

