

Luminous Arcs Discovered Between Galaxies

While surveying clusters of galaxies for other purposes, Roger Lynds of Kitt Peak National Observatory at the National Optical Astronomy Observatories in Tucson, Ariz., found two, possibly three examples of bright luminous arcs stretching between galaxies in three of the 58 clusters of galaxies he surveyed. The discovery of such intergalactic arcs is unprecedented. They were unknown before now, and what they are made of and how they got where they are remain mysteries, Lynds and theorist Vahe Petrosian of Stanford University told last week's meeting of the American Astronomical Society in Pasadena, Calif.

were stars blown out by a blast wave, they should form fragments of spherical shells, and they don't seem to. They seem like pieces of rope — or, as one scientist put it, sausages. Furthermore, such an explosion would require the energy of 100 million supernova explosions — the thermonuclear explosions of 100 million large stars — to drive it. Such an explosion should leave other evidence behind, and there is none of that.

If the arcs were dragged out of the galaxies in their clusters by some kind of tidal distortion by a mass in the center of each cluster, there would have to be a mass there equal to 100 trillion (10^{14}) suns, something many times larger than most galaxies. Moreover, the shape of the arcs is too smooth for them to have been made that way.

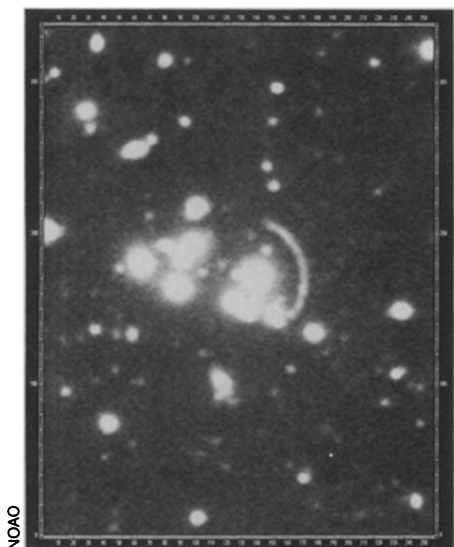
If the arcs were made of nonstellar matter — that is, if they were giant examples of the jets associated with quasars and some galaxies — they would have to be

strong radio emitters. One attempt to find radio waves from them came up negative, but that is not conclusive. However, such jets radiate by mechanisms that involve large amounts of highly energetic electrons. To energize jets of this size in that way, Petrosian estimates, would take the energy of a billion supernovas. The source of such energy should be obvious, and it isn't.

A fourth, less prominent possibility is that they are something primordial, left over from the time the galaxies formed. But there is not yet much theory about that one way or the other.

Future plans include looking for more examples of these jets, and trying to get their spectra. Lynds also says he would like to use the Very Large Array of radiotelescopes near Socorro, N.M., to see whether they show up as radio emitters. Future activity will also undoubtedly include some more theorizing.

— D.E.Thomsen



NOAO

Galaxy cluster 2242-02 with large arc.

The arcs are more than 100,000 parsecs (300,000 light-years) long, blue in color, sharply defined and shaped in almost perfect circular arcs. They are very luminous, with powers equal to 100 billion suns, but they are also very far from us.

The geometric perfection is especially intriguing, Lynds and Petrosian say, as nature rarely deals in such perfect shapes. "It's as if God took a piece of rope and bent it there," Petrosian says.

The blueness may indicate that the arcs are made of young stars. Young stars are blue; mature stars tend to be yellow or white. Spectra will tell whether there are stars in the arcs, or whether they are simply made of some luminous gas. So far the observers have not been able to obtain spectra, but that is one of their aims for the future.

Whether the arcs are made of stars or of other matter taken out of the galaxies or from the intergalactic space of the cluster, how they got where they are is another puzzle. Petrosian says the three most obvious possibilities don't work. If they

Cameroon lake: New clues, new clouds?

Just as final reports are being issued on the disaster that killed 1,746 people last August when an asphyxiating carbon dioxide cloud exploded from Lake Nyos in Cameroon (SN: 9/20/86, p.180), the lake may have been racked by three new explosions. On Dec. 30, according to the Associated Press, a French scientist reportedly observed the explosions, accompanied by light flashes, in the space of five minutes. No injuries or fatalities were reported.

However, according to Paul Krumpe at the U.S. Agency for International Development (AID) in Washington, D.C., that report does not completely jibe with information presented to the U.S. ambassador in Cameroon. "We're not sure exactly what has transpired, if anything," he told SCIENCE NEWS. "We've asked the embassy whether they'd like some technical assistance to evaluate what may or may not have happened."

While scientists who have studied the lake are puzzled by the reports of light flashes, they say the explosions, if confirmed, would be consistent with theories proposed to explain the August event. Studies have shown that the highly stratified lake contains high levels of dissolved carbon dioxide. Many scientists believe that something upset the stratification, causing a runaway degassing of the lake and the explosive eruption of the carbon dioxide cloud.

The Dec. 30 explosions may be "larger than what we would have predicted for this soon after the main August event,"

says volcanologist John Lockwood. But "we're loath to make any statement because we don't know what went on." Lockwood, at the Hawaiian Volcano Observatory on the island of Hawaii, was a member of the team sent to Cameroon by AID.

That team's final report on the August event is scheduled for release this week. Most noteworthy, according to scientists familiar with the report, is the team's resolution of the sulfide mystery: Scientists had speculated that hydrogen sulfide or other sulfur compounds were in the cloud because witnesses reported smelling rotten eggs or gunpowder, both of which have distinctive sulfur odors. Investigators also thought at first that the victims had been burned by sulfuric acid or other chemicals. However, geologists could find no measurable levels of sulfides in the lake.

Members of the medical team say they now believe the victims' skin lesions, probably similar to bedsores, developed because the people had been lying unconscious for many hours. And, they say, the thermal burns they observed came not from hot gases emitted from the lake, as some had speculated, but because some of the victims had become unconscious next to heat sources such as stoves.

Moreover, the AID researchers found past studies in which a large percentage of volunteers subjected to low levels of carbon dioxide had "olfactory hallucinations" in which they smelled sulfide