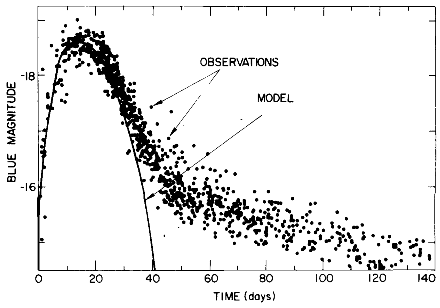
Illustrations: IBM

Chan, Lasher and Karp at computer.



Light prediction and observation.

20 days. Lasher explains that until the envelope expands for several days, most of the light created cannot escape because of electron scattering. The model then predicts a steady decrease of emerging light to practically nothing by 40 days.

The predicted intensity curve follows observed data almost exactly, with two exceptions: The initial burst of X-rays has never been detected, and after about 30 days, the light fades much more slowly than the simple model would lead one to expect. Lasher says this lingering "tail" is probably caused by additional energy coming from the collapsed core—now a pulsar—and that a colleague at the Watson Center, Charlotte Gordon, is attempting a mathematical model of that phenomenon. Detection of the X-ray burst will require new observations by astronomical satellites.

Previous models of supernova behavior have tended to yield only qualitative information about a wide range of phenomena, Lasher says. By concentrating on one aspect, his group has succeeded in generating quantitative estimates. Understanding supernova explosions is particularly important in the study of stellar evolution, since most heavy elements are thought to originate in stars (as opposed to being formed by the primordial "big bang") and to be liberated for use elsewhere by just such events. ☐

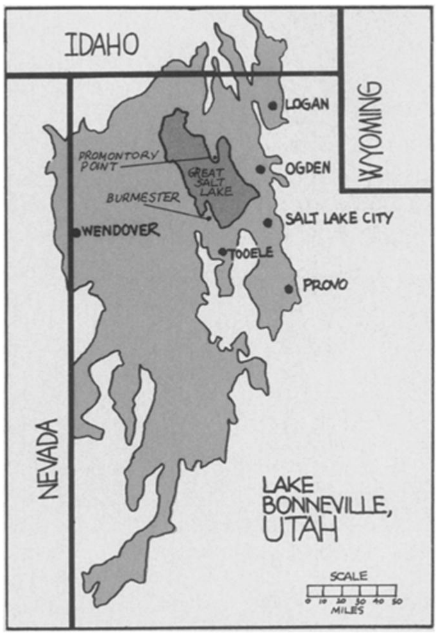
Lake Bonneville's cycles: Climate clues

The Great Salt Lake is the largest lake in the United States west of the Mississippi River, but it is just a salty drop in the bucket compared with its ancient predecessor, Lake Bonneville. At its maximum, 14,000 years ago, Lake Bonneville was 13 times larger than the present Great Salt Lake, sprawling over 19,750 square miles of northwestern Utah and parts of Nevada and Idaho. It was then 1,000 feet higher than it is now. Its waters covered the present sites of most of the large cities of Utah. It rose until its waters spilled over the basin rim at Red Rock Pass in present-day southern Idaho, creating a Niagara-sized river flowing into the Columbia and westward to the Pacific.

Actually there has been not just one Lake Bonneville but many. Time and time again this great intermontane lake has expanded and then shrunk again. Studies reported and reviewed at the Geological Society of America annual meeting in Salt Lake City show that the lake has gone through far more rise-and-fall cycles than previously thought. They also show that those fluctuations provide an excellent, and for some intervals, unsurpassed, record of the vast climate changes in North America in the last one million years.

Times of the lake's greatest extent coincide with periods of extensive glaciation in North America, when colder weather caused precipitation to exceed evaporation. The lake shrinks to its minimum levels during warm interglacial periods when the higher temperatures cause evaporation to exceed rainfall.

It was once thought that the ancient lake had gone through perhaps four or five cycles of expansion and retreat. The evidence collected in the last five years clearly reveals no fewer than 28 such cycles in the last 800,000 years. This lengthens the duration of the climatic record of Lake Bonneville by six times.



Science News

Bonneville dwarfed the present Salt Lake.

One key piece of evidence is a core obtained in 1970 by drilling from the surface to a depth of 307 meters on the south shore of Great Salt Lake near Burmester, Utah. University of Utah researchers (A.J. Eardley, et al) have analyzed the upper 110 meters of this paleomagnetically dated core to produce a detailed record of lake cycles (Geological Society of America Bulletin 84:211). Roger B. Morrison of the U.S. Geological Survey at Denver calls the Burmester core "one of the best climatic cores in the world from land."

The second line of evidence is above the surface, exposed stratigraphy at a gravel pit near South Promontory Point, Utah. Morrison considers this exposure, which he has studied extensively, an outstanding record, one that "surpasses any other" on the surface. "It has established many details of lake history that were previously totally unknown."

In general, deep cores provide a good record of when lake water was present or absent at any level and time; surface stratigraphy provides the clearest evidence of maximum levels of the lake.

Morrison has prepared a chart of lake cycles, not yet published, that shows more than 20 major lake cycles in the last 850,000 years, 10 of them farther back than 500,000 years ago. Included is the clearest picture yet of a group of three strong interglacial periods, with weak glacial periods, 600,000 to 700,000 years ago. "I know of no better record of this time in North America," says Morrison.

In more recent times, Morrison's record clearly shows the strong, well-defined glacial periods of approximately 125,000; 200,000; 300,000; 400,000 and 440,000 years ago, plus the more recent glacial advances of the last 100,000 years.

South of Salt Lake City in Little Cottonwood Canyon geologists have found intriguing direct proof that the lake's high levels coincided with times of maximum glaciation. There they have found glacier-deposited rocks interbedded with former lake deposits in such a way that the rocks had to have been rolled in wet lake mud. The glaciers virtually licked the edge of the expanded lake. "I know of no other place in the world that shows that relationship better," says Morrison.

All in all, the sediments along and beneath the shores of the Great Salt Lake are revealing a record of a prehistoric Lake Bonneville that has gone through many more oscillations than previously expected ("This surprised many people," says Morrison) and is simultaneously proving to be a valuable indicator, nearly akin to deep-sea-core records, of how climate has changed in North America in the last million years. ☐