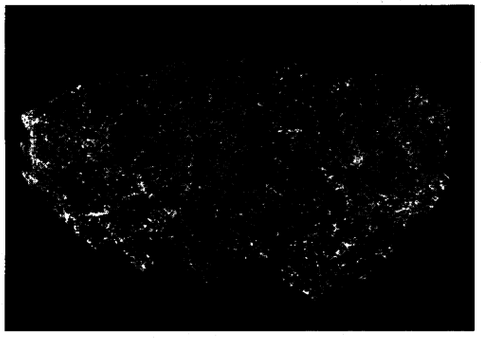
Astronomers to Map 1 Million Galaxies

Determined to create a cosmic Rand McNally atlas of unprecedented scope, astronomers from three institutions have banded together to perform a "digital sky survey" that will cover 100 times more of the universe than any previous map. The survey, which will take 10 years, will produce a three-dimensional map of 1 million galaxies and 100,000 quasars. It will also generate a two-dimensional color map of some 100 million additional galaxies, including many that are too faint to be included in the 3-D atlas.

"Nobody has ever made such an elegant and detailed map of the sky," declares University of Washington astronomer Bruce Margon, who is chairman of the Astrophysical Research Consortium (ARC),* which agreed on 20 November to sponsor the study by researchers at the University of Chicago, the Institute for Advanced Study, and Princeton University.

Costing an estimated $14 million—almost all of it private money raised by the participating universities—the survey will require a new 2.5-meter telescope designed to have a very wide field of view. The ARC plans to build the telescope atop Apache Point in New Mexico, next to a general-purpose 3.5-meter telescope that the consortium is already constructing there. The survey telescope will be equipped with a spectrograph capable of taking the spectra of 600 galaxies simultaneously, as well as a digital camera that can image the sky in swathes some 36 times the size of the full moon.



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What they're up against. *This 2-D map shows some 2 million galaxies.*

What motivates all this, says Richard Kron, director of Chicago's Yerkes Observatory, is the desire to understand the large-scale structure of the universe—the bizarre way that galaxies and clusters of galaxies seem to trace out the boundaries of empty-seeming "bubbles" and "voids" that are hundreds of millions of light years across. "Large-scale structure is the topic of the day" in cosmology, he says. So far no one has found a convincing explanation for it..

One problem with existing surveys is that they don't reach far enough. The best one to date, for example, comes from Margaret Geller and John Huchra of the Harvard-Smithsonian Center for Astrophysics. These researchers have spent the better part of a decade mapping the universe the hard way; they measure the redshifts of galaxies one by one and then use the Hubble equation to convert the redshifts to distances. Geller and Huchra have now turned those measurements into three-dimensional maps of thousands of galaxies out to a distance of some 500 million light years. And they are still finding structures such as the Great Wall, a vast, undulating membrane of galaxies that is so big they can't even see the edges. (*Science*, 17 November 1989, p. 885.) So for several years now, says Kron, there's been a consensus in the community that the only way to figure out what's going on is to expand the surveys dramatically—say to a million galaxies, covering a volume at least 100 times that of the Geller-Huchra survey.

Thus the ARC project, with its state-of-the-art technology for gulping down spectra by the hundreds. The 2.5-meter mirror is already on order, says Kron. The partners hope to have the telescope assembled and taking data by 1995. And they expect to have a 3-D map of the northern sky completed within 5 to 7 years after that.

"It's going to be a fundamental resource for astronomy," says Kron.

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* In addition to the institutions mentioned above, ARC includes the New Mexico State University, Washington State University, and the University of Washington.

Archeologist Cleared in California Case

Archeologist David Van Horn says he can't remember when he last had even a parking ticket, so he was stunned when his house was searched by police last summer and he was accused of being a felon. The charge: illegal possession of Indian remains and artifacts dug up the year before in the desert town of Indian Wells, California. Now a judge has thrown out the case, but archeologists believe the episode will have a chilling effect on paleo-Indian archeology in California. For Van Horn, the impact has been more than chilling: It's cost him $16,000 in legal fees.

The case began in May 1989 when Van Horn, who has a doctorate from the University of Pennsylvania, began what he thought was a routine job: to survey some land slated for construction to be sure no Indian artifacts would be destroyed. But his team found potsherds and charred bone fragments, most the size of a dime, and sent them to a lab at the University of California at Los Angeles to find out if the bones were human or animal. After the lab determined that a few of the bones might be prehistoric human remains, Van Horn notified the landowners, who reburied them and contacted the coroner's office and the state's Native American Heritage Commission, as required by state law.

But then the state attorney general's office heard about the find. It asked Riverside County Deputy District Attorney Rick Erwood to determine if Van Horn had violated a newly revised state law that makes it a felony to willfully obtain or possess Native American remains or artifacts taken from a grave. A search of Van Horn's house turned up potsherds that the district attorney believed had been removed from the Indian Wells burial site, and he slapped a felony charge on Van Horn and his employee for the possession of those artifacts—a crime punishable by up to 3 years in prison. Van Horn protested that the potsherds did not come from the gravesite at Indian Wells.

The case reached a climax in mid-November when a 3-day preliminary hearing was held in the Municipal Court in Indio, in a courtroom packed with California archeologists and expert witnesses. It ended when Judge B. J. Bjork ruled that evidence was "wholly lacking" that Van Horn illegally possessed remains or artifacts at any time. Judge Bjork accepted Van Horn's plea that the artifacts found in the district attorney's search didn't come from the grave, and he concluded that Van Horn didn't "willfully" remove the remains for analysis because he didn't know the bones were human when they were exhumed.

The decision came as a relief to archeologists, who passed around bumper stickers saying, "Archeology Is Not Dead." But they realize their problems are not over: "If I were to uncover human remains, I'd be afraid to do anything beyond calling the coroner and walking away," says Van Horn. "At that moment, archeology's all over." Especially since he'll be in an even bigger quandary the next time he comes across remains that aren't clearly human.

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