ASTRONOMY

New Dark-Matter Map Reveals Where Galaxies Gambol

AUSTIN, TEXAS—The most detailed map of dark matter ever made confirms that galaxies cluster together where the density of the mysterious dark stuff is highest. The new survey, which spanned a patch of space 16 million light-years across and required 5 days of observing time on the Hubble Space Telescope, also shows that galaxies affect one another most strongly on the outskirts of these high-density regions. "It's as if people move in from rural areas to city centers, and most interactions occur in the suburbs," says astronomer Meghan Gray of the University of Nottingham in the United Kingdom, a member of the team that made the map.

Space ghosts. In supercluster Abell 901/902, astronomers plotted concentrations of invisible mass (pink regions) from their effects on passing light.

Dark matter can't be seen, and no one knows what it is. But the gravity of a dark-matter clump slightly bends the light from faint galaxies in the background in a process known as weak lensing. Thus, a statistical analysis of the shapes of tens of thousands of remote background galaxies reveals the distribution of dark matter in the foreground. "It's a very, very weak effect," says team member Catherine Heymans of the University of British Columbia in Vancouver, Canada.

The new survey, presented here last week at the 211th meeting of the American Astronomical Society, was aimed at the relatively nearby supercluster Abell 901/902, 2.6 billion light-years from Earth. As predicted by current theories on cosmic evolution, dark-matter condensations within the supercluster appear to be the gravitational pits that galaxies fall into. Four particularly dense clumps (shown as pink blobs on the map) coincide with strong concentrations of galaxies. The map also confirms earlier indications that most galaxy interactions (such as tidal deformations and mergers) occur in regions with a moderate dark-matter density, on the outskirts of the densest blobs. Gray says galaxies in the dense cores may be shooting past one another too quickly for much interaction to take place there.

Physicist J. Anthony Tyson of the University of California, Davis, warns that many more clusters need to be studied before researchers can draw firm conclusions about how galaxies evolve and clusters grow. "I think we are witnessing only the beginning of an exciting exploration of the history of assembly of structures in the universe," says Tyson, who is also director of the planned Large Synoptic Survey Telescope (LSST) (*Science*, 27 August 2004, p. 1232). "LSST will survey an unprecedented volume of the universe, charting billions of galaxies back to when the universe was a quarter of its current age." Tyson expects the telescope, to be built in northern Chile, to be ready in 2014. **–GOVERT SCHILLING**

Govert Schilling is an astronomy writer in Amersfoort, the Netherlands.

EVOLUTIONARY GENETICS

Polynesians Took the Express Train Through Melanesia to the Pacific

The Polynesians who settled the far-flung islands of Remote Oceania several thousand years ago accomplished one of humanity's most rapid feats of colonization. But who were these early seafarers? Researchers have long debated various origins for them, from Taiwan to the islands of Melanesia.

Now, modern genetics has offered the most definitive answer yet. A study led by anthropologist Jonathan S. Friedlaender of Temple University in Philadelphia, Pennsylvania, indicates that Polynesians bear a much closer relationship to aboriginal inhabitants of Taiwan than to the Melanesian groups who occupied New Guinea and surrounding islands from 50,000 to 30,000 years ago.

The new study "makes excellent sense," says archaeologist Peter Bellwood of Australian National University in Canberra. It supports the "express train" theory, which posits that people from Taiwan moved rapidly through Melanesia, leaving little genetic footprint. Other ideas have included the "slow boat" hypothesis, in which the migrating Polynesians mixed with Melanesians on their way east. Then there is what has been called the "entangled bank" scenario, which holds that patterns of ancient migrations are too enmeshed to be accurately reconstructed (*Science*, 2 March 2001, p. 1735).

Until now, genetic studies have yielded conflicting answers. Data from mitochondrial DNA (solely from women) told of little interbreeding between Polynesians and Melanesians, but a Y chromosome study suggested extensive blending between the two.

The new study, reported online on 17 January in *PLoS Genetics*, is based on 890 genomic markers from the nuclear DNA of 952 people in 41 populations. The conclusion? "There was remarkably little genetic intermixture," says Friedlaender. Melanesians speaking Papuan languages—their own ancestral tongues—showed no sign of genetic contributions from Polynesians. Even among Melanesians sharing languages with Polynesians, there was minimal genetic mixing, never more than 20%. "When different peoples interact, … genes tend to be exchanged far less frequently than ideas and languages," concludes Friedlaender.

Geneticist and skeptic Martin Richards of the University of Leeds, U.K., says, however, that the researchers could not distinguish whether the Polynesians originated in Indonesia or Taiwan; he argues that the paper "does not really move the debate forward very much." But archaeologist Patrick Kirch of the University of California, Berkeley, calls the work "truly a major accomplishment." **–CONSTANCE HOLDEN**

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