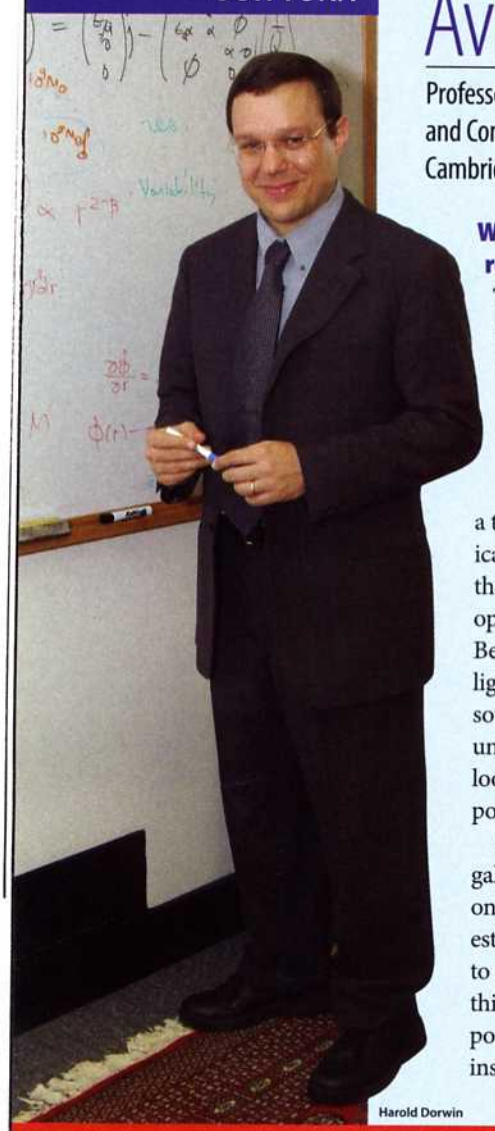
Astroconfidential

Go beyond the latest discovery, research, or theory and meet the professionals who make it all possible.

by Karri Ferron

OUR TURN



Harold Dorwin

Avi **Loeb**

Professor at Harvard University and director of the Institute for Theory and Computation of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts

What has been your favorite research area?

The first stars and galaxies. We know the universe was denser and hotter than the Milky Way or the Sun at early times, so these familiar objects couldn't have existed forever.

We are privileged to live in a time when we can explore critically the story of genesis (how the universe started and developed) with direct observations. Because of the finite time it takes light to travel to us from distant sources, we can see images of the universe when it was younger by looking deep into space through powerful telescopes.

I started to work on the first galaxies 2 decades ago when only a few theorists were interested in the field. It is gratifying to see an explosive evolution of this frontier now, with the potential of a wealth of new instruments under construction.

I just finished writing a popular book, *How Did the First Stars and Galaxies Form?* (Princeton University Press), that describes the latest developments in this field, which should come out in spring 2010.

What are some cool things you've done in your career?

In 1992, I was a postdoctoral fellow at Princeton. My neighbor, Andy Gould, was working on the phenomenon of gravitational microlensing by stars. One day I asked him, "Have you considered the effect of planets on the microlensing light curve?" Andy said, "No, but I suspect the effect would be small." An hour later, he rushed back to my office and said: "The effect is surprisingly large! Let's write a paper on the subject."

Today, microlensing is one of the major techniques used for discovering new planets and the only one that works at large distances across the galaxy.

Then, one morning in 2001, while taking a shower, I started wondering what the accelerated expansion of the universe might mean for future observers. Within a day, I submitted a short paper about it to *Physical Review* entitled "Long-Term Future of Extragalactic Astronomy."

My paper showed that as soon as the universe ages by a factor of 10, all the distant galaxies we now see will have exited from our horizon. The only galaxy visible to us will be the merger product of the Milky Way and Andromeda. This paper received a lot of attention in the media.

What do you like to do in your spare time?

I enjoy spending time with my two girls and wife and fixing things at home. I also enjoy watching the sky at night from our porch. It gives me the sense that we humans are too often preoccupied with ourselves. There is much more to the universe than meets the eye around us on Earth.

Astro**ideas** *Where is the study of galaxy evolution going?*

Quite a few puzzles confront astronomers studying galaxy evolution. Among them is why some galaxies have gassy, dusty disks that form stars while other galaxies lack disks and have not formed stars in billions of years. Could one type of galaxy evolve into the other?

Important clues come from galaxies whose spectra indicate recent, but not current, star formation. Their stars' positions and motions suggest these galaxies had disks that were disrupted in mergers with other galaxies. We are working to learn whether such mergers are the dominant mechanism by which many galaxies are similarly transformed. If mergers are important, then a lot of galaxy evolution must take place where mergers are most common, in gravitationally bound groups of galaxies somewhat more dense than our own Local Group.

Another way galaxies could evolve, especially in the early universe, is by accreting gas from their surroundings. This inflowing gas allows galaxies to form stars.

Unfortunately, it is difficult to measure inflowing or outflowing gas in a distant galaxy, at least using its brightest spectral line, because the path light takes at that wavelength in escaping the gas is ambiguous. My colleagues and I are using some of the world's biggest telescopes to detect other spectral lines that are cleaner tests of gas inflows and outflows. We hope to obtain new insight into the role of gas accretion in the development of galaxies.

Dennis Zaritsky; Abell 3266: Michael

Ann **Zabludoff**

Associate professor of astronomy at the University of Arizona in Tucson