The Other Side of the Story

IT HAPPENS every time. We publish an article about the latest discoveries in cosmology, and I get letters from readers asking why *Sky & Telescope* uncritically accepts the Big Bang theory and the existence of dark matter and dark energy. My correspondents scold the magazine for parroting the "party line" and inevitably ask, "Why don't you tell the other side of the story?"

The short answer is that the other side of the story is usually *wrong*. I'm not being arrogant here. I'm just saying that science is different from politics and most other topics covered by journalists. The universe is not subject to opinion. It is what it is, and it works the way it works, period. Our challenge is to understand it.

I *would* be arrogant if I suggested that when scientists ask nature a question, they always get the right answer on the first try. History is replete with counterexamples! But through repeated observing, experimenting, testing, and questioning, science eventually *does* get it right. History is replete with examples of that too!

In politics, there are two sides to every story. Not so in science.

How does all this apply to cosmology? Multiple, independent lines of evidence gleaned from studies of everything from subatomic particles to clusters of galaxies suggest that the universe began with the Big Bang 13.7 billion years ago, and that the ordinary matter and energy with which we're familiar make up only a tiny fraction of the total cosmic inventory. Do all physicists and astronomers accept this? No, but the overwhelming majority do, and that's good enough for us.

Most of the time, anyway. Occasionally an astrophysicist comes up with a piece of evidence or an idea that challenges the prevailing consensus. Such a thing rarely survives careful scrutiny by other researchers, but every now and then one does — and we publish something about it in *S&T*.

That's the case in this issue, where you'll find (beginning on page 30) an article about Modified Newtonian Dynamics. The brainchild of astronomer Mordehai Milgrom, MOND posits that when gravity gets really weak — as it does in the outskirts of galaxies — it no longer follows Isaac Newton's inverse-square law. This may seem like it was pulled from a hat, but it seems able to explain some key features of galaxy motions without recourse to extra gravity from exotic dark matter. To those who feel uncomfortable or dissatisfied with the notion that we're not made of the same stuff as most of the universe, MOND offers a possible way out.

In the past we've covered other challenges to the established paradigm. One example is astronomer Halton C. Arp's contention that high-redshift quasars are ejected from low-redshift galaxies. If true, the link between an extragalactic object's observed redshift and presumed distance would be broken, shaking the very foundation of observational cosmology.

NASA / HUBBLE HERITAGE TEAM (STSCI/AURA)

The accompanying image shows the poster child for this idea: the spiral galaxy NGC 4319 in Draco and, just to its south (lower left), the quasar Markarian 205. Ground-based images show a bridge of light between the two, which Arp has taken to mean a physical connection. The conventional interpretation of their widely different redshifts, however, says that the quasar is 14 times farther away than the galaxy. Now we know that the light bridge was an illusion, thanks to this exquisite view from the Hubble Space Telescope. And that's the way it usually goes as more and better data are accumulated: the conventional theory survives, and outlying data points are dismissed as artifacts or statistical flukes.

Will MOND go the way of Arp's mismatched redshifts? Probably, but who knows? We don't yet fully understand gravity, which physicists have tried for decades without success to unify with the other fundamental forces of nature via quantum mechanics. Maybe when gravity gets very weak, as it does on cosmic scales, quantum effects come into play and cause it to deviate from the usual inverse-square law. More likely, dark matter really *is* the answer. In any case, MOND forces us to think, and that's always good.

We don't accept *anything* uncritically at *S&T*. My philosophy mirrors that of Arthur Hays Sulzberger, former publisher of the *New York Times*, who said, "I believe in an open mind, but not so open that your brains fall out."

Rick Fienberg

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