Scientists

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He Thinks We're Alone Now

By Harold Henderson

The three planets that now circle Upsilon Andromedae—a faint star that rises in the east on fall evenings—travel in wildly varying elliptical orbits, moving from close to their sun to almost twice as far away. Northwestern astrophysicist Fred Rasio thinks this has a telling message for us. In an article published in *Nature* this year, Rasio, along with Verene Lystad and Eric Ford, argues that this pattern implies a missing fourth planet—and suggests that most planets aren't as stable or hospitable to life as ours is.

I gather it's not just Upsilon Andromedae—that most of the 150-plus planets recently discovered around other stars have very elongated orbits, quite unlike the nearly circular ones we're used to in our solar system.
Right after a star is formed you have a disk of ingredients—soot and gases—in orbit around it. These "leftovers" gradually clump together, a bit like the way dust accumulates on the floor.

You mean our planet is like a big dust bunny?
That's how it starts. Through many stages the clumps build up and get to the size of rocks and boulders—like the asteroids in the solar system. As they keep hitting and forming larger objects, eventually you get planets. At the end the various planets' orbits are nearly circular, because that's the only arrangement where they're no longer hitting each other.

So that's how our solar system came to be. The question is, does this apply to others?
Previous theorists only had this solar system to observe and explain. In the past ten years we've learned that the new extrasolar planets don't fit this picture. The vast majority of these new planets do not have circular orbits; they're highly eccentric.

So the one example we had to work on previously turns out to be weird.
We don't know just how weird, though. If we're special at the rate of 1 in 150, that's no big deal, considering there are 10 billion stars in this galaxy alone. But if we're special at the level of 1 in 100 million or more, that's a different matter.

How can we tell?
We're far from having explored much of even our own backyard. NASA's Kepler Mission, set to fly in 2007, will enable us to search for habitable extrasolar planets around 100,000 stars near the sun—a much larger sample than the few thousand that have been monitored so far.

Meanwhile, it would be nice to have an idea why the other planetary systems seen so far aren't like ours.
One explanation I proposed ten years ago is based on the idea that planets don't have to remain in stable orbits for billions of years.

In other words, they could evolve from that disk of gas and soot and still wind up with eccentric orbits?
People have worried about how stable our own solar system is. It turns out that if you play God with a model of it, you don't have to change very much to screw it up. One thing that keeps our system relatively stable is that we have only one big guy, Jupiter. If Saturn were as big as Jupiter, the long-term stability of the outer solar system could easily be compromised.

Their competition might destabilize, say, Neptune's orbit?
It might. Basically if two planets perturb each other enough that their orbits start crossing, that's when all hell breaks loose. And if a Neptune were to crash through here, the earth might be flung out into space, or hit another planet, or be propelled into the sun.

LLOYD DEGRANE

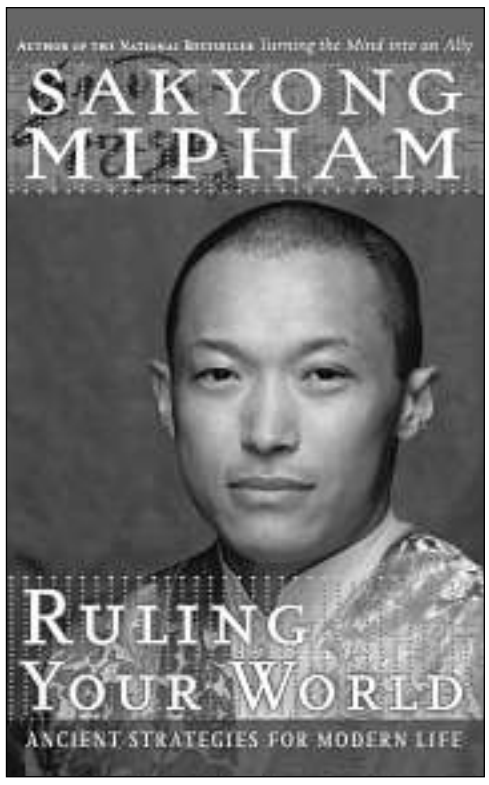
Fred Rasio

So the nontechnical part of your theory is that this kind of instability happens in many planetary systems, and we just lucked out?
Yes. The Upsilon Andromedae system has been observed in detail. We've been able to model its evolution—the first proof that this scenario actually happened, in which two planets tangle, and one is thrown out of the system altogether, leaving the other one in an eccentric orbit.

That's the "slingshot effect" sometimes used to speed up our own space-exploration vehicles?
Yes. Today we see three planets; the outer two have highly eccentric orbits, but the middle one has the extremely unusual property of going from eccentric back to a circular orbit every 7,000 years or so. The only way that could have come about is that after the fourth planet was thrown out, the outer planet's new eccentric orbit gradually perturbed the middle planet—not abruptly, but just enough to change it some. The system works as it does because there was no other violent event after the fourth planet was thrown out.

So we may be alone out here after all.
We know primitive life can exist in extremely harsh conditions. Perhaps in other systems an eccentric Jupiter, say, might have a moon where bacteria could live despite temperatures swerving from arctic to ovenlike because of its orbit. But to evolve from bacteria to intelligent beings takes a very long time and a lot more stable conditions. And that may not be very common at all.

Sakyong Mipham Rinpoche is a Tibetan lama and spiritual teacher of Shambhala Buddhist meditation practitioners throughout the world. He is appearing in Chicago to mark the publication of his new book, ***Ruling Your World***, the sequel to his best-selling book, ***Turning the Mind Into an Ally.***



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