Please Feed the Jays

by Jay Reynolds Freeman

Lassen National Park regulations prohibit feeding animals, so perhaps the Clark's nutcrackers are a sting operation. These handsome gray birds mooch with cheerful abandon and professional skill, here in the Bumpass Hell parking lot, 2.5 Km above sea level. They clearly expect regular hand-outs from passers-by, and won't abandon a good thing for mere rules. I cannot help but smile tolerantly at the antics of these clever corvids, for I share a name with many of their cousins -- the jays.

There is cause not to feed them. Human diseases affect many animals, and most of the food we provide is poor nutrition. Still, I admire the birds for trying: For all the harm we do to our less technically advanced neighbors, many of those who survive us best, do so by coexisting. I have raccoons and opossums under my back deck, rats in the roof, and squirrels and birds at the yard feeders. I would hate to deny a species the chance to survive by changing: I have more faith in their adaptability than in our good will.

Still grinning, I turn to my equipment. My Intes 15 cm Maksutov is one of the smallest telescopes at our club's 1997 Lassen expedition, but I have big plans for it. I am completing the full "Herschel list", chasing down all 2500 or so deep-sky objects found by the great observer, William Herschel, nearly two centuries ago. I have already logged the brighter half. Those that remain are delightfully difficult for a six-inch telescope.

With an hour to sunset, the sun slides behind the ridges to the west. We find Venus in binoculars, then with the naked eye, but Mercury remains elusive. Yet how wonderful to be reminded that day does not chase things of night away, it merely hides them: The sun does not make us see more, it makes us see less.

The remaining Herschel objects are of course nearly all galaxies, mostly in the third of the sky near the Virgo galaxy cluster, which now lies south and west at twilight. I want to log as many objects here as I can, before the sun's eastward march blocks my view for months.

Starting a month ago, I found the first sixty objects from brighter sites, like California's Fremont Peak State Park, or the San Francisco Peninsula hills above Palo Alto. Last night, from a lower parking lot at Lassen's Devastated Area, I found another fifty. Tonight, the dark

sky and far southwest horizon promise many more. Besides, a friend with a 30-cm Meade LX200 has set up next to me. I, too, am a Jay, so perhaps I can mooch a look through his telescope, if the viewing gets too tough or the fields too crowded for my small telescope.

Twilight does not descend: The shadow of the world rises from the east to engulf the heavens. I find the field of my first object while it is still invisible. Yet before long it appears, against a background darkened by 121x, even while the sky nearby remains faintly blue to the naked eye. The galaxies, too, are still there by day, when the harsh sun forces our attention to nearer objects and screens the wider truth beyond.

Soon full night is upon us, and the sky is wonderfully black and transparent. The rising Milky Way almost casts a shadow. The Pipe Nebula, the Pelican Nebula, and the North American Nebula are prominent to the naked eye -- I can see the Gulf of Mexico and the Florida Peninsula in the latter. The evening's joke is that if the stars went out, it might get really dark. Here in the wilderness, far from the glare and bustle of distant cities, the light of stars is almost all that remains. Only one shallow light dome lifts above the south horizon, from Chico, California.

I have grouped my targets by hour of right ascension, and sorted each group by declination, so I can start in the south and work north as objects sink toward the horizon. The galaxies are usually close together enough to star-hop between them without changing eyepieces. My friend with the big Meade helps: When two are close together, or when there is a dense cluster, it is hard to tell which is which without the larger aperture. I have long since surveyed most of the glare and bustle at the heart of Virgo cluster, to the depth of the Herschel list and beyond, but there are several outlying small groups which I have not looked at closely, like the ones centered on NGC 4266 or 4365. Here, as many as a dozen galaxies are visible in the 12-inch, at one time, with a 20 mm Nagler eyepiece. Perhaps these regions are the Chicos of the sky.

For all the 8000-foot altitude, my wool hat and down vest are enough to keep me warm in the calm air. I do not need the extra layers I sometimes wear at lower sites. I observe intensively, unbothered by cold. I quit after four hours, with eighty more objects logged. The next evening, at the Devastated Area again, I find almost fifty. On the final night, I return to Bumpass Hell. The Clark's nutcrackers are back, and I spot a red fox scavenging an abandoned sandwich from the edge of the parking lot. I log another fifty Herschel targets, then start the long drive home. I cruise down California's Great Valley in darkness, watching the dawn break clear. The entire Sierra Nevada, from

Mount Lassen to Mount Whitney, stands in violet silhouette against the eastern sky, as one by one the stars go slowly out.

Yet I cannot forget that the galaxies remain. The sea of space is replete with island universes, and I feel awash in the waves that break upon their shores. In four nights, I have looked at over 200 galaxies, from a catalog that emphasizes the large and bright. A big galaxy contains hundreds of billions of stars. In four nights, I have gazed upon the combined light of nearly ten to the fourteenth stars. The total number of galaxies in my logbook is about ten times as great. That's ten to the fifteenth stars -- a million billion suns. What can such a number mean? What should such a sight make me wonder about?

I wonder who is looking back. Some say no one. "Chance in a thousand million that any given star has a planet with intelligent life. Chance in a million million. Not likely to be any other civilizations in the Milky Way." Since I don't have to be so parochial, I'm not worried. If the odds are as good as a chance in a million million, it's a near certainty that somewhere, somehow, someone was looking back at me. Maybe I should have waved. If the odds are worse, no problem, there are lots more galaxies where those came from, all I need to do is buy a bigger telescope -- or mooch one.

The odds may not be so bad. Radio astronomer Frank Drake described something like a giant pinball machine. You launch stars into play, one at a time. Each cascades through an array of shiny pins, bouncing this way and that. If all the zigs and zags turn out just so, it falls into a bin labeled "Jackpot! Intelligent life here!" The rate at which stars reach that bin equals the rate they are put in play, times the probability that all the bounces come out exactly right.

In our own galaxy, the average rate of star formation, which Drake called "R", is about ten per year -- the rate at which stars enter play. The probability, "p", used to worry people -- no one had any idea how many stars had planets, or how many planets had life, and so on, and properly cautious assumptions set some of those probabilities very small. But the pins are bending. Spectrometric study of other stellar systems suggests that a substantial percentage of stars have planets. Strange structures in Martian meteorites, and the prospect of thermal vents warming ice-sheathed oceans of Europa, suggest that our own solar system harbors not one, but three, plausible locations for life. The heyday of Martians may be past, and if hypothetical Europan organisms have a day in the sun, it may lie in a distant aeon when Sol is warmer. Still, a win and two possibles in a single solar system makes me think that perhaps a substantial fraction of stars with planets, at some time have life on one of their worlds.

The trend toward complex behavior is broad in the animal kingdom. Horses and harvest mice use simple tools, as do my friends, the corvids. Some birds even make tools. Structure-building environment-modifying, albeit probably more instinctive than intellectual, is wider spread -- spider webs are good examples. There seem to be many ecological niches in which complex behavior promotes survival; thus I conjecture that a substantial fraction of life-bearing worlds eventually harbor something we might call intelligence. I speculate that one to ten percent of stars reach the "Jackpot!" bin.

How long does a star stay there? Suppose the lifetime, "L", of an intelligent civilization is 1000 years. Then, when you look, you see last year's jackpots, plus the year before's, and the year before that's, and so on back to 1000 years ago. Thus the number, "N", of extant civilizations is N = RpL -- and that, in a nutshell, is the famous "Drake equation". For our own galaxy, if you happen to agree with my numbers for R and p, it works out to N = 0.1 to 1 times L.

L is very uncertain. The only data we have, is us. We have been capable of interstellar radio communication for less than a hundred years. During much of that time it looked like we would blow ourselves up in atomic war by a week from Tuesday. If L is less than 100 years, technological civilizations are scarce, and most will be gone before we can know each other. Yet L might be larger in two ways.

First, who says we care just about technological civilizations? If we last long enough to go find them, it might be fun to meet folks with art or culture advanced enough to impress us. From the example of our own history, that might give L of 10000 or 20000 years -- back at least to the era of Lascaux Cave or the Solutrean laurel-leaf obsidian blades. Or, it might do to meet someone with intelligence that split the difference between us and the most advanced non-human terrestrials. I'm not sure who the latter are, but our ancestors had cranial capacity half way between chimpanzee and modern human, over a million years ago. L = 1000000 is more promising.

The second way to stretch L is more thought-provoking. Suppose a fraction of civilizations avoid a self-destructive phase, and live a really long time. It doesn't take a high percent of civilizations lasting a billion years, before the most common societies become old ones. What's more, they might have expanded notably. Even if the speed of light is unbeatable, that doesn't keep a billion-year civilization from exploring the Virgo galaxy cloud -- after all, it's only a few hundred million light years across. Look at it another way: If my numbers are correct, the ten to the fifteenth stars I have observed,

have produced at least ten to the thirteenth jackpots -- 10000000000000 intelligent civilizations. If just one lasted billions of years, it should long since have explored its galaxy, and many others, and be sitting in our laps right now.

So, where are they? That puzzle is the "Fermi Paradox": Physicist Enrico Fermi was the first to realize and articulate that even very rare long-lived civilizations could explore and influence a vast volume of space. For a long time, it was easy to use the Fermi Paradox as an argument that the probability "p", in the Drake equation, had to be tiny. If it weren't, "they" would have to be here, wouldn't they? That argument gets less tenable as discoveries bend the pinball pins, but the question remains: Where are they? It's enough to drive you crazy.

It's enough to make you think about the rules against feeding animals in Lassen National Park. I don't know if a billion-year-old civilization would have attitudes about conservation, the natural world, or preserving indigenous cultures, like we do, but a deliberate hands-off policy, imposed and enforced, is one way to explain away the Fermi Paradox. The trouble is, nobody asked me if I like a hands-off policy, and I don't. I would prefer to be a raccoon, or a corvid. Thank you very much, but I would rather rely on my own adaptability than on somebody else's good will. So if anybody out there is listening, I hope some of you are willing to sneak past the rangers. I hope some of you will come and feed the Jays.