

Astrobiology News June 2014:
Reflections on New Frontiers in Science & Philosophy

Earlier this month, I attended a very interesting conference that presented results of a grants and awards program led by University of Chicago astrophysicist Don York and funded by the Templeton Foundation.¹ *New Frontiers in Astronomy & Cosmology* highlights innovative research by scientists that could be classified as “high risk, high potential gain”. In this context, “high risk” refers to projects that often don’t get funded through typical government grant programs because of the speculative nature of the research, and the probability of a null result or one that fails to generate future productive lines of research. “High potential gain” means projects that could lead to revolutionary, paradigm-changing discoveries. Presentations included topics at the forefront of cosmology, such as multiverse and string theories, as well as the ongoing Search for Extraterrestrial Intelligence (SETI).

Since funding new observations solely directed at SETI is challenging, scientists are using archived data from large observing programs to search for signs of extraterrestrial technology in novel and creative ways. Even null results can lead to significant insights. For example, Penn State Astronomer, Jason Wright, noted that we could already rule out the presence of galaxy-spanning energy-hungry (Type III Kardashev) civilizations in relatively “nearby” galaxies, since the thermal waste from any such societies would be detectable in current infrared surveys². Of course all programs searching for signs of extraterrestrial technology must make certain assumptions about the civilizations themselves, and these assumptions are necessarily speculative given that we currently have only humanity as an example. One long-standing argument known as the “Fermi paradox” posits that advanced technological civilizations may be rare.

Nobel laureate physicist Enrico Fermi is perhaps best remembered for his work with the Manhattan project. Later in his career, Fermi worked at the Institute for Nuclear Studies at the University of Chicago, where he led investigations into the origin of high-energy cosmic rays. The Fermi National Accelerator Laboratory (or “Fermilab”), America’s premier particle physics laboratory, was named in Fermi’s honor in 1972. Perhaps less well known is a lunchtime remark Fermi made that scientists searching for extraterrestrial civilizations still ponder. Fermi argued that even with modest rocket technology, any civilization with imperialist tendencies or needs could “rapidly” (within 10 million years) colonize the entire Galaxy. Here “rapid” is with respect to our Galaxy’s 10-billion-year lifetime. So where is everybody? Even if you assume a broad range of speeds for hypothetical alien spacecraft, this argument is hard to get around. The SETI website likens it to debating whether the Spanish ships of the 16th century could travel at two knots or twenty – either way they could rapidly colonize the Americas. If anything, the argument is even stronger when you consider that the orbits of stars about the center of

¹ <http://www.newfrontiersinastronomy.org/>

² I wrote about the Kardashev scale in last September’s *Astrobiology News*. You can also check out <http://www.seti.org/media/hangouts/searching-for-kardashev-civilizations-with-wise>

our Galaxy bring them closer to different stars and parts of the Galaxy at different times, shortening the distances for any star-faring civilizations to spread through the Galaxy.

In the 1980s dozen of scientific papers were written that addressed the Fermi paradox using both technical and sociological arguments. Some possibilities are that technological civilizations are very rare, such that we may be the first to arise in our Galaxy, or the bleak possibility that civilizations destroy themselves before reaching an intra-galactic phase of technological development. Many stranger possibilities have also been proposed.³ Of course “very rare” doesn’t automatically translate to “nonexistent”. The part of the Universe we can observe contains hundreds of billions of galaxies and it is quite possible that the Universe is infinite in extent, so “very rare” might mean a vanishingly small possibility of actual communication or contact between civilizations due to the vast intergalactic distances in our expanding Universe!

Whether advanced civilizations really are rare, or whether our very human assumptions about the behaviors, motivations, and capabilities of other societies are in error, exploring these questions gives us new insights into what it means to be human. Science is very good at provoking deep and profound questions, which brings me back to the *New Frontiers* conference. One grant recipient presented a summary of a novel project that initiated round-table discussions between scientists and philosophers on a wide range of topics from climate change to a paper by a young physics and philosophy graduate student at the University of Grenoble entitled *Philosophical Reflections on the Reality of C-type Shock Waves*⁴ that amazed everyone! Attendees discovered (or maybe rediscovered), much to their surprise, that concepts developed in these two disciplines could enrich each other. So why aren’t more of these discussions taking place in academia? The obvious answer is a very simple one – lack of time. The demands of a highly specialized society don’t exactly encourage academics to devote significant time and energy to pondering abstract existential questions. Real progress in this area may come only once we’ve reached a quorum of scholars who recognize what the participants in this project learned – that we have valuable things to learn from each other. We may never recapture the days of the Renaissance Scholar, but perhaps we will eventually establish “Renaissance Communities”, where expertise in diverse disciplines will be “crowd-sourced” to expand human knowledge in ways we can’t presently imagine.

Stay tuned,

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³ See, for example, <http://io9.com/11-of-the-weirdest-solutions-to-the-fermi-paradox-456850746>

⁴ Sibylle Anderl: sibylleanderl.wordpress.com/cv,
<https://twitter.com/hashtag/newfrontiers>