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SPUTNIK AND SETI: UNITING EAST AND WEST

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The realization of spaceflight technology and the birth of modern SETI science were contemporaneous and interdependent developments. The impact of early Soviet space accomplishments upon Western society is well documented. Less well known are the parallel strides in the modern Search for Extra-Terrestrial Intelligence, made by Eastern and Western scientist in the years following Sputnik. This short paper presents one Western scientist's perspective on how the Space Age and the Age of Interstellar Contact have, over the past half century, brought our world closer together.

INTRODUCTION

In the "bad old days" of the Cold War, scientists in the United States and Western Europe were largely cut off from their Russian counterparts, and had little understanding of, or appreciation for, the great strides in space science being made in the Soviet state. The successful launch of Sputnik I, although announced in conjunction with the UN's 1957 International Geophysical Year, still caught Western scientists largely by surprise, spurring in their countries both great advances in education, and a re-evaluation of Russia's scientific and technological capabilities. Only years later, when their respective governments decided to wage peace, did Eastern and Western colleagues enter into a productive and collegial relationship. In recent years, Russian and European scientists have even developed a close cooperation regarding future space missions, the launch of space vehicles, and the development of future satellite elements and systems.

Educated in the United States, the author was a direct beneficiary of advances in American scientific and technological education that were largely a result of Western fears regarding Soviet technical superiority. "You are good at science; you are good at math," his high school guidance counsellor told him, post-Sputnik. "Go and become an engineer; we can never have enough engineers to catch up to the Russians."

Only quite recently, at the end of the Cold War, did the author finally have the opportunity to meet his anonymous Russian counterpart (one who had, for years, been keeping him employed, and vice-versa). This newfound brother related a similar tale. "You are good at science; you are good at math," his high school guidance counsellor had told him, post-Sputnik. "Go and become an engineer; we can never have enough engineers to keep ahead of the Americans."

Despite the regrettable fact that it brought the world to the brink of war on more than one occasion, the Space Race was largely a healthy competition, a backdrop against which mutual progress played out. SETI science, in contrast, was an enterprise largely neglected by governing bodies on both sides of the Iron Curtain. Hence, it evolved in something of a more cooperative environment, with Eastern and Western scientists communicating and collaborating across the geographic and ideological divide (to the extent that their respective governments would permit). This seems entirely appropriate, given that the overall objective of the SETI enterprise is to gain the admission of a united Earth into the galactic community.

COMMON ORIGINS

It is no coincidence that Sputnik and SETI were born mere months apart. As soon as humanity first realized its ages-old dream of space travel (albeit in close proximity to our home planet), we began grappling with the challenges of telemetry, tracking, communications, and control beyond Earth's atmosphere. It was instantly obvious to telecommunications engineers of the day that the very

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technologies needed to establish contact with our own craft in space could readily be applied to the larger problem of contact with distant civilizations farther out in space.

By fortuitous temporal coincidence, the great 76 meter diameter parabolic dish at Jodrell Bank, UK (then the world's largest and most sensitive radio telescope) was commissioned only months prior to the 4 October 1957 launch of the first Sputnik. This dish is, in fact, the first Western instrument known to have tracked and deduced the orbit of Earth's first artificial satellite. Jodrell Bank was also the very antenna which Western academics Giuseppi Cocconi and Philip Morrison had in mind, when they published their landmark paper "Searching for Interstellar Communication" in *Nature* [1]. From Jodrell Bank and similar instruments, the authors argued, humanity had finally attained the technological sophistication necessary to seek out intelligent, communicative civilizations inhabiting worlds warmed by the fires of distant suns.

Unbeknownst to Morrison and Cocconi, at the very time they were writing their seminal paper, at the United States' recently organized National Radio Astronomy Observatory NRAO), the newly minted radio astronomer Frank Drake was assembling equipment, preparing to conduct the very search which they were about to propose [2]. As Drake was observing in the utmost secrecy (not for reasons of national security, but rather out of concern for his professional reputation!), neither proponents nor practitioner knew anything about the other. However, once the Morrison and Cocconi article saw print, Drake was thrust into the limelight, as *Project Ozma* went public.

Whether our Russian counterparts were at the same time contemplating SETI science, we in the West had no knowledge. That particular bridge was not crossed until a year later, following what was arguably the world's first SETI scientific conference. Hosted at NRAO by Drake himself, the 1961 *Order of the Dolphin* meeting (the name chosen to as an acknowledgment of the challenges of inter-species communication, even between inhabitants of our own planet) brought together a small cadre of SETI enthusiasts from a variety of disciplines. One among them was the young planetary scientist Carl Sagan, who went home from the meeting to contact the distinguished Academician Iosif Shklovskii. Their resulting landmark publication "Intelligent Life in the Universe" [3] set the standard for SETI collaborations between East and West, even to the present day.

SETI VS CETI

Initially, the acronym selected to describe attempts at interstellar radio contact was CETI, for Communication with Extra-Terrestrial Intelligence. The name implied an ambitious agenda: dialog with our cosmic companions. The term CETI persisted in the Soviet block for some time, and is in fact still preferred by many Russian scientists to this day. However, in the West in the 1970s, a subtle shift in scientific thought was taking place. Interstellar distances, it was reasoned, were too vast immediately to support a two-way flow of information. Better, it was thought, to seek first those photons which had already been traversing the interstellar medium at the fastest of all possible speeds, which were even now washing upon our friendly shores. So, in the US and Europe, the whole enterprise became a receiving endeavour, renamed SETI, or *Search* for Extra-Terrestrial Intelligence.

The implications of this subtle difference go far beyond nomenclature. In the West, the prevalence of scientific opinion held that we should concentrate our efforts on reception of extant signals from (possibly) extinct civilizations. This perspective precluded transmissions from Earth into space (with but a single exception, to be delineated shortly). In the East, however, the desire for dialog persisted; thus, Eastern CETI scientists remained (and, in fact, remain to this day) much more open to the possibility of launching Earth's own signals into the black void of space.

The single exception to Western silence, to which I have alluded, occurred in 1974, when a single, brief but deliberate transmission into space was emitted from the 305 meter diameter Arecibo Radio Observatory in Puerto Rico, still the world's largest radio telescope. The instrument was just being recommissioned after a prolonged outage for engineering upgrades. The Director of the observatory was by now Frank Drake (the very same Drake who performed the world's first modern SETI experiment from NRAO in 1960, and hosted the first SETI conference there in 1961). As part of the dedication ceremony to mark the return of his great radio telescope to service, he crafted a clever digital message, and beamed it at the M13 cluster of stars, some 18,000 light years distant.

To this day, the Arecibo Message remains the only concentrated Western attempt at deliberate transmission to our cosmic colleagues. As shall be seen, Active SETI, or METI (Messaging to Extra-Terrestrial Intelligence) as it is now becoming known, is at present largely an Eastern enterprise.

THE SOUND OF SILENCE

For nearly half a century, SETI scientists have sifted through the cosmic static, in search of that elusive fish in the galactic pond. To date, not one single definitive example of an extraterrestrial transmission has yet been detected. Could it be that *they* are listening too, waiting for *us* to initiate contact? Might it be time to break our radio silence, and make some noise from Planet Earth?

The notion of terrestrial transmissions into space is not without controversy. Space is, it has been argued, a dangerous place, filled with malevolent aliens lurking everywhere, just waiting for an opportunity to devour our fledgling civilization. While this perspective may seem to rational minds more than a bit paranoid, in truth we cannot say that transmission from Earth is totally devoid of risk. No matter how minuscule that risk might be, it cannot cavalierly be disregarded.

Nevertheless, METI has its proponents, and they are mostly in the East. Over the past decade, from the Evpatoria radar telescope in Crimea, three deliberate transmissions from Earth have been beamed toward neighbouring stars. Cosmic Calls I and II, and the landmark Teenage Message, consisted of carefully crafted analogue and digital content, intended to convey to our cosmic neighbours something about Earth's technological and artistic sensibilities. Breaking planet Earth's radio silence, these three transmissions (and perhaps others to follow) represent the very best of Eastern and Western scientific collaboration. Funded by an American, these messages were designed by two French Canadians, and transmitted by a Russian scientist from a Ukrainian radar facility. Although the Evpatoria transmissions cannot pretend to speak for all of humanity, in a way they speak to humanity's aspirations.

REGULATION AND RESTRICTION

Despite the Arecibo and Evpatoria transmissions (or, more likely, *because* of them), there have been recent attempts to restrict and regulate transmissions from planet Earth. Within the International Academy of Astronautics (IAA) exists a SETI Permanent Study Group (SPSG) which grapples with such issues as international policy vis-à-vis SETI science. Proposals before the SPSG have of late included protocols establishing a moratorium on, if not an outright prohibition against, de novo transmissions from Earth to space.

Recognizing that not all possible transmissions subject Earth to equal exposure, the distinguished Hungarian astronomer Iván Almár has for the past three years been working on an analytical tool for quantifying the significance of transmissions from Earth. His resulting San Marino Scale (named for the small European republic where first it was proposed) is an integer, ordinal scale on the range of 1 to 10, which considers both signal intensity and information content. The author has been privileged to collaborate with Prof. Almár on the development of this analytical tool [4, 5].

Recently, the San Marino Scale has been invoked in developing a set of four case studies, quantifying the significance of four very different transmission modalities: the landmark 1974 Arecibo Messages, the more recent Evpatoria transmissions, near-Earth asteroid detection attempts from planetary protection radars, and the unconventional Invitation to ETI, an internet-based Active SETI experiment. On the one-to-ten ordinal San Marino Scale, these four examples weighed in at 8, 7, 6, and 4, respectively [6]. Clearly, this exercise has demonstrated, not all transmissions are created equal.

REGULATORY IMPLICATIONS

At its annual meeting in conjunction with the International Astronautical Congress in India in September 2007, SETI scientists embraced the San Marino scale as a rational first step in evaluating the impact of various transmissions from Earth. The IAA SPSG accepted it as the standard by which de novo transmissions should be measured, prior to establishing blanket policy in the arena of Active SETI. Their adopted resolution reads:

> "Resolved: that the SETI Permanent Study Group of the International Academy of Astronautics hereby adopts the San Marino Scale, as it now exists or may be modified in the future, as an accepted tool for analysis of transmissions from Earth."

It has been suggested that any proposed international regulations should consider quantification on the San Marino Scale of any given transmission. Below a value of four or so, the impact of a transmission might be considered negligible, not worthy of international consultation or restriction. Above a threshold value (perhaps in the area of eight or thereabouts), it can be argued, the implications of a transmission are sufficiently significant to justify regulation. Between these two extremes, each transmission from Earth should be evaluated on its individual merits.

EAST MEETS WEST

Like the space scientists who launched the first Sputnik, SETI scientists in the East and West share a common goal: to gain entry of our home world into the Galactic Community. We shall continue to seek reception of signals from the stars. We shall also, it is to be hoped, continue to craft clever messages, and to beam these to our cosmic companions. Through such collaborative efforts as the San Marino Scale, it is hoped, we can continue to bring order and reason to our international deliberations. Only by adopting rational standards, accepted by East and West alike, can we ever hope together to speak for planet Earth.

REFERENCES

1. Giuseppi Cocconi and Philip Morrison, "Searching for interstellar communications", *Nature*, **184**, pp.844-846, 1959.
2. Frank D. Drake and Dava Sobel, "*Is Anyone Out There?*", Dell Publishing, New York, 1994.
3. Iosef S. Shklovskii and Carl Sagan, "*Intelligent Life in the Universe*", Holden Day, San Francisco, 1966.
4. Iván Almár and H. Paul Shuch, "The San Marino Scale: a new analytical tool for assessing transmission risk", *Acta Astronautica*, **60**, p.5759, January 2007.
5. H. Paul Shuch and Iván Almár, "Shouting in the jungle: the SETI transmission debate", *JBIS*, **60**, pp.142-146, 2007.
6. H. Paul Shuch and Iván Almár, "Quantifying past transmissions using the San Marino scale", *58th International Astronautical Congress*, Hyderabad, India, 24-28 September 2007. Paper no. IAC-07-A4.2.04.

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