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SETI Tallinn-81
Communication With Terrestrial Intelligence

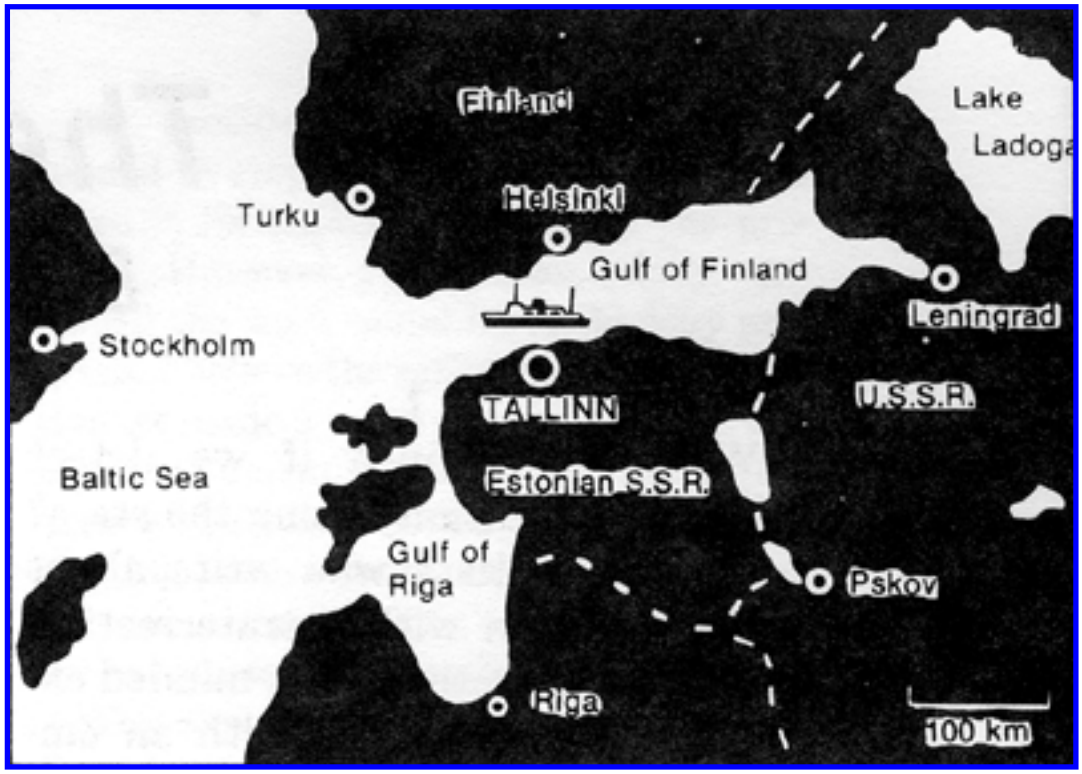
By: Frank Drake

Just ten years ago a remarkable international conference on SETI was held by the U. S. and U.S.S.R. National Academies of Science. That conference, at Byurakan, in Soviet Armenia, was a milestone in the history of SETI; it brought together for the first time the leading figures in SETI from the two countries which have most

actively pursued the subject. The discussions then gave guidance in both countries as to better approaches to SETI. Now ten years have flown by, and time for a new planet-wide SETI symposium. In response, from December 8-11 1981, the Soviet Academy of Sciences, along with several other Soviet groups, sponsored an "All-Union" SETI Symposium, and invited active SETI researchers from all over the world. Some thirty people from the United States were invited, but the shortage of travel funds and other obstacles prevented most from attending. Indeed, were it not for a timely travel grant from the Sloan Foundation, there would have been very few Americans present. In the end, a total of 10 Americans, of which I was one, attended this conference in another world and about other worlds.

The symposium was held in an unlikely place, Tallinn, in the Estonian Soviet Socialist Republic, not far from the Arctic Circle. It is one of the most northerly places on earth inhabited by a substantial number of humans and is an old city on the shores of the Baltic Sea.

It is cold; it snows every day, and it is dark, somewhat to the surprise of even the astronomers present. In December the first glimmers of dawn only show through the clouds about 9 in the morning, and the sun barely rises by about 10:30. It then hovers tentatively just over the southern horizon until it sets about 2:30. (Tallinn is on Daylight Saving Time!) By 4:00 the city is in total darkness, and the citizenry can be seen scurrying through the snowy streets bundled up in fur coats and caps. Nevertheless, life for us was not so grim. One of the reasons the symposium was held there is that it boasts two of the most modern and comfortable hotels in the Soviet Union, and as a result, living arrangements were much better than at Byurakan, although not elegant by American standards. There was also a practical benefit to the American participants; one can get to Tallinn by a direct flight to Helsinki, Finland, from either the West coast or the East coast, at "super-saver" fares. From Helsinki a luxurious ferry boat takes you to and from Tallinn in about 4 hours. This route of travel so reduced travel costs to the U.S.S.R. that there were about twice as many participants from the U.S. than otherwise could have been supported by the Sloan Foundation funds.



Delegates walking through old Tallinn.

Fortress towers of old Tallinn.

Tallinn from old city. New hotel where we stayed at upper left.

Once in Tallinn, we spent a non-stop three and one-half days attending the Symposium and hearing a deluge of papers on all aspects of SETI. Indeed, the total

number of participants was more than double the number at Byurakan, clear evidence of the growth of SETI in the scientific field. However, the number of Americans present was less than half that at Byurakan, while the number from the U.S.S.R. had more than doubled, to over a hundred, as best I could tell.

Two things were striking to the Americans present. One was the great respect paid to SETI and to science in general in the Soviet Union. When we arrived in port at Tallinn we were given priority treatment in passing through customs, which is a remarkable event in that country where customs agents are as hard-headed and unbending as anywhere in the world. That did not stop the agent who checked me from looking through every one of the six copies of "COSMOS" I had brought on behalf of Carl Sagan, or looking at every one of my slides, but it certainly was a chink in the System. Then, we found that everywhere we went we got priority treatment. The most heady spectacle was the police escort that was provided our bus every time we went anywhere, daytime or nighttime. This escort usually consisted of two "militia" cars, each with four uniformed men, who went slaloming ahead of us, lights flashing, to stop traffic at each intersection we came to, so that we could go relentlessly through stop signs and red lights.

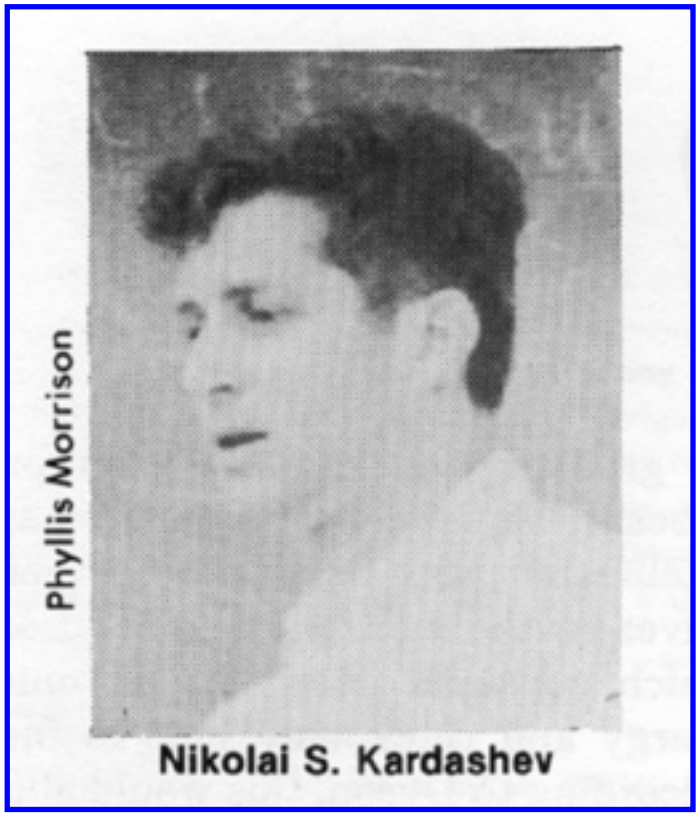
Another indication of the prestige of SETI was the presence at the meeting of four cosmonauts and one member of the Supreme Soviet, the equivalent of a Member of Congress. One cosmonaut, Vitaly Sevastianov, attended almost every session. He is one of the most reknowned of the cosmonauts, having flown in space three times, and in addition presents a popular science program shown on TV monthly throughout the Soviet Union. He is also President of one of the major chess clubs, is a gymnast, and turned out to be a friendly, extremely bright, and personable man. There were a large number of people from the press and TV present, and this in the end became a problem because of the almost rude competition which took place to obtain interviews with the visiting scientists. Several times the Americans wondered to each other if such a variety of displays of interest and support would ever occur in America.

The other striking phenomenon, which kept rearing up throughout the course of the symposium for SETI, was the difference in intellectual discipline between the American and Soviet studies of SETI. Somehow the level of peer review, interpersonal discussion and criticism, the weeding out of the unsound or spurious, has been very much greater in the U.S. than in the U.S.S.R. Over the years the subject of SETI has been debated and criticized over and over in the U.S., especially in

recent years through the workshops and symposiums organized by the SETI group at the Ames Research Center. Our thoughts on SETI have been thoroughly examined, and we are clear on what hypotheses can stand a swipe from Occam's Razor, what the potentials of real radio telescope search systems are, or what is speculative but still possible to embrace intellectually.

The many Soviet presentations led to the clear conclusion that there was far too little mutual contact, mutual criticism, and peer review in Soviet science. The papers ranged from excellent, to, well, preposterous; somehow no one had lowered the boom on those who violated the basic tenets of true science. It was clear that many of the senior Soviet scientists present were quite aware of this weakness and were somewhat embarrassed by it.

Thus, we heard a presentation which proposed that the ideal message to send to another civilization was $10^2 + 11^2 + 12^2 = 13^2 + 14^2$ because this was somehow mind-catching. It was pointed out that the above sum also equals 365, the number of days in a year (forgetting that the year is actually about 365.26 days), which is somehow significant; it was even suggested that the ETIs had adjusted the rotation of the earth to bring this striking equality about! We heard suggestions, based on some Viking pictures, that there are mammoth ETI-made monuments on Mars. There was talk about "paleo-contacts," in the venue of Von Daniken. It was proposed that super-civilizations would build solar-powered stations half way between their space colonies and their star in order to increase the thermodynamic efficiency of the solar cells employed. It was suggested that some unusual celestial objects, such as the object SS433, were the products of ETI. It was proposed that the "blue straggler" stars, were dying stars being kept alive by ETI, who are throwing hydrogen "logs" into them to keep the nuclear fires burning.



Amongst a great deal of this there were some important papers. I.S. Shklovsky, one of the SETI pioneers, voiced his worries that ETI may be very rare in the universe, and that evolution on the earth is at a dead end. Nikolai S. Kardashev gave arguments as to why the central portions of galaxies would be good regions for SETI searches. M. Ya. Marov, a leading planetary scientist, gave a careful analysis of the energy requirements of multistage relativistic rockets utilizing nuclear fusion reactors and suggesting that in the long run some limited programs using such rockets might make sense. Several papers examined the potentials of additional approaches to SETI other than the classical radio search. These included discussions of the problems of direct photography of planetary systems, infra-red emissions, astronometry, etc. The conclusions were similar to those in the U.S., namely that radio searches were the most promising for the detection of civilizations, while the optical search for perturbations of stellar proper motion were the most promising approach to the detection of other planetary systems. There also was considerable sentiment for a careful study of any peculiar infra-red source to determine if it just might be an artifact of some large-scale engineering enterprise.

There is an impressive and exciting program of major instrument construction in the Soviet Union. V.S. Troitsky, long a leading figure in the Soviet SETI program, described a new system to be built especially for SETI. It will utilize about 100 antennas of 1-meter diameter, operating at the famous 21-centmeter wavelength and

so designed as to allow continuous observation of all the celestial sphere which is above the horizon. The first portion of this system will go into service in 1982, and will provide a sensitivity about 1000 times better than has been available to Troitsky and his colleagues at Gorky. It will use up-to-date radio receivers.

A major approved project was described by Kardashev involving the construction of an extremely precise 70-meter fully-steerable parabolic telescope. Primarily for astrophysical study, the telescope will be placed on an excellent site at an elevation of about 2500 meters near Samarkand. Its surface will have an accuracy better than one millimeter. This is a $75 million project and will provide an instrumental capability far exceeding that available anywhere else. Measurements on a similar existing antenna have shown useful efficiency at even the shortest milimeter wavelengths. It is expected that the telescope will be finished within five years, and Kardashev hopes to devote a substantial portion of its time to SETI.

There is also a well-planned and impressive program to install and operate radio telescopes in space. This will commence with the second launching of a 10-meter telescope in a low orbit to be used primarily as an interferometer antenna paired with antennas on earth. Similar projects have been discussed in many countries, and offer great promise for the achievement of high-quality, high-resolution radio images of such objects as quasars and galactic nucleii [sic; "nucleii" should be "nuclei"]. In the long run such telescope systems may be the most powerful of all radio telescopes. There are already projects in the Soviet Union for more advanced systems of the same kind. These include the launching of similar antennas into higher orbits, so as to obtain better resolution, and the launching of a high-precision antenna which will operate well at wavelengths of 1 millimeter and less. Most grandiose is the plan to launch a large antenna instrumented on many frequencies into a highly elliptical orbit ranging from 2000 to about one million kilometers from earth. Not yet finalized are plans for a similar system which separations from the earth of several times the distance of the earth from the sun.

The American group at the symposium presented a package of succinct, highly informative papers which received a great deal of attention. Bernard Oliver, gave a very clever discussion of methods of transmitting interstellar signals in the form of pulses which would maximize signal-to-noise ratio, and suggested that we be alert to such transmission modes. A. Schwartzmann reviewed the hypotheses of the sociology of advanced civilizations, including such matters as space colonies and interstellar colonization. He is partial to the idea that civilizations have an ethic which

inhibits them from intervening in the affairs of other civilizations, and this may explain the lack of direct contact with the earth.

Jon Lomberg gave a fascinating talk about the design and contents of the interstellar message carried on a phonograph record by the Voyager spacecraft. This immediately made him very popular to all the Soviet participants, and particularly to the press! Woodruff Sullivan, gave an ingenious analysis of the effect of variations in the brightness of civilizations on search strategy, showing the advantages of searching close to the plane of the Milky Way galaxy.

Paul Horowitz described his design of a "suitcase" SETI system, a portable and inexpensive digital computer which is designed to perform SETI searches at a variety of telescopes. His system is almost ready for use. I described some mathematical formulations which can be used to judge the relative chances of success of different SETI programs. I also described hypotheses which suggest that searches might be best done at millimeter wavelengths (a conclusion independently reached by Kardashev), and suggested some approaches for building large millimeter wavelenth telescopes for SETI derived from our experiences at the Arecibo telescope.

George Gatewood, described his very impressive success in measuring stellar perturbation far more accurately than heretofore, and his success in making a very old refracting telescope in Pittsburg, [sic; "Pittsburg" should be "Pittsburgh"; the telescope is located at the Allegheny Observatory of the University of Pittsburgh in Pennsylvania], of all places, perform so well that it should detect other planetary systems in only a few years. This work seems to represent a real breakthrough in the problem of detecting other planetary systems.

Robert Dixon gave an excellent and detailed description of the results of the long-term SETI program which has been carried out with the large radio telescope of the Ohio State University. Many useful lessons have come from his experiences, as well as the very tantalizing signals from somewhere in the sky, however, it is not possible yet to say if they came from the sky of earth or the skies of some other worlds. The need for more analysis equipment is evident, and every one wished that the means to procure it would be found.

Jill Tarter, presented a quantitative description of the "Cosmic Haystack" the combination of dimensions which must be searched for SETI signals. These include

directions in the sky, frequencies, signal levels, band-width and transmission time. She showed how far past searches have delved into the "haystack" and demonstrated that we have a long way to go to find the needle. Samual Gulkis [sic; "Samual Gulkis" should be "Samuel Gulkis"] described the planned NASA SETI program, the program which recently lost its funding due to actions of the U.S. Congress.

Finally, as the concluding contribution to the program, Jill Tarter gave a careful and thorough review of all the SETI programs carried out anywhere in the world up to the present. From this it was very clear that there has been a great deal of activity in SETI. At the same time we have a long way to go before we can say realistically that we have searched the cosmos with a diligence which is deserving of sucess.

As a final order of business, the Soviet participants prepared a resolution to their own government concerning SETI. This was a balanced, well-reasoned document which presented a realistic and strong case for major support for SETI projects in the U.S.S.R. It also evoked the only political discussion of the entire symposium. Buried in the resolution, very innocently it seemed to me, was a statement condemning extremist or fanatical position, either pro-SETI or anti-SETI. Shklovsky was very irritated by this, taking it as an attack on his point of view and, surprisingly, to the Americans at least, as a threat to his freedom of thought. He gave an impassioned speech reminding the participants of the Lysenko affair, where science was run by government fiat rather than true scientific principles, and suggested that the offensive statement smacked of a return to such a bad approach. There seemed to be much sympathy for him, but the statement in question stayed in the resolution which was passed unanimously.

After the sun had set on this last day of the conference, the Americans met with Kardashev, Troitsky, and a few others to discuss possible joint programs in SETI. Everyone agreed that this was a good idea, since it would allow the sharing of resources — Soviet telescopes and American computer know-how. It would reduce costs, and bring more minds to bear on the problem. Sad to say, we from America could only speak tentatively, for there is now no SETI program in America and all major funding for SETI is stopped, at least for the present. Whereas the leading Soviet astronomers were in a position to offer concrete plans and tentative commitment, we could only indulge in wishful thinking. We had to leave these possibilities up in the air, to be taken up seriously at such time as SETI becomes an American endeavor again. For us there was an air of disappointment to this: to have come so far, to have shared facts, exciting possible projects and dreams, and then, much like the extraterrestrial creatures in "Close Encounters of the Third Kind," to do

no more than turn away and walk silently into the darkness.

The time had flown, and now there was only time for hurried good-byes and a quick bus ride through the snowy night to the waiting ship. Only a few hours later there would be the lights of Helsinki, and then glimpses of Iceland and Greenland, and then the sun and warmth of California for some of us.

Even though much of what took place at Tallinn seems a dream, one thing at least is very real: *Despite the varied civilizations and ways of life which abide on the earth, there are everywhere brilliant people who want to make the enormous effort to find inteligent life out there.*

Photos not otherwise credited are by Frank Drake.

This issue was held for Frank Drake's report which he telephoned on his return to Ithaca.

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