

# Bioastronomy - The Next Steps

**George Marx**  
(editor)



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# BIOASTRONOMY- THE NEXT STEPS

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## WELCOME

George Marx

vice-chairman, IAU Commission 51: Bioastronomy

People were and are busy in solving their immediate everyday problems. They do not think that our world is the best one among all the possible worlds. Experiencing the difficulties and mischiefs of terrestrial existence, philosophers of each age *dreamt* about people living beyond Earth. Lucretius, Giordano Bruno, Cyrano de Bergerac, Johannes Kepler, H.G. Wells used the dreamworlds beyond to express their criticism with respect to our society. The present era of high technology made science fiction especially popular, mainly because newspapers and television made the vocabulary and technology of astronomy and astronautics known to the public. Instead of the medieval ghosts and witches simpleminded persons are willing to see U.F.O.-s and E.T-s. The young people are eager to join imaginary space missions (by books and videogames), because they anticipate their future in such ventures.

As a result of the achievements of atomic physics, molecular biology and new technology, science can treat the great problems of the origins of stars, planets, elements, molecules, life in a more exact way. We may ask about the possibilities and we may dare to give *logical* answers to these questions. The search for alien life and intelligence is not only ivory tower science, not only romantic escapism from everyday's difficulties. Nowadays the mankind faces the global threats of population explosion, environmental pollution, runaway greenhouse effect, nuclear armament. Our future looks less certain than it did in more optimistic eras like at the end of the last century. Is intelligence a transient unstable phenomenon in the Universe, a dead end, like the exaggerated muscular size of the dinosaur was? Or has intelligence an absolute evolutionary advantage, which enables man to think rationally: not only to anticipate, but to shape future? Can we survive technology?

To understand these problems, to explore their solutions, we have to develop global models. Global models, however, can be tested only by making comparisons with other planets, atmospheres - possibly by alien biospheres and cultures. "I LOVE E.T." - is printed on the T-shirts of this Colloquium. Extraterrestrial intelligence is a relevant question for science, because scientists are concerned about terrestrial intelligence. For this reason the topics of the IAU Colloquium 99 is not only of public and scientific, but - in a wider sense - also of political interest: Bioastronomy may offer a mirror in which we may learn to know ourselves, to understand our place and role on Earth.

In the name of the host institutions - the sponsoring Hungarian Academy of Sciences and the organizing Roland Eötvös University - I offer a most cordial welcome to you, who have come from different cultures but who have the destiny to coexist on a small planet.

## FERMI'S QUESTION

Sir Francis Crick, the Nobel-laureate discoverer of the DNA structure recounts in his book "The Life Itself":

*The Italian physicist, Enrico Fermi, was a man with outstanding talents. It was Fermi and his Hungarian friend, Leo Szilard, who directed the design and construction of the first atomic pile. Fermi was credited with asking famous questions. There is a long preamble to Fermi's questions, rather like a shaggy dog story. It goes something like this: The universe is vast, containing myriads of stars, many of them not unlike our Sun. Our own galaxy has perhaps 100 billions of stars and there are at least 10 billion galaxies and probably more. Many of these stars are likely to have planets, a fair fraction of these planets will have liquid water on their surface and a gaseous atmosphere made up of simple compounds of carbon, nitrogen, oxygen and hydrogen. The energy pouring down from the star will cause the synthesis of numerous small organic compounds, thus turning the ocean into a thin, warm soup. These chemicals will eventually join onto each other and interact in an intricate way to produce a self-reproducing system, a primitive form of life. The simple living things will multiply, evolve by natural selection and become more complicated till eventually active, thinking creatures will emerge. Civilization, science and technology will follow and before long they will have mastered the entire environment of their planet. Then, yearning for fresh worlds to conquer, they will learn to travel to neighboring planets and then to planets of neighboring stars, choosing for their colonization those with favorable environments. Eventually they should spread all over the galaxy, exploring it as they go. These highly exceptional and talented people could hardly overlook such a beautiful place as our Earth, with its ample supply of water and organic compounds, its favorable temperature range and all its other advantages. "And so," Fermi would say, coming to his overwhelming questions, "if all this has been happening they should have arrived here by now, so w h e r e a r e t h e y ?" It was Leo Szilard, a man with an impish sense of humor, who supplied the perfect reply to Fermi's rhetoric. "They are among us," he said, "but they speak Hungarian."*

# THE HISTORY OF IAA SETI COMMITTEE

Iván Almár

vice-chairman, IAA SETI Committee

**ABSTRACT.** The International Academy of Astronautics is fostering since 1965 activities aimed at establishing communication with extraterrestrial intelligence.

Twenty seven years ago the first scientific CETI program i.e. Project OZMA was initiated by our present chairman, dr. F. Drake. Also in 1960, another historical event took place: the International Academy of Astronautics was founded by T. von Kármán, the world famous pioneer of rocketry and astronautics. Von Kármán was born here in Hungary. He was always a strong supporter of new and bold ideas in science and technology, as well as of international cooperation. No wonder that his academy, the IAA has, from the beginning, given a forum to those imaginative people who wanted to establish the scientific basis for communication with extraterrestrial intelligence.

CETI - the concept and the word itself - was introduced into the IAA by Prof. R. Pešek in 1965, when the Board of Trustees suggested holding a 3 day symposium on the subject, either during one of the IAF congresses, or separately [1]. Prof. Pešek was charged with starting this organization. After an all-round inquiry to 50 scientists (16 of the 26 responses supported the symposium) the Board of Trustees accepted the idea and formed a special study group with the following members:

R. Pešek (chairman), C.J. Clemenson, V.L. Ginzburg, A.G. Haley, E.B. Konecni, J.S. Shklovskii, F.L. Whipple (S.M. Beresford and F.I. Ordway joined later)

This group, which held its first and only meeting during the Madrid congress of IAF on 10th October 1966, should be considered as the first international body dealing with CETI, and as the progenitor of our present SETI Committee of the IAA as well. The study group was reorganized in 1967 as Organizing Committee with the following members:

R. Pešek (chairman), C.J. Clemenson, F.D. Drake, E.B. Konecni, B. Lowell, P.M. Morrison, F.I. Ordway, C. Sagan, J.S. Shklovskii, M. Subotowicz

It held its first meeting in 1967 during the Belgrade congress of the IAF.

After some years of negotiations, the planned symposium was replaced

by a Soviet-American Conference on CETI (Byurakan, 5-11 September 1971). The IAA CETI Organizing Committee, at its 1971 meeting, cancelled the planned symposium and decided to organize a half-day "CETI Review Meeting" during the next IAF congress in Vienna. It was a real milestone in the history of the committee, which has since 1971 been always involved in the selection of papers for subsequent IAF congresses. The review meetings held regularly each year continue to give a unique opportunity to outline CETI-research on a truly international basis. They have generally enjoyed a large audience, and have provided one or more papers for publication in the official journal of the academy - *Acta Astronautica*. In 1979 a special issue of *Acta Astronautica* was devoted to the topic of CETI.

Only 5 papers were presented in 1972, but the number of CETI papers soon increased to the point where it proved to be necessary to have two half-day sessions. The first session is usually devoted to papers discussing the fundamental scientific basis for SETI, the second focusing more on the technology and strategies. Some papers of fundamental importance have been presented, such as the description of the SETI program of NASA, new proposals of unconventional and microwave methods, parasitic searches for extraterrestrial intelligence, the idea of a galactic belt of intelligent life, etc. I still remember the exciting discussion between Prof. Shklovskii and other CETI authorities in Prague (1977) on the strategy of searching for extraterrestrial civilizations.

This year (1987) we have 2½ sessions for CETI, one of them devoted entirely to the formulation of an international protocol for activities following the detection of a signal from extraterrestrial intelligence. The number of CETI papers increased each year (Fig. 1), demonstrating the growing interest of scientists in this rather "exotic" topic. Since the total number of papers presented in all sessions of an IAF congress is essentially constant, CETI has obviously gained importance.

The organizing committee was renamed "Standing Committee" in 1974 and the following membership list was accepted:

R. Pešek (chairman), J. Billingham, C.J. Clemenson, V.V. Gogosov,  
A.T. Lawton, G. Marx, C. Ponnampertuma, M. Subotowicz

The Committee has grown in size since then and has been strengthened by the addition of several members actively involved in recent observational programs. They come primarily from Section 1 of IAA, but qualified members of other sections, as well as others who may not be members of the academy are also included [2]. Members are appointed to 3 year terms and may be appointed for a second 3 year term.

The present Committee consists of

R. Pešek (honorary chairman and founder)

J. Billingham (chairman)

I. Almár (co-chairman)

J. Tarter (vice chairman)

and 28 members.

It is clear that the annual opportunities for interchange and discussion afforded by the review sessions greatly enhanced the possibilities for international cooperation. Such initiatives have been discussed from time to time and reported to the Academy. The Committee formulated, as one of its aims, to coordinate national CETI programs and to incite the interest



of the United Nations in CETI. In 1982 the United Nations published "The World in Space" based on the Unispace'82 meeting; the section on SETI was written primarily by members of the Committee.

The activity of our Committee was not restricted to the organization of the review meetings. The Committee

- sponsored the regular publication of a SETI/CETI bibliography in JBIS,
- prepared the annual report on CETI for submission to IAA,
- organized or cosponsored several international conferences on SETI (like a special evening session during the Toulouse congress of COSPAR last year, or the small educational SETI meeting held in December 1985 in Sri Lanka).

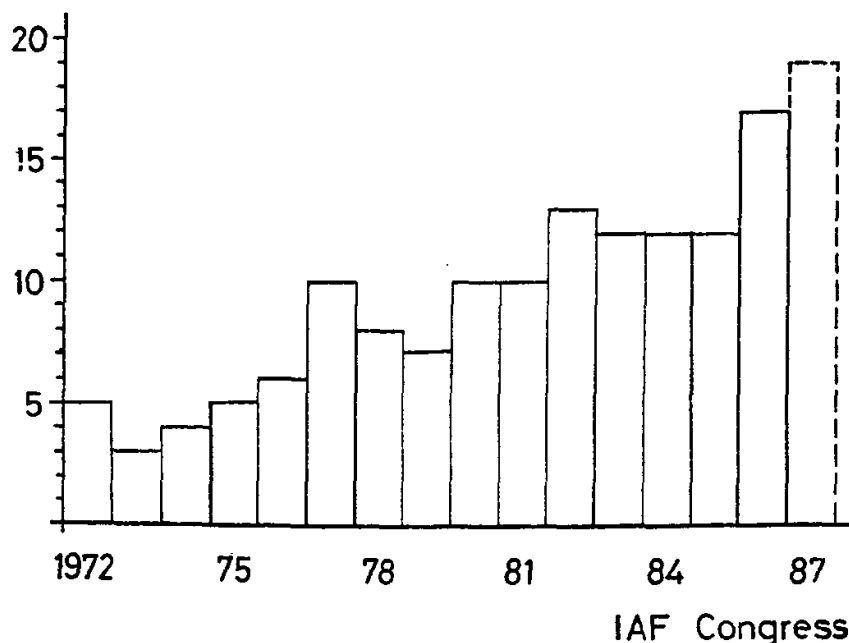
The concepts of the Committee are briefly summarized in a 5 year plan. A new scientific topic that should perhaps be addressed by the Committee in the future concerns the detection of other planetary systems. A highly technical international meeting on SETI instrumentation and technology is also planned. Discussions will be held with the International Institute of Space Law on the desirability of having an internationally agreed upon format and procedure for the announcement of the unequivocal discovery of signals from extraterrestrial civilizations, as well as on the need to identify critical regions of the microwave spectrum as being protected for SETI purposes in the future.

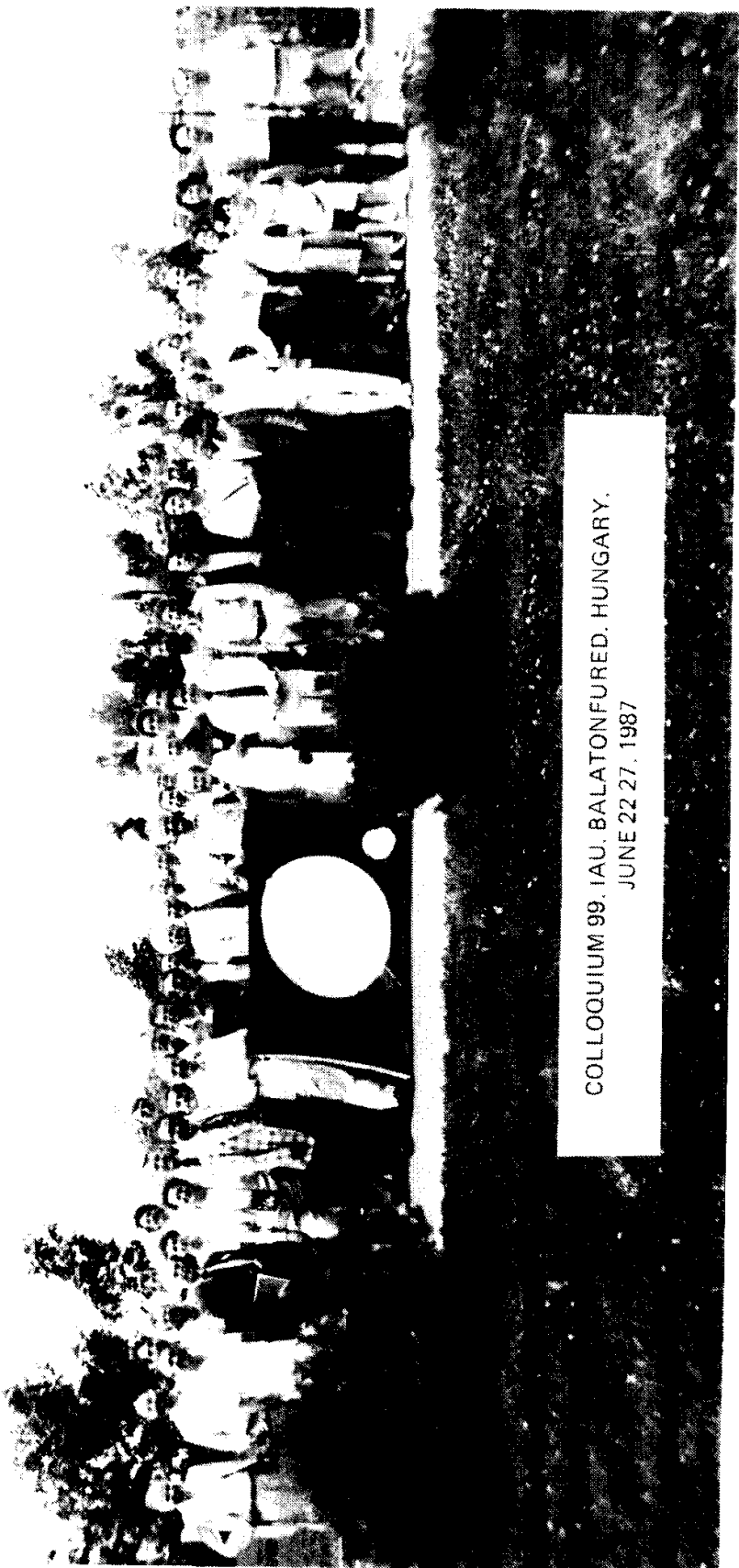
Since 1986 the IAA Committee has changed its name from CETI to SETI in order to express its growing interest in every possible kind of search after extraterrestrial civilizations. The Committee would like to act as a focal point for the initiation of cooperative ventures in SETI science and technology as a long term activity well into the future.

#### References

1. R. Pešek, Acta Astronautica 6 No.1-2 pp. 3-9 1979
2. Minutes of CETI Committee Meetings and Annual Reports

Number of papers presented





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## CLOSING REMARKS

Frank D. Drake

president, IAU Commission 51: Bioastronomy

After five days of meetings, we see once again that there is probably no more fascinating subject than the one we address here – Bioastronomy, the search for extraterrestrial life. The potential rewards for success in our search are beyond calculation. At the same time, we grope in the dark for ideas as to how best to pursue our search. As always, our human creativity has come forward to produce provocative, stimulating, and perhaps, correct ideas as to how we should pursue the searches of the future.

Also, as always, one of the greatest joys at a meeting like this is to meet with colleagues, to learn of new activities and new opportunities in distant lands. In the excitement and good will that this produces, we see a rehearsal for the excitement and progress which will accompany the detection of extraterrestrial life.

As always at meetings of Commission 51, we have seen human creativity and imagination at its best. There were new ideas here in abundance, and they will serve to stimulate us over the years which will pass before our next major meeting.

At the same time, we have seen substantial real progress in our search. On the one hand, particularly, in the search for extrasolar planets; on the other, in the search for radio signals for other civilizations.

Perhaps the most remarkable development at this Colloquium were the reports of many new projects aimed at detecting the planets of other stars. Not one, but several groups reported truly remarkable improvements in instrumentation which bring the detection of other planetary systems within reach. This is a development we only dreamed of a few years ago; now, not just one but several groups have demonstrated the accuracy necessary to accomplish this formidable task. Already we are glimpsing evidence of the existence of planets around the nearest stars. If indeed those planets are there, it means that planetary systems are abundant throughout the galaxy, and presumably throughout the universe. We wish our colleagues well in this challenging endeavor.

At the same time, others of us here have developed some very sophisticated observing equipment for the radio searches now underway, or soon to be underway. These searches for extraterrestrial intelligent radio signals will dwarf all previous searches put together, and will give us a real chance of finding other civilizations. We are gratified to see that, at last, both governmental and private funding organizations are beginning to provide funds for Bioastronomy at a level which is substantial, yet modest in comparison to the importance of the subject and its potential to benefit all the people of our planet. We are gratified to see that the most powerful technology of our era is being applied to one of its most challenging problems. In this, we see the talents of our species applied in a way which is to be applauded.

We thank our hosts from Hungary. They have made our stay here both comfortable and delightful. They have provided the finest facilities. They have provided the atmosphere in which we could conduct our work most productively. We have seen the best of both the old and new, here at Lake Balaton. We hope this tradition continues; if so, our next meeting will also be one to remember with very special pleasure.



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