

# MARSBUGS:

## The Electronic Exobiology Newsletter

Volume 1, Number 5, November 1994

Co-editors:

David Thomas, Life Sciences Department, Belleville Area College, Belleville, IL 62221, USA, marsbugs@delphi.com.

Julian Hiscox, Department of Molecular Biology, I.A.H. Compton, Compton, Nr Newbury, Berkshire RG16 0NN, England, UK, hiscox@bbsrc.ac.uk.

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### CONTENTS

- 1) SOCIETY ANNOUNCEMENT: MILKY WAY PANSPERMIA ASSOCIATION
  - 2) *SETIQuest* MAGAZINE  
Carl Helmers
  - 3) MARS FORUM IV
  - 4) CURRENT PUBLICATIONS AND ARTICLES OF INTEREST IN EXO BIOLOGY  
By Julian Hiscox
  - 5) SOLAR SYSTEM SIMULATION
  - 6) RESPONSE TO PAUL BIRCH (Vol. 1, No. 3)  
Will Fischer
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#### SOCIETY ANNOUNCEMENT: MILKY WAY PANSPERMIA ASSOCIATION

(Society for the Propagation of Life in Space)

**Objectives:** To promote the propagation of terrestrial-type organic Life throughout the Milky Way Galaxy, and beyond. Specifically, the Society will promote technical research and public education aimed at launching directed panspermia missions toward nearby young planetary systems by the year 2050.

**Motivation:** The Society recognizes that organic, DNA- and protein- based Life occupies a unique position in Nature. Life is precious because its uniquely complex structures, allowed by a precise coincidence of the basic laws and constants of physics.

Life exhibits a propensity to conquer ever expanding niches, and creates increasingly advanced structures in this pursuit. However, terrestrial Life is also vulnerable and will become extinct with the Sun, or sooner, unless planted in diverse independent habitats throughout the galaxy. Being of Life, humans can assure that Life survives and becomes dominant in Nature. The Society therefore recognizes safeguarding and propagating Life in the universe as the ultimate human purpose.

**Why now?** Rapid progress in astrometry, astronomy, propulsion and biotechnology suggests that successful interstellar panspermia missions can be implemented within a

few decades. The new technologies will identify nearby young stars with young planetary systems, where implanted life will succeed while avoiding the unlikely interference with indigenous biota. Biotechnology will provide diverse microorganisms with high potential for survival and evolution.

At the same time, technology presents unforeseeable dangers, and the long-time survival of the present civilization is not assured. It is therefore prudent to act soon to safeguard and propagate Life in the Galaxy. This endeavour will endow human existence with a cosmic purpose.

This is a preliminary announcement to identify like-minded persons to form the Milky Way Panspermia Association (Society for the Interstellar Propagation of Life). For further information contact Dr. Michael Mautner (Department of Chemistry, University of Canterbury, Christchurch 8002, New Zealand), address November 1994-February 1995: Chemical Kinetics and Thermodynamics Division, NIST, Gaithersburg, MD 20899, Fax (301) 926-4513, E- mail mmautner@enh.nist.gov

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#### *SETIQuest* MAGAZINE By Carl Helmers

*SETIQuest* is a new quarterly print/electronic mail (E-mail) periodical containing news, technical information, and tutorials devoted to bioastronomy and its subset, SETI (Search for Extraterrestrial Intelligence).

*SETIQuest* is published for professionals, serious amateur astronomers, and individuals curious about this fascinating field of observation. *SETIQuest* fills the need for a specialized astronomical publication devoted exclusively to the on-going search for evidence of life in the Universe. Such evidence could be intentional or inadvertent signals of other civilizations. Such evidence could be found in spectral signatures of biological activity on extrasolar planets or in the interstellar medium.

*SETIQuest* is written and edited for the scientifically literate individual taking part in the progress of our technological civilization, with articles by amateur and professional scientists. *SETIQuest* includes information about hands-on observational programs that can be carried out by individuals and groups of amateur astronomers at radio and optical wavelengths.

*SETIQuest* is filled with articles covering topics such as:

- Tutorials about bioastronomy and SETI
- Microwave or optical SETI as practiced by amateurs
- "Do-it-yourself" participation in bioastronomy and SETI activities
- Book reviews
- Regular commentary on issues relevant to SETI and bioastronomy:
  - SETI and the political milieu
  - Philosophical issues regarding the prospects of success and failure in the search
  - SETI as a parable of science versus pseudo science

Publications Watch: Summaries of recent scientific/general publications relevant to SETI

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#### MARS FORUM IV

Mars forum IV will be held at NASA's Ames Research Center on December 12 & 13, 1994. The meeting will take place in the auditorium of building 245. People wishing to attend should contact Dr. Douglas O'Handley at (415) 604-3525 by December 5th.

Agenda:

Monday, December 12th:

Lunar: 8:30 am - noon

Introduction  
Update on Strategic Planning for Mission from Planet Earth;  
ESA's  
"Lunar Declaration"  
Lunar Exploration Status  
Coffee break  
Commercialisation of Lunar Exploration

Lunar Discovery Missions: Pele, Prospector, Interlune, Orbiter

Lunch: noon - 1:30 pm

Mars: 1:30 - 5:00 pm

Mars Exploration Program Planning  
Mars Surveyor Program, including "Mars Together"  
Mars Micrometeorology Mission  
Mars Exobiology Science Strategy  
Life on Mars? Mission Strategy  
Coffee break  
Marsokhod the Machine  
Marsokhod Field Testing Plans  
Potential US Role in "Mars Together" Marsokhod Mars Sample Return  
Using in situ Propellant Production

Dinner: Stanford Faculty Club

Tuesday, December 13th:

Human Exploration: 8:30 am - noon

Life Support for Human Exploration Mission  
JSC Plans for Demonstrations of Advanced Life Support Systems for  
Lunar and Mars Exploration  
Coffee break  
Stanford Report  
Reports/Commentary from Industry Representatives

Lunch: noon - 1:30 pm

Education Outreach: 1:30 - 3:00 pm

ARC Internet/New CAN  
California Space Grant Consortium Educational Outreach Program  
UC Berkeley Science-on-line Project

#### CURRENT PUBLICATIONS AND ARTICLES OF INTEREST IN EXOBIOLOGY

By Julian Hiscox

Origin of Life.  
R. Hill, P. Arhem, B. Lindahl.  
Karolinska Inst., Nobel Inst., S-17177 Stockholm, Sweden.  
Univ. of Stockholm, Dept. of Philosophy, S-10691 Stockholm, Sweden. NATURE 1994 Vol.371 No.6499 p.646

Origin of Life - The Origin Of Macromolecular Chirality.  
A. W. Schwartz  
Catholic Univ. of Nijmegen, Faculty of Science, Evolutionary Biology Research Group, 6525 Ed Nijmegen, Netherlands. CURRENT BIOLOGY 1994 Vol.4 No.8 pp.758-760 (peptide nucleic acids)

A Hydrothermally Precipitated Catalytic Iron Sulfide Membrane as a First Step Toward Life.  
M. J. Russell, R. M. Daniel, A. J. Hall, J. A. Sherringham.  
Univ. of Glasgow, Dept. of Geology & Applied Geology, Glasgow G12 8Qq, Scotland. Univ. of Waikato, School of Science & Technology, Dept. of Biological Science, Hamilton, New Zealand. JOURNAL OF MOLECULAR EVOLUTION 1994 Vol.39 No.3 pp.231-243 (Protocell, hot springs, sea floor, replication, evolution)

Assemblies of Free Amino-acids as Possible Prebiotic Catalysts.

A. Barnun, E. Kochavi, S. Barnun.

Tel Aviv Univ., Dept. of Geophysics & Planetary Science, IL-69978 Tel Aviv, Israel. Tel Aviv Univ., Dept. of Biochemistry, IL-69978 Tel Aviv, Israel.

JOURNAL OF MOLECULAR EVOLUTION 1994 Vol.39 No.2 pp.116-122 (Prebiotic catalysts, prebiotic reactions, emergence of biological enzymes)

On the Origin of the Genetic Code.

H. Kuhn, J. Waser.

Ringoldswilstr 50, CH-3656 Tschingel, Switzerland.

FEBS LETTERS 1994 Vol.352 No.3 pp.259-264

(Evolution of the genetic code, RNA world)

Planetary Protection Considerations for Marsnet and Mars Sample Return Missions.

C. Linberg and G. Horneck.

DLR, VB-AB and FF-ME Institute of Aerospace Medicine, Biophysics Division, Linder Hohe, 5000 Koln 90, Germany.

ADVANCES IN SPACE RESEARCH 1995. Vol.15 No.3. pp.(3)277-(3)380 (Biological contamination, Mars exploration)

#### SOLAR SYSTEM SIMULATION

[This is part of a simulated Mars colonization mission.]

The Journal of Dr. Mack T. Knife, Chief Medical Officer, Ares Base.

March 15, 2078

0616-- I have just received a memo from Gaea. He has informed me that he is planning to take the shuttle craft to the Northern Pole in two days to map and begin a systematic search for life frozen in the polar caps. He asked that I come along for medical assistance, but more importantly, because he wanted another biologist to help him in the search for Martian life. This trip intrigues me, and I think I will arrange for coverage so that I can attend. I have not had a chance to explore the planet surface, and this will allow me to see a great deal of the planet surface.

March 16, 2078

0600-- I am gathering material that I shall need for the journey to Mars FE Northern Pole. I have put together a medical kit if an emergency should arise that the shuttle on-board kit cannot handle. I have also taken along a thermal pot to brew some Earth Grown coffee, and a special bottle of champagne, should we discover life. I will be meeting with Gaea later today to be briefed on the itinerary. I am keeping my fingers crossed...

1338-- I am making final preparations for the trip tomorrow-- packing a few things to keep me from getting bored on the overnight stays in the shuttle. Gaea says that he intends to stay at the Northern Pole for three days. We will be taking several core samples of 300m in the frozen ice cap. After which we will make preliminary scans with an enhanced portable MRI1 device. With any luck, the scans will pick up organic material, perhaps even life.

March 18, 2078

0800-- Gaea and I are preparing to board the shuttle to the pole. This will be my last journal entry from the Ares Base. After this I will be logging into the computer on the shuttle, and transferring the data the colony computer core. Both Gaea and I are almost giddy with anticipation. Both of us are wishing for a successful journey. We will begin our trip by lifting up from the Ares Base and docking at the Orbital Platform. After re-

fueling, we will make a low-level descent and map the polar region. Touch-down is expected to be 10km from the southern most part of the ice fields of the cap. We will then take the rover to the ice cap for our studies.

2027-- We have landed on the planet surface once again. We are currently making preparations for the rover to depart tomorrow morning. As the last supplies are being stored on board the rover, I think of Darwin and his great journey on the Beagle. Gaea and I are planning to turn in early tonight so as we can get some much needed rest.

March 19, 2078

0800-- Final preparations have been made to leave the shuttle craft and embark on the rover to the Northern Ice Cap. Gaea and I have great expectations about this trip, even though we are trying to calm ourselves. There is no guarantee that life would have existed in the water of Mars, but it would truly be a great find.

1700-- Nothing has been located yet. As expected, the temperatures are quite cold up here at the pole. We spend most of our time sitting in front of the computer screens operating the drilling arms that are making the core samples. Gaea anticipates another hour of drilling before we head off the Ice Caps for the night. Even though we are saddened by the absence of life up here at the pole, there is always tomorrow...

March 20, 2078

0800-- We spent another restful night in the shuttle sleeping compartment. Gaea and I are making our way into the rover for Day Two of the core drillings. Perhaps today we will find life.

1300-- This is it! Core sample 157 indicates organic materials. I am planning to run it through the MRI.

1700-- Preliminary results have confirmed initial results. Life has been found on Mars! The organism was found at 1300 March 20, 2078 in Core Sample 157. It resides at 98m in the 210m core sample and is located in a region of near frozen water (3.7oC). Gaea and I are currently running a more intense diagnostic of the core sample and preparing an isolation container in the rover for transport. Once the container has been secured, the organism and the fragment of the core sample will be transferred to the shuttle for storage until the remainder of the core samples have been taken.

2000-- We have returned to the shuttle and have successfully transferred the organism to the containment bin. Gaea has contacted Ares Base and informed them of our find. I am sure by the time we return to the base that the news will be over all of CIN. As for me, I can do without the hype. I just want to return to Sick Bay and begin the intensive studies of the organism. Gaea and I are going to be getting a late start tomorrow, as we are partaking in a little champagne. This is truly a great find, but the true magic of this Martian life form will be revealed in the laboratory in the days to come.

March 21, 2078

1353-- We have completed our drilling of the Northern Polar Caps and are preparing to return to the shuttle for departure. With any luck we will be back at Ares Base by 1000 tomorrow. Plans call for an overnight stay on the Orbital Platform. I would like to conduct all the research up there, but as the medical facilities have not been transferred over from PMS-I, and since there is no staff, I will have to conduct the research in the Med Lab on Ares Base. The containment fields in the lab should be able to hold the organism in place. An interesting side note-

the colonists and Gaea have named the organism Marvin for now.

March 22, 2078

0600-- Ah, back where I belong... here in Sick Bay. At 0800 this morning I will be briefing the staff on the organism, and assigning the research staff. I will be overseeing the studies. We will begin a general observation of the organism and then move on to greater detailed reports using the tunneling microscope. It is my hope to develop a complete understanding of this organism.

1700-- The staff is working hard on the description of the Martian Microbe (as we call it, I have told them not to use the term Marvin, which for some strange reason irritates me). The preliminary results should be on my desk in the morning.

March 23, 2078

0500-- I came in early to work today to ready the report from yesterday...The following were the initial results from the Tunneling Electron Microscope (TEM)2 and conditional testing. Surface scans of the organism have yielded several protuberances that have not been identified. In addition, there appears to be some sort of pore near the area containing a large concentration of genetic material. The organism does appear to have a bi-polar, lipoprotein membrane; however, the actual components are structurally different. Internal scans have detected several internal organelles. At this time, five separate organelles have been discerned, but their function has yet to be determined.

The organism can survive in a wide variety of temperatures (see table below). The organism does have an exterior motive tail that allows it to move in a liquid environment.

Temperature and Living condition (271K to 273K). In unfavorable living conditions the organism slows its metabolism and dies. (Temperature range 273K to 283K are the most favorable living conditions for the organism. After 283 K increases instability of the nuclear region of the organism. Further research is scheduled for this area of uncertainty. That completes the first report for the Lab Team.

0545-- I have just finished absorbing the report from the Lab guys. They have been busy the last 24 hours. I will have to make a note to them saying that I am proud of what they are doing. I have also received a communique from Lou Chrono over at the CINNews Net wanting details on the organism. It seems that Gaea has gone ahead and delivered the news to the rest of the solar system and has told them how great of a find it is. This may be true, but we don't understand what we have yet. I will be traveling up to the Orbital Platform to meet with Janos this afternoon to discuss some modifications to the Infirmary on the station. After that, I will return to Ares Base and continue the research on the organism.

1500-- The Ares Base is on Red Alert. Some sort of water contamination has occurred in the Agricultural Domes. Dr. Hawking Stephenson has been in contact with the Life Sciences Department to gain assistance in the matter. I am cutting short my visit to the Orbital Platform so that I may return to the planet and assist in the assessment of the contamination.

2000-- Internal base scans have determined that the Ag Domes are now secure, and that contamination was only limited to two domes. Water circulation has now been restored to the rest of Ares Base, but I am still recommending colonists to boil water for another couple of days. The problem with the

ECLSS3 was a safety valve malfunction. Hawking says that he and the Engineering Department are working to fix the problem. Also, a large amount of the Martian Microbe has been found in the water contamination. I am currently organizing an investigation in the matter.

2300-- Hawking and the Engineering Department have corrected the problem to the ECLSS and assure me that everything is in working order. CIN has also learned of our little mishap and is questioning me for details. I learned that Gaea took a sample of the microbe out of the lab and contaminated the Ag Domes on accident. He has made an apology to the colonists and is writing an article to the CINNews Net. I am preparing a statement to CIN about the ECLSS failure. Hawking is also doing the same. I am going to give the Lab Team the day off tomorrow. They worked hard on the ECLSS failure and the microbe research.

March 24, 2078

0500-- I am back at the office again. No one has been injured from the ECLSS failure and I am preparing to send off my statement to Lou Chrono. I will be going into the lab this morning to conduct some of the research on the microbe and will be releasing an initial report to the colonists.

2200-- I have been a busy bee today. Below is a report I have compiled for the Lab Team while they had the day off. Exterior cellular components have been separated into three groups based on function. These groups are receptors, Sexual Gonopore, and the Exterior Motive Tail (EMT). I have identified at least twenty different types of receptors that have three basic functions. One function is phototaxis, another is chemotaxis, and a third is cellular recognition. The receptors that deal with cellular recognition are able to discern between Martian and Terran cellular and inorganic components. The Martian Microbe, in fact, encompasses the Terran cells and rejects all inorganic materials. The relationship of how the receptors work in the overall functioning of the cell has not yet been determined. What I am calling the Sexual Gonopore is only an assumption. It is at this site that two microbes connected and passed genetic material. The Gonopore does seem to remain stationary over the center of the genetic material. More information will be available after internal exploration of the microbe has been conducted. The EMT is a long filamentous structure made of proteins unfamiliar to Terran science. Further TEM testing will be conducted in the next few days. The unexplained hyperactivity of the microorganism has not been explained at this time, but some new information has been gathered. The nuclear region definitely undergoes several changes at elevated temperatures. In addition, most of organelles seem to produce several compounds that are not present during favorable living conditions. Research continues...

March 25, 2078

0545-- I arrived this morning to find on my desk, a letter from the Life Sciences Department...You cunning old man, you gave us the day off so you could have all the fun...I guess they really appreciate the fact that I can still manage to do a little research at my age. Numerous reports are coming in from Sick Bay of people coming down with allergic reactions. Hawking is checking the Ventilation system to see if something is wrong. Also, dust seems to be piling up in some of the offices. This may be the cause. Cleaning of the AgDomes continue and should be completed by the end of the week. I have a meeting with Janos this afternoon to discuss some of the changes that need to be made to the Infirmary on-board the Orbital Platform. After that, I will join the Lab Teams in conducting research. It has been brought to my attention that several of the colonists

feel that I am not concerned by the Ag Domes disaster. While I am mad that there was not a back-up of the water pressure valve, there is nothing that can be done about that now. Hawking and Janos will make triple redundant valves for the future. In addition, no one has come down with any serious illness from the contamination, and the organism does not appear to harm humans. Furthermore, Janos and Hawking are working around the clock to repair the Ag Domes. Since the matter is out of my hands, I see no point in worrying over it.

2200-- My meeting with Janos went well. He will make the alterations to the Infirmary and also has told me that he has finally picked out a name for the station. It should be fully operational in two weeks. As for a name for our little microbe, that is still up in the air. Gaea hasn't picked anything out except for Marvin, which I don't think is very suitable for the first life we find on Mars... We found a few interesting things about our microbe today in the lab...Research has indicated that the organism does not conform to surface contact inhibition. In addition, the organism can produce for at least 30 generations without the original cells dying. Further research of the interior organelles is progressing rapidly and reports to the scientific community and the Ares Base colonists should be ready in the next day or so. Reports on the genetic make-up will follow shortly there-after, as that research is progressing at a slower rate.

March 26, 2078

00553-- Today will be busy for all of us here in Sick Bay. While the teams are finishing up their research, I have to perform an operation on the arm of one of the engineers. In an unfortunate accident last night, some rigging on the Orbital Platform collapsed on him and crushed his arm. He was rushed down to planet side and put in a room for the night while tests were run on his arm to see if it could be saved. Unfortunately, it cannot. I will be amputating the arm at 0700, and then adding a cybernetic appendage to his body. If all goes well, I should be finished by 1200.

1306-- The operation was a great success. The patient is doing well in recovery and should be leaving Sick Bay by dinner time. He has been scheduled to see Dr. Iaardo for psychological adjustments to the new arm, and physical therapy will begin also. I am going to grab a quick bite to eat, and then go to the lab to help in the research.

2000-- Much research was completed this afternoon. My staff has been working very hard on this project, not only because I asked them to, but also because I think that they are also excited about describing the first life form on this planet. I am going to pass on filing a report on the findings this evening, and take the team out for dinner-- they deserve it.

March 27, 2078

0700-- I have just compiled the findings from the internal organelle report. The synopsis follows: There appears to be seven separate organelles within the microbe. While their complete morphology and function have not been fully described, what follows is a brief listing of their suspected rolls with in the microorganism:

Chemo Center. This organelle occurs with great frequency within the cell. Its main purpose is the production of various chemicals needed for normal cell operation. This is also the site for anaerobic respiration. Interior scans indicated that the cell membrane has numerous convolutions to increase surface area.

Aerobic Center: Structurally similar to the Chemo Center, the Aerobic Center's main function is the oxidation of several compounds. This organelle also packages bundles of phosphates for high energy bonds.

Fluidic Mass: This fluid is present everywhere in the cell. It seems to serve as a transport medium within the organism. In addition, there is a high concentration of genetic material in the fluid. This relationship has not been determined at this time. All remaining uncertainties should be cleared up after research on the genetic material has been completed.

Storage Center: This area contains the waste products of the organism. In addition, several lysidic compounds have been found in several Storage Centers. This center also is capable of breaking down organic wastes and recycling them into new cellular components.

Digestive Folds: A major portion of the interior area of the microorganism is devoted to the colonists and to Lou Chrono at CIN.

Research on the genetic material continues and, with a little luck, we may have some idea to how it works. Right now all that is known is that it uses several different isomers of glucose as its sugar chain. I am going up to the Orbital Platform today and will remain there for the next few days. I will make the final adjustments to the finished areas of the Infirmary while Jano's team of engineers finalize construction. Janos has told me that Farpoint Station 4 would be fully operations in a week-- this is one week ahead of schedule, but at the pace Janos is working, I am not surprised. I am going to recommend that he gets some rest after Farpoint is completed.

1800-- I have just arrived here at Farpoint Station and have set up my home in the crew quarters. The rooms are not fancy; however, for the short stay, they are quite cozy. The medical offices are completely furnished, except for the few alterations each member of the senior medical staff will make to personalize their office.

March 28, 2078

0700-- I am taking it easy today. As there is not much to do here at the station, I am spending some time today walking around. Janos has told me not to enter the Command Deck until the afternoon, as this morning they are running several tests with Ares Base, and he put it politely, that I would just be in the way. I will respect his wishes and just confine myself to finishing up the minor details in the Infirmary, and then take a brief walk through the Docking Bay and Storage Facilities.

1900-- I am back in the office again. Janos gave me a splendid tour of Farpoint Station. He outdid himself here. I am going to have a nice quiet dinner in the Observation Lounge, and then call it a night. The Observation Lounge is a very beautiful place. From this point on the station, one can see Mars and Olympus Mons. In fact, with a high powered viewing scope, one could even see Ten Surface 5 inside Crater dh6.

March 29, 2078

0634-- I am making the final notes to the engineers on the Station. They have done a fantastic job constructing Farpoint. The only modification I wish for them to make is the addition of another coffee machine in the waiting area. There is also more news coming in from Ares Base about allergies. Dust is also becoming more prevalent in the base. I have scheduled a meeting with Hawking this afternoon on the subject.

0945-- My meeting with Hawking has just been completed. He has assured me that the ECLSS is working properly. However, tiny spore-like particles have entered the base. These particles are too small to be screened by the filters in the air ducts. Hawking has agreed to release a statement to the colonists, and I will be making contact with the Lab Teams to investigate this problem.

1307-- Lab Teams have been apprised of the situation and are looking into the problem. I shall spend the rest of the day on Farpoint and take a relaxing break-- for a change.

March 31, 2078

1000-- Finally got a chance to sleep in this morning. I am going to go to the Rec Room on the Station before I head down to the planet. I think I will stop in by the Lab just to see how the progress on the genetic research and the spore problem is progressing.

1400-- Ah, I am back home again. I made a quick stop by Sick Bay and they had some interesting news. The spores are coming from the microbe. Hawking must have missed a few during his sweep of the Ag Dome. My team has notified him, and he has already begun sweeping the dome again. The Team has also informed me that they are finishing their preliminary reports on the genetic make-up of the organism. According to them, it should be on my desk in the morning.

2100-- I am heading off to bed early this evening. I am very excited about what is about to be seen by me in the morning. I wonder if I can get any sleep at all?

April 1, 2078

0545-- I have arrived here at the office to see something wonderful- a computer pad on my desk labeled, Genetics of Marvin, the Martian Microbe. What follows is the preliminary report on the genetics of the Martian Microbe. While the specifics of the genetics are still being researched, this report gives a basic overview of the structure of the microbe.

**Glucoid Nucleic Acid:** The overall structure of the genetic make-up is similar to RNA. Since the basic sugar of this compound is glucose (both D and L), we will be using the term GNA to abbreviate the material. There is no phosphate backbone in this molecule; therefore, the GNA has a very interesting shape. It forms a giant web that encompasses the entire interior of the microbe. At the binding sites of the glucose molecule, there are a variety of substrates capable of bonding. Research has shown at least seven different nuclear Nitrogen bases that bond to the glucose web. In addition, different molecules of glucose can bond to the main chain, producing side chains that extend into the microbe. This is how the GNA becomes a web. Since the GNA is in the Fluidic Mass, the microbe has direct access to the genetic material. We have not been able to code the GNA at this time, and do not expect to any time soon, but it is believed that several key parts of the GNA are replicated for fast access.

**Exterior Gonopore:** The Gonopore is always present over the Genetic Reservoir. This exterior organelle serves as a conjugation tube between two microorganisms, in which sexual reproduction takes place. On several occasions, conjugation has been observed in the laboratory and genetic material has been confirmed to pass between the two microbes. Materials from conjugation are sent to the Genetic Reservoir.

**Genetic Reservoir:** This organelle is a storage facility for extraneous genetic materials. Materials from conjugation are stored here and assembled for transport to the Reproductive

Site. In addition, materials for internal synthesis of materials are also stored here. During unfavorable living conditions, asexual reproduction occurs here. In asexual reproduction, the extraneous materials come together and form complete genetic packages, which are then sent to the Reproductive Site. The microorganism becomes a reproductive machine during asexual reproduction. All energy is focused on making genetic packages.

**Reproductive Site:** Once genetic material from sexual or asexual reproduction is packaged and sent here, it is developed into a viral-spore and expelled from the cell for disbursement. In periods of unfavorable living conditions, the number of spores expelled is incredible. Asexual spores can remain in their spore state for a period of time that has not been established. However, it is known, that when favorable living conditions return, they emerge from their sheath to become functional adults.

**Exterior Motive Tail(EMT):** The EMT is a highly organized structure. The proteins that make-up this structure are new to Terran science and form a highly secured network. The EMT is anchored firmly in the center of the microbe and is arranged in a 15+4 bundle. At the center of the microbe is a high concentration of Chemo Centers and Aerobic Centers that are thought to be the main power suppliers of the EMT.

0800-- Impressive. I will release this tomorrow, as I think April Fool's Day would be a poor choice. I also believe that I have found a name for our little creature... *Gaaris macondoli*. Ga is from Gaea's name, aris is for the planet, and macondoli is for myself. Hawking has made a request into the nature of the organism. Since Gaaris macondoli likes to metabolize organic wastes, he would like me to look into having the organism break down plant wastes in the Ag Domes. This may be possible, but after the dust problem, I think I will recommend that we postpone testing his hypothesis until a later time.

## End Notes

1. The portable MRI device is a hand-held scanner that is widely used by the medical and scientific community in the year 2078. While similar to the MRIs used by present day medicine, the small size of this device makes it very useful to detect injuries or organic compounds on survey missions. The Virtual Board of Consultants verified that this device could be constructed and be implemented by the year 2078.
2. The Tunneling Electron Microscope (TEM) is in use today. The Virtual Board of Consultants verified that a plausible extension of microscopy could entail one machine capable of resolving objects from 1x to the sub-atomic level by the year 2078.
3. ECLSS is the abbreviation for Environmental and Life Control Support Systems.
4. Farpoint Station was chosen as the name for the Mars Orbital Platform for two reasons. During the simulation, Star Trek: The Next Generation was completing its last season, and Farpoint Station was the original destination of the starship Enterprise-D on its maiden voyage. The second reason for naming the station Farpoint is because Ares Base is the farthest manned outpost in the year 2078.

5. Ten Surface is the name of the lounge on the surface of the planet. There are several viewing portals for the colonists to look at the surface of the planet.
6. Crater dh is the location of Ares Base.

For correspondence please contact:  
Steven G. Miller sgm@dana.ucc.nau.edu  
Andrew J. Stevenson ajs@dana.ucc.nau.edu  
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#### RESPONSE TO PAUL BIRCH By Will Fischer

Paul Birch's recent article was interesting, but fundamentally flawed. To summarize his argument:

- A. "simple organisms" exist in larger numbers than more complex ones, but,
- B. no living thing simpler than a single cell is known to exist. Therefore,
- C. no living thing less complex than a single cell can exist, and,
- D. it is therefore impossible for life to have originated from non-cellular components.

In short, Birch considers the absence of non-cellular life in the modern biosphere as evidence against current theories of the origin of life. This reasoning is incorrect because his initial premise is wrong: "that simpler organisms are more common," is not as obvious as it appears. While bacterial cells are not as structurally complex as those of so-called "higher" organisms, they are generally capable of much more complex metabolism. In short, bacteria are as highly evolved as are humans, but have taken different path. The real progression in organism numbers isn't evolutionary (from simple to complex), but rather ecological (from small to large).

Birch also fails to consider the effect of life on the proto-biosphere: conditions on Earth now are not at all like the

conditions under which life originated; this is thought to be largely the effect of the metabolism of living things (liberation of O<sub>2</sub> by photosynthesis, etc.). In other words, life changed the conditions under which it originated, making it impossible (or at least highly improbable) for the event to recur. More simply put, life originated in a rich primordial soup, and then ate it all up.

Further, pre-cellular life forms would be necessarily simple, and necessarily inefficient in metabolism. They would therefore be out-competed, or actually consumed, by the mass of (mainly prokaryotic) life, which is in fierce competition for (now) limited nutrients.

To sum up, clearly, non-cellular life is not overwhelmingly common in the present-day environment, but (just as clearly), we shouldn't expect it to be. It is entirely conceivable that such life (or proto-life) was extremely common in the utterly different environment of the early Earth, and that thriving proto-ecosystems were completely wiped out by the cellular life-forms to which they gave rise.

Though a "more elegant" explanation for the origin of life would be interesting, it is not necessary. Birch's arguments do not at all diminish the credibility or utility of the theories we already have.

Address for correspondence:  
Will Fischer  
wfischer@indiana.edu  
Department of Biology Voice: 812-855-2549  
Jordan Hall  
Indiana University  
Bloomington, Indiana 47405 USA FAX: 812-855-6705  
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End *Marsbugs* Vol. 1, No. 5.