

**ELSI 3<sup>rd</sup> international symposium**  
**“Life in the Universe”**  
**- Program -**

**Day 1** (Tuesday, January 13, 2015)  
**Planets as Cradles of Life** (co-chair Hidenori Genda)

**Welcome Message by Kei Hirose, Director of ELSI (8:50 — 8:55)**

**Introductory Remarks by Piet Hut, Chair of the Symposium (8:55 — 9:00)**

**Session 1 : Chair George Helffrich (9:00 — 10:30)**

**09:00 – 09:50 Keynote speaker:** David J. Stevenson (Caltech), “Planetary Diversity”

**09:50 – 10:10** Shigeru Ida (ELSI), “Planet formation and origins of H<sub>2</sub>O, C and N on the Earth”

**10:10 – 10:30** John Hernlund (ELSI), “The potential importance of Mg/Si ratio in terrestrial planet evolution”

**10:30 — 11:00: Coffee Break**

**Session 2 : Chair Kei Hirose (11:00 — 12:30)**

**11:00 – 11:50 Keynote speaker:** Stephen Mojzsis (Univ. of Colorado), “Early Earth vs. Origin of Life”

**11:50 – 12:10** Yuichiro Ueno (ELSI), “Carboxylic acids from Hadean and Archean atmosphere”

**12:10 – 12:30** Hidenori Genda (ELSI), “Splashed Hadean Seawater Hypothesis”

**12:30 — 14:00: Lunch**

**Session 3 : Chair Hidenori Genda (14:00 — 15:30)**

**14:00 – 14:50 Keynote speaker:** Seiji Sugita (Tokyo Univ.), “The Early Atmospheres of Terrestrial Planets inferred from Impact Experiments and Asteroid Missions”

**14:50 – 15:10** Hikaru Yabuta (Osaka Univ.), “Expansion of Organic Cosmochemistry in the New Era of Small Body Missions”

**15:10 – 15:30** Tetsuo Irifune (ELSI/GRC), “Chemical compositions of the mantle transition region and the lower mantle of the Earth”

**15:30 — 17:00: Posters with flash talks on "Planets as Cradles of Life" and Beer ()**

**17:00 — 18:00: Panel Discussion;** Moderator: John Hernlund

**18:30 — 20:00: ELSI will host a Public Lecture in the same symposium hall from.**

The title of this event is also "Life in the Universe".

Speakers: Mary Voytek (NASA), "How do we look for life beyond Earth?" and Shigeru Ida (ELSI), "Clues from the Moon for understanding the Earth and its life's origins"

Emcee: Piet Hut (ELSI/IAS)

**Day 2 (Wednesday, January 14, 2015)**

**Towards Universal Biology** (co-chair Nathaniel Virgo)

**Session 1 : Chair Daisuke Kiga (9:00 — 10:30)**

**09:00 – 09:50 Keynote speaker:** Nicholas Hud (Georgia Tech), “A Self-Assembly Approach to Proto-RNA”

**09:50 – 10:10** Chrisantha Fernando (Google DeepMind), “Open-Ended Evolution Revisited”

**10:10 – 10:30** Mary Voytek (NASA), “Towards a Universal Biology”

**10:30 — 11:00: Coffee Break**

**Session 2 : Chair John Hernlund (11:00 — 12:30)**

**11:00 – 11:50 Keynote speaker:** Paulien Hogeweg (Utrecht Univ.), “Toward a bioinformatic theory of living systems”

**11:50 – 12:10** Nicholas Guttenberg (ELSI), “Detecting the signatures of heredity in generative chemistries”

**12:10 – 12:30** Takashi Ikegami (Tokyo Univ.), “A study of a boids model at large scale”

**12:30 — 14:00: Lunch**

**Session 3 : Chair Takashi Ikegami (Tokyo Univ.) (14:00 — 15:30)**

**14:00 – 14:50 Keynote speaker:** Lee Cronin (Univ. of Glasgow), “Engineering the Transition to Evolvable Chemistry: Inorganic Biology”

**14:50 – 15:10** Bruce Damer (UC Santa Cruz), “Coupled Phase Cycles: A Testable Origin of Life Scenario for Fluctuating Inland Volcanic Hydrothermal Fields”

**15:10 – 15:30** Jim Cleaves (ELSI/IAS), “Some Perspectives on the Origin of Life from Organic Chemical Space”

**15:30 — 17:00: Posters with flash talks on "Towards Universal Biology" and Beer**

**17:00 — 18:00: Panel Discussion;** Moderator: Nathaniel Virgo (ELSI)

**From 19:00 — Symposium Banquet held in the ELSI building, 1st floor**

**Day 3** (Thursday, January 15, 2015)

**Signs of Life on Other Planets** (co-chair Yuka Fujii)

**Session 1 : Chair Joe Kirschvink (Caltech/ELSI) (9:00 — 10:10)**

**09:00 – 09:50 Keynote speaker:** Rolf de Groot (European Space Agency), “The ExoMars Programme: searching for traces of life on Mars”

**09:50 – 10:10** Bethany L. Ehlmann (Caltech), “The Aqueous Environments of Early Mars: Where are the Biosignatures and Where Should We Be Looking?”

**10:10 — 10:40: Coffee Break**

**Session 2 : Chair Joe Kirschvink (Caltech/ELSI) (10:40 — 11:50)**

**10:40 – 11:30 Keynote speaker:** Chris McKay (Ames/NASA), “Search for life on other worlds of our Solar System”

**11:30 – 11:50** Takeshi Naganuma (Hiroshima Univ.), “Generation and transportation of molecular oxygen to sub-ice ocean of Europa”

**Lunch (11:50 — 13:20)**

**Session 3 : Chair Shigeru Ida (ELSI) and Jun Kimura (ELSI) (13:20 — 15:40)**

**13:20 – 14:10 Keynote speaker:** Wesley Traub (JPL/NASA), “Future Prospects for Characterizing Earth-size Exoplanets”

**14:10 – 14:30** Tyler Robinson (Ames/NASA), “Strengths and Limitations of Reflected-light Observations of the Pale Blue Dot”

**14:30 – 15:20 Keynote speaker:** Antigona Segura (UNAM), “Oxygen as a biosignature, the importance of the geological context”

**15:20 – 15:40** Yuka Fujii (ELSI), “Color variation of planets”

**15:40 — 17:10: Posters with flash talks on "Signs of Life on Other Planets" and Beer**

**17:10 — 18:10: Panel Discussion; Moderator: TBD**

## **POSTER SESSIONS**

### **Day 1 (Tuesday, January 13, 2015) - Planets as Cradles of Life**

#### **Posters with flash talks (15:30 — 17:00)**

- P1-01 Jennika Greer** (University of Colorado, Boulder)  
Pre-3.78 Ga sedimentary protoliths in the Inukjuak Domain, northern Quebec (Canada)
- P1-02 Ryoichi Nakada** (ELSI, Tokyo Tech)  
Cerium stable isotopic fractionation as a potential paleo-redox proxy
- P1-03 Nigel M Kelly** (University of Colorado, Boulder)  
Impact history of the inner solar system from (U-Th)/He geochronology of lunar and meteoritic zircon
- P1-04 Kazumi Yoshiya** (ELSI, Tokyo Tech)  
In-situ iron isotope analysis of pyrite and organic carbon/nitrogen isotope ratios from the Middle Proterozoic sediments, McArthur Basin, Northern Australia
- P1-05 Louis Lerman** (Foundation for Molecular Evolution (FFAME))  
Global Organic Weather Cycles and the Origin of Life: Planetary-Scale Infrastructures for Prebiotic Chemical Evolution on Terrestrial-like Planets
- P1-06 Shinnosuke Aoyama** (Tokyo Tech)  
Microbial activity below Archean seafloor constrained by quadruple sulfur isotopes analysis of pyrite grains in ca. 3.5 Ga basalts from Pilbara Craton, Western Australia
- P1-07 Joseph G O'Rourke** (California Institute of Technology)  
Powering Earth's dynamo with magnesium precipitation from the core
- P1-08 Steve Greaux** (Ehime University Geodynamics Research Center)  
Seismic velocities of pyrolite and the structure of the Earth's mantle.
- P1-09 Haruka Ozawa** (JAMSTEC)  
High-pressure melting experiments on Fe-FeSi alloys
- P1-10 Shigehiko Tateno** (ELSI, Tokyo Tech)  
Temperature and structure of the Earth's inner core
- P1-11 Matthieu Laneuville** (ELSI, Tokyo Tech)  
Effect of a fractionated basal magma ocean on the Earth dynamo
- P1-12 Hiroki Ichikawa** (Ehime University Geodynamics Research Center)

Hot plumes caused by transitions involving majorite

**P1-13 Zhaodong Liu** (Ehime University Geodynamics Research Center)

Phase relations of MgSiO<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub> system in Earth's lower mantle

**P1-14 Nao Cai** (Ehime University Geodynamics Research Center)

Dehydration of chlorite and formation of a new hydrous phase

**P1-15 Koichiro Umemoto** (ELSI, Tokyo Tech)

Liquid iron alloys with light elements at outer core conditions by first-principles calculation

**P1-16 Wei Du** (Ehime University Geodynamics Research Center)

Contribution of volatile rich material to the Earth's accretion

**P1-17 Vincenzo Stagno** (Ehime University Geodynamics Research Center)

Quasicrystals at HP-HT: implications for the redox conditions during planetary formation

**P1-18 Hernandez-Resendiz Patricia** (Universidad Nacional Autonoma de Mexico)

Study of chondrule formation mechanisms in chondrites from melts generated experimentally.

**P1-19 Shoji Ueta** (Tokyo Tech)

Development of simulation code for impacts of small planetary bodies and estimate of the impact erosion

**P1-20 Junko Kominami** (RIKEN/ELSI, Tokyo Tech)

Formation of Planetary Systems : Large Scale N-Body Simulations

**P1-21 Miki Nakajima** (California Institute of Technology)

Origin of the Earth, Moon and exomoons

**P1-22 Toshiaki Iitaka** (RIKEN Computational Astrophysics Laboratory)

Early Earth Simulator Project

**P1-23 Takayuki Saitoh** (ELSI, Tokyo Tech)

Entropy core formation in cluster of galaxies with DISPH

## Day 2 (Wednesday, January 14, 2015) - Towards Universal Biology

### Posters with flash talks (15:30 — 17:00)

- P2-01 Yuko Sasaki-Sekimoto** (ELSI, Tokyo Tech)  
Evolution of plant lipid metabolism during colonization of land
- P2-02 Lewis M Ward** (California Institute of Technology)  
A Model for Rapid Oxidation of the Atmosphere Following Evolution of Oxygenic Photosynthesis Suggests Late Evolution of Cyanobacteria
- P2-03 Kumiko Kihara** (ELSI, Tokyo Tech)  
Toward to the genome analysis of the microorganisms living in a primitive environment
- P2-04 Ken Kurokawa** (ELSI, Tokyo Tech)  
MicrobeDB.jp: Developing an integrated Database for Microbes with Semantic Web Technologies
- P2-05 Arturo Rubio** (UNAM)  
Virtual Communities for Astrobiology divulgation
- P2-06 Enrico Sandro Colizzi** (Utrecht University)  
Mutation-driven division of labour within Quasispecies
- P2-07 Matthieu Laneuville** (ELSI, Tokyo Tech)  
Emergence of multicellularity from stochasticity
- P2-08 Tetsuya Yomo** (Osaka Univ./ELSI, Tokyo Tech)  
The Evolutionary Enhancement of Genotype-Phenotype Linkages
- P2-09 Ryo Mizuuchi** (Osaka University, Information Science and Technology)  
An evolvable artificial cell model
- P2-10 Yutetsu Kuruma** (ELSI, Tokyo Tech)  
Construction of artificial cell membrane for the study of the origin and evolution of life
- P2-11 Jay G. Forsythe** (Georgia Institute of Technology)  
Structural Investigations into the Prebiotic Origins of Peptides
- P2-12 Norio Kitadai** (ELSI, Tokyo Tech)  
Thermodynamic evaluation for the effects of pH and metal cations on the polymerization of amino acids
- P2-13 Hossein Shenasa** (University of California, Santa Cruz)  
Generation of oligonucleotides under hydrothermal conditions by non-enzymatic polymer-

ization

**P2-14** **Kuhan Chandru** (ELSI, Tokyo Tech)

The Unknown Complexes in Prebiotic Chemistry

**P2-15** **Chris Joseph Butch** (Georgia Institute of Technology)

High pH Chemistry of Glyoxylate as a Starting Point for a Prebiotic Metabolism

**P2-16** **Vincent Oostelbos** (Utrecht University)

Genetic takeover: From pre-RNA to the RNA world

**P2-17** **Masashi Aono** (ELSI, Tokyo Tech)

Improvements in Amoeba-inspired Heuristic Search Dynamics for Exploring the Origins of Life

**P2-18** **Kazuaki Amikura** (ELSI, Tokyo Tech)

A genetic code without the sulfur containing amino acids

**P2-19** **Shigenori Maruyama** (ELSI, Tokyo Tech)

A way to establish Astrobiology



## Day 3 (Thursday, January 15, 2015) - Signs of Life on Other Planets

### Posters with flash talks (15:40 — 17:10)

- P3-01 Jennifer Buz** (California Institute of Technology)  
A Reinvestigation of the ALH84001 magnetites using SQUID Microscopy
- P3-02 Abigail Ann Fraeman** (California Institute of Technology)  
Habitable Environments Preserved in Lower Mt. Sharp: Exploring Curiosity's Future Path from Orbit
- P3-03 Mathieu Gaetan Andre Lapotre** (California Institute of Technology)  
How much water on Hesperian Mars - Insights from canyon morphology
- P3-04 Louis Lerman** (Foundation for Molecular Evolution (FFAME))  
Prebiotic Chemical Evolution on an Early Mars: Consequences and Artifacts of 'Organic' Weather Cycles in the Noachian
- P3-05 Renyu Hu** (Jet Propulsion Laboratory, California Institute of Technology)  
Carbon Reservoir History of Mars Constrained by Atmospheric Isotope Signatures
- P3-06 Sebastian Oscar Danielache** (Sophia University Faculty of Science)  
Chemistry with KROME II: A dynamical photochemical core coupled with disequilibrium and sulfur isotopes
- P3-07 Alexis Gilbert** (ELSI, Tokyo Tech)  
Tracing the origin of natural gas hydrocarbons using position-specific isotope analysis
- P3-08 Yuhito Shibaïke** (Tokyo Institute of Technology)  
Melting of Hadean Continents by Late Heavy Bombardment and Origin of Life
- P3-09 Juan Pedro Ferrio** (Universitat de Lleida)  
Drinking rocks: plants can use crystallization water from gypsum mineral
- P3-10 Jun Kimura** (ELSI, Tokyo Tech)  
Polymerization of building blocks of life on Europa and other icy moons
- P3-11 Steve Vance** (Jet Propulsion Laboratory, California Institute of Technology)  
Thermodynamic Equations of State for Ammonia and Sodium Chloride Solutions Applied to Deep Icy World and Exoplanet Oceans.
- P3-12 Masashi Omiya** (National Astronomical Observatory of Japan)  
Search for extrasolar Earth-mass planets around low-mass stars using InfraRed Doppler