



Image: NASA, solarsystem.nasa.gov

Workshop and course in astrobiology, 16-17.10.2017, Umeå, Sweden: Life on Earth and in the Universe 🌍 Current State & Future Visions

Key scientific topics:

- Space and astrobiology activities in the Nordic countries
- Tracing the history of the solar system and the conditions for life
- Searching early traces of humans, life and intelligence in the universe
- Exploring ancient traces of life on Earth and in the universe
- Global changes and their impact on the future of Earth
- Evolutionary biology on Earth and in the universe
- Human relations on Earth and to the universe
- Sustainable technology on Earth and on future space missions
- *Brainstorming discussion:* "Do biological laws exist and if so, do they exist elsewhere in the universe? How will this affect the future of our research policy and space missions?"
- Popular scientific events for schools and the public (e.g. Space colonization - Cities in space)

Website: www.emg.umu.se/astrobiologi-2017

Information and registration: natuschka.lee@umu.se

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Background: The secrets of the universe and life has fascinated humankind since its early history. During the last century, we have experienced amazing discoveries in science and technology. These have enabled fascinating journeys to the smallest components of matter and life, the different global ecosystems of Earth, and to the outer universe. With the ongoing amazing new discoveries in the universe, astonishing remains of ancient life on Earth, or amazing extremophiles, we are constantly expanding our insights about the universe and life. However, we have also experienced global environmental destructions, political crises, and contaminated our solar system with large amounts of waste. Furthermore, many fundamental existential questions are still far from solved. Some of the main future challenges are to understand the principles of life and human evolution and interactions with our bio- and geosphere, and how to develop a sustainable civilization and technology, on Earth and if possible in the universe. This workshop aims to discuss current trends and visions around these topics.

Astrobiology is a young, fascinating research field, which in contrast to the current trend towards more specialization, strives to bring together different fields like physics, chemistry, biology, geology, technology and humanistic sciences. Astrobiology therefore encourages both a broader education, deeper interdisciplinary understanding, as well as novel, interdisciplinary interactions and research. Welcome to our workshop!

Organizers: The board of the Swedish Astrobiology Network (SWAN). For more information, contact: natuschka.lee@umu.se

Local organisers at Umeå University (UmU):

- Natuschka Lee, researcher, department of Ecology and Environmental Science (EMG), natuschka.lee@umu.se
- Asta Pellinen Wannberg, professor, department of Space Physics at Umeå University and at the Swedish Institute of Space Physics (IRF) in Kiruna, asta.pellinen-wannberg@umu.se

Deadline for registration and submission of conference contributions: 15/9 2017 (abstract in a word file, maximum 250 words). Last minute registrations and presentation suggestions after this deadline will still be possible to a limited extent. For more information, contact: natuschka.lee@umu.se

Costs: No conference fee. No food is included; however, lunch or dinner can be booked via the registration (an email will be sent to all registered participants on this).

Time: Start of conference: Monday 16/10 2017 at 13:00 (registration will be open from 12:00). Start of PhD course: Monday 16/10 2017 at 09:30. The conference and the course will finish Tuesday afternoon on the 17th October 2017. After this, there is a possibility to visit the local observatory and planetary in Umeå, the Umevatory from 6-22 pm.

Location: Umeå University, Chemical Biological Center (KBC house), Linneaus väg 6, 90187 Umeå. Carl Kempe Lecture hall (close to the KBC café).

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Day 1: 16/10 2017, Carl Kempe Lecture Hall, KBC house, Linneaus väg 6, 901 87, Umeå.

1. Welcome words ~ 20 min

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| 13:00-13:10 | Natuschka Lee , associate professor, Ecology and Environmental Science, Asta Pellinen Wannberg , professor at space physics, UmU and IRF in Kiruna | Organizational issues |
| 13:10-13:20 | Sara Sjöstedt de Luna , Pro-Dean of the faculty of Science and Technology, UmU | Welcome words and short overview of Umeå University |

1. General information on space and astrobiology activities in the Nordic countries: ~ 40 min

Chair: Anna Neubeck, PhD, Astrobiology Centre, Stockholm University

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| 13:20-13:25 | Alexis Brandeker , associate professor, Astronomy, Stockholm University | Presentation of the Swedish Network on Astrobiology (SWAN) |
| 13:25-13:30 | Wolf Geppert , director of the Astrobiology Centre, Stockholm University | Presentation of the Nordic Astrobiology Network |
| 13:30-13:40 | Gunnar Florin , space engineer | Presentation of activities of the Swedish Space Corporation (SSC) |
| 13:40-13:50 | Joakim Enerstam , manager of space related companies | Presentation of the European Space Agency (ESA) Business Incubation Centre (BIC), Luleå. |
| 13:50-14:00 | Carol Norberg , associate professor, space physics, UmU and IRF in Kiruna | Space Science Education |

2. Tracing the history of the solar system and the conditions for life: ~1 h

Chair: Carol Norberg, associate professor, space physics, UmU and IRF in Kiruna

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| 14:00-14:20 | Asta Pellinen Wannberg , professor, space physics, UmU, and IRF in Kiruna | Hunting for the small messengers from space - meteors and meteorites |
| 14:20-14:40 | Paula Lindgren , PhD, lithosphere and biosphere science, Lund University | The fate of carbon in impact melts |
| 14:40-15:00 | Ingemar Jönsson , professor, theoretical and evolutionary ecology, Kristianstad University | Space related research on tardigrades |

15:00-15:30 *Coffee break and poster session.*

3. Keynote lectures – Searching early traces of humans, life and intelligence in the universe: ~1,5 h

Chair: Alexis Brandeker, associate professor, Astrobiology Centre, Stockholm University

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| 15:30-16:00 | Philip Buckland (director) and Philip Jerand (PhD candidate), Environmental Archaeology Lab, UmU | Archaeological and environmental methods for detecting and analyzing ancient civilizations |
| 16:00-16:30 | Cancelled due to disease, replacement will be sought: Javier Martin Torres, professor, atmospheric science, Luleå University of Technology, UK Astrobiology Center in Edinburgh, UK | An update on the current Mars environment after Curiosity data, and challenges for future human space missions |
| 16:30-17:00 | Eric Zackrisson , associate professor, Department of Astronomy, Uppsala University | Searching for Extraterrestrial Intelligence |

17:00 → *Poster session*

19:00 → *Dinner (location to be announced)*

Day 2: 17/10 2017: Carl Kempe salen, or Lilla hörsalen KBC house, Linneaus väg 6, 90187 Umeå

4. Exploring ancient traces of life on Earth and in the universe: ~1 h

Chair: Paula Lindgren, PhD, Geology and planetary science, Lund University

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| 08:00-08:20 | Andras Gorzsas , manager of the Vibrational Spectroscopy Core Facility at KBC, Chemistry, UmU | Vibrational spectroscopy for extraterrestrial research |
| 08:20-08:40 | Anna Neubeck , PhD, Astrobiology Centre Stockholm University | Methanogens and nickel |
| 08:40-09:00 | Jonathan Klaminder , associate professor, Ecology and Environmental Science, UmU | Ancient terrestrial ecosystems during the Ice age |

5. Global changes and their impact on the future of Earth: ~1 h

Chair: Natuschka Lee, associate professor, Ecology and Environmental Science, UmU

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| 09:00-09:20 | Sylvain Monteux , PhD candidate, Ecology and Environmental Science, UmU | Extreme microbes in permafrost and their impact on climate change |
| 09:20-09:40 | Juanjo Rodríguez , PhD candidate, Ecology and Environmental Science, UmU | Effects of organic pollutants on bacterial communities under future climate change scenarios |
| 09:40-10:00 | Jing Helmersson , PhD candidate, Department of Public Health and Clinical Medicine | Climate change and Dengue/Zika mosquitos - risk of invasion of <i>Ae. aegypti</i> in Europe |

10:00-10:30 *Coffee break and poster session*

6. Evolutionary biology on Earth and in the universe: ~1 h

Chair: Ingemar Jönsson, professor, theoretical and evolutionary ecology, Kristianstad University

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| 10:30-10:50 | Felipe Cava , associate professor, Molecular Biology, UmU | Evolutionary aspects of bacterial cell wall chemical structure |
| 10:50-11:10 | Natuschka Lee , associate professor, Ecology and Environmental Science, UmU | Phototrophs in space – the BIOMEX project on the international space station ISS |
| 11:10-11:30 | Mehdi Cherif , associate professor, Ecology and Environmental Science, UmU | The mechanics of life: can we predict ecological interactions from the physical properties of life's media? |

11:30-13:00 *Lunch and poster session*

8. Human relations on Earth and in the universe: ~1 h

Chair: Merlin Sheldrake, PhD, University of Cambridge

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| 13:00-13:20 | Natuschka Lee , associate professor, Ecology and Environmental Science, UmU | Science & Fiction – Are we ready to meet life in the universe? |
| 13:20-13:40 | Peter Sköld , Arctic Research Centre (ARCUM), UmU | Sami history and cosmology |
| 13:40-14:00 | Kalle Grill , associate professor, Historical, philosophical and religious studies, UmU | Life on Earth and in space - ethical and existential issues |

9. Sustainable technology on Earth and on future space missions: ~1 h

Chair: Asta Pellinen Wannberg, professor, space physics, UmU and IRF in Kiruna

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| 14:00-14:20 | Johannes Messinger , professor, chemistry, UmU | Artificial photosynthesis: making H ₂ from sunlight and water |
| 14:20-14:40 | Christiane Funk , professor, chemistry, UmU | MicroBioRefine – wastewater treatment and production of energy from psychrotrophs |
| 14:40-15:00 | Stina Jansson , associate professor, chemistry, Umeå University (currently guest researcher at NASA) | Skype lecture (from NASA): Thermal treatment of waste into carbon materials and gaseous fuels on future Mars missions |

15:00-15:10 *Closure – departure*

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**Post-conference activities (mostly in Swedish, for the public and school children)/
Populärvetenskapliga rymd-relaterade aktiviteter på tisdag eftermiddag 17.10. 2017 i Umeå:**

Alternative 1: Cities in Space/Rymdkolonisering: För skollärare, elever och alla övriga intresserade, kl 15:15-18:15. Plats: KBC huset, Umeå Universitet, Linneaus väg 6, 901 97 Umeå, (antingen Lilla Hörsalen eller Carl Kempe salen (beroende på antal anmälningar).



Innehåll:

- Föreläsning "Cities in Space" - om rymdkolonisering.
- Praktiska övningar: skapa en egen rymdkoloni.

Föreläsare: Ulf E Andersson och Ariel Borenstein, Svenska Rymdsällskapet. För mera information: ulferikandersson@gmail.com

Denna aktion har utövats två gånger under de senaste två åren, på det tekniska museet i Stockholm, och på SpaceUp Sweden på KTH i Stockholm.

Kostnadsfritt. Fika kan ordnas till självkostnadspris.

Alternative 2: Visit the Umeå university library:



Umeå University Library

Cosy reader corner with different kinds of space related books (science as well as science fiction)/Mysig läshörna med olika tycker av rymd-relaterad literature (vetenskaplig litteratur och science fiction).

Alternative 3: Visit Umeå Observatory and science center for the public/Besök Umevatoriet: För alla, kl 18-22. Plats: Umestans Företagspark, hus, 903 47 Umeå, Sverige



Exempel på program:

- Planetariumshow
- Teleskop
- Matematikrummet "Spektrum" med hundratals olika klurigheter
- Rymdutställning

För mera information, ring 090-718020, eller maila till:

Marianne.eik@umu.se , <http://www.umevatoriet.se/>

Vuxna, 100 kr

Studenter och pensionärer, 50 kr

Barn och ungdom (<18 år), 50 kr

OBS! Varje barn kan ta med sig en vuxen gratis!

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Astrobiology course (for undergraduates, PhD students, postdocs and others), 1,5 credit points

Course conditions:

1. Participation at a 2 h introductory lecture by Natuschka Lee, EMG Umeå University: "History and future of astrobiology". Time: 16/10 2017, 9:30-11:30, in room KBH4 at the department of Ecology and Environmental Science, KBC house, Linneaus väg 6, 901 87 Umeå.
2. Participation at the whole conference.
3. Presentation of a poster or an oral presentation.
4. Participation at a 1 h lecture after the conference, for questions, summing up impressions and to discuss: ***"Do biological laws exist and if so, do they exist elsewhere in the universe? How will this affect the future of our research policy and space missions?"*** Time: 17/10 2017, 15:30-16:30, in room KBE5 at the department of Ecology and Environmental Science, KBC house, Linneaus väg 6, 901 97 Umeå.

Recommended literature:

- Textbook: ***"Understanding life in the universe"***, by C. Cockell, Wiley-Blackwell, 2015
- Classical literature: E. Schrödinger ***"What is life"***.
- Classical literature: T. Kuhn ***"The structure of scientific revolutions"***
- The recent ***Roadmaps from the European Science Foundation and NASA:***
 - <http://dx.doi.org/10.1089/ast.2015.1441>
 - https://nai.nasa.gov/media/medialibrary/2016/04/NASA_Astrobiology_Strategy_2015_FINAL_041216.pdf
 - ***Statement from the Swedish government on space research:***
<http://www.regeringen.se/rattsdokument/statens-offentliga-utredningar/2015/09/sou-201575/>
 - Free option: ***Human governance beyond Earth; Extra-terrestrial liberty : an enquiry into the nature and causes of tyrannical goverment beyond the Earth*** (both books by Charles Cockell).

Costs: No course fee.

Confirmation of participation of the course will be made by a signed letter by the course organiser (Natuschka Lee). For PhD students at UmU, this letter must be shown to the supervisor in order to obtain the credit points.

More information: natuschka.lee@umu.se