General Assembly of the European Astrobiology Institute

5 October 2021

Motion 1

The General Assembly may approve the following Report of the Activities of the European Astrobiology Institute for the year 2020.

Report about the activities of the European Astrobiology Institute

Year 2020

Recruitments of institutions

The recruitment of member entities was continued during 2020. Up to the date of the report (September 2021) there were 6 Core Organisations (CNRS (FR), CNES (FR), DLR (DE), FNRS (BE), INAF (IT), Centro de Astrobiología (ES) and around 25 participating institutions. We were very happy to welcome the University of Bologna (IT) and the Centro de Astrobiología (ES) as participating entities. This gives the EAI an ample membership with a sound financial basis.

Networking Activities

For the Working Group *"Formation and Evolution of Planetary Systems and Detection of Habitable Worlds" t*he year 2020 started with the active phase of the preparation of the EAI summer school „Formation and evolution of planetary systems and habitable planets", which was supposed to take place on August 19-26, 2020 in the Faculty of Physics, Astronomy and Informatics of the Nicolaus Copernicus University in Toruń (Poland). Unfortunately, due to the COVID-19 pandemic the school had to be postpone to 2022. In 2020 the WG started its work on a collaborative paper entitled: „Habitable Worlds: Formation, evolution, detection and characterization". The aim of this undertaking is to write an article with a special focus on astronomical aspects of habitability. A large team of colleagues with expertise in various research fields has been gathered together to work on different aspects related to the formation, evolution, detection, and characterization of habitable worlds. This paper will not only give an in-depth overview about the state-of-the-art of our understanding of habitable worlds, but also provide a unique view on this topic by a truly interdisciplinary team. In particular, it will indicate a way to make further progress and will stimulate collaborative work in finding the solutions to fundamental questions. Towards the end of the year the WG Formation and Evolution of Planetary Systems and Detection of Habitable Worlds decided to invite the WG Planetary Environments and Habitability to join the efforts. The first joint meeting took place on the 4th of December 2020. The first half of 2021 was devoted to the intensive work on the contents of the paper. There has been a series of on-line meeting dedicated to this task. Now, the working groups investigate the best option for the final format and publication of the paper.

The Working Group *"Planetary Environments and Habitability"* started initial discussions with the WG on Planetary Environments and Habitability and the WG on Formation and Evolution of Planetary Systems and Detection of Habitable Worlds for a joint white paper. For this the WG has redefined the WG scientific questions to reflect the diversity of topics in the Planetary Environments and Habitability WG:

- How did life and habitability co-evolve on Earth
- Which parameters and processes determine the habitability of rocky and water-rich planetary bodies
- Which conclusions can we draw for other planets and moons from studies of the Earth and vice versa?

Meetings took place to define chapter outlines and discuss chapter status for the white paper/special issue that is being prepared in collaboration between the WG Planetary Environments and Habitability and the WG Formation and Evolution of Planetary Systems and Detection of Habitable Worlds. The Editorial Team of the journal "Astrobiology" was contacted in August 2021 for the white paper/special issue (the response still pending)

The main activity of the *Working Group "Early Life and Life in extreme conditions"* during 2020 was the building up the WG. To this end an on-line workshop with was organised in late autumn 2020. Also, WG members were speakers at the EAI online seminar, including the WG leader Emmanuelle Javaux. In cooperation with the Project Team on Tracing Life and Identifying Habitable Environments an application was filed for an ISSI project. The application was successful. On international level WG members are also active: Emmanuelle Javaux is on the scientific committee of AbSciCon 2022 organisation.

In September 2020 an internal on-line WG meeting was held. Its main objectives were to allow the WG members to get acquainted with each other, identify research interests, and create links within the WG community. The meeting was also used to identify topics for focused workshops, to identify and develop possible common research projects and funding, to propose speakers for seminars, and in general, to discuss any EAI issue relevant to that WG.

In winter 2020/21 an online workshop with the topic: "Diversity, preservation and detection of life traces and abiotic processes mimicking life", with a focus on Mars analogue sediments of early Earth and modern aquatic environments analogue to ExoMars and Mars 2020 landing sites was organised. This aimed to build up strong background knowledge to identify key questions to address in new EAI research projects and field activities.

The Working Group *"Biosignatures and the Detection of Life beyond Earth"* also constituted itself and is planning two on-line workshops in autumn and winter 2021/22 on the astrobiology in future space missions. One will focus on Mars and one on outer planets. The EAI will also be engaged in a joint meeting of the "Chemistry" and "Astrobiology" Working Groups of the oncoming ARIEL mission. The venue, Liblice Castle (CZ), has already been secured and first discussions on the layout of the event have taken place.

The Working Group *"The Pathway to Complexity: From Simple Molecules to First Life"* was also constituting itself. The WG has been engaged in planning a workshop in the area of Heidelberg (DE) in 2022 to forge links between the astrobiology and astrochemistry community. Such an event was already organised in Liblice with success by the previous COST Action "Origins and Evolution of Life in the Universe"

The Working Group on *Historical Philosophical and Societal Questions in Astrobiology* was engaged in the preparation of two events in late spring 2022, namely a summer school entitled "Life on Earth and Beyond" and a workshop on "Astrobiology and Society". Funding was also obtained from Lund University to perform multidisciplinary research, which will enable co-funding of those events.

The first half of 2020 was devoted to planning of the *Project Team "Protoplanetary disks and their physical and chemical processes"* and preparation of its launch. The initial Project Team assembly and recruitment for the team was completed in September 2020. Now the team

consists of 38 members, across 12 countries. 40% of team members are female, and there is a balanced mixture of early career, mid-career, and established researchers. A temporary team website was set up in November 2020, with introductory videos of team members which can be found at: https://eai-ppd.dreamhosters.com/. The first team meeting was held virtually on zoom in January 2021 and it focused on dust mass budget and chemical composition of PPDs. An application for an in-person team workshop hosted and funded by the Max Planck Society at Schloss Ringberg was submitted. The application was successful, and the meeting is planned to go ahead in March 2022. The second team meeting held virtually on zoom in April 2021 and focused on planet formation. An application is now in preparation for a COST Action proposal "The birth of solar systems" which is to be submitted in October 2021.

The Project Team *"Science Fiction as A Tool of Astrobiology Outreach and Education"* consists of 14 members from 10 countries, 50% female, of various stages of career and varying professional interests. In 2020, the e-book anthology *Strangest of All* was published, containing eight SF stories with astrobiology themes, eight accompanying essays on the science, and tips for use of the stories and essays in the classroom; the authors were interviewed i.a. about the science in their stories and the ways SF can help us teach science. In spring 2021, the Kickstarter funding campaign for the print and e-book anthology *Life Beyond Us* successfully concluded; the book will contain 28 stories and 28 accompanying essays covering topics such as exoplanet detection, deep hot biosphere, planetary protection, interstellar medium, possibility of life on Titan, or SETI. The Kickstarter for *Life Beyond Us* was covered by various popular science and SF media, increasing the visibility of the EAI. *Strangest of All* and *Life Beyond Us* were presented at the EPSC, AbGradE, AbGradCon and (upcoming) the Shaw-IAU Workshop on Astronomy for Education

The project team *"Tracing Life and Identifying Habitable Environments"* applied for funding from the International Space Science Institute (ISSI) and was selected for a work group "Towards a universal tracers portal". The ISSI working group will be supported financially and administratively, allowing it to have several in-person (plus online) meetings to develop a new website - the universal tracers portal, throughout the next few years.

The project team *"Impacts and their Role in the Evolution of Life"* focused on the planning of two events in 2023, namely a summer school and a meeting on the subject. Local contacts have already been forged and discussions for an accompanying outreach programme have been started.

The project team *"Mars Sample Return"* is in the phase of constituting itself.

Seminars

Since autumn 2020 the EAI organises a biweekly series of seminars by eminent astrobiologists. Up to the summer break in 2021 13 seminars were given which were livestreamed on our website (https://europeanastrobiology.eu/streamed-seminars/) and archived on a special Youtube channel. Attendance was very good (usually more than 50 participants) and the resonance very positive. The seminar series will be continued in the academic year 2021/2022 and slots are already filled until mid-February.

General Assembly 2020 and 2021

The General Assembly 2020, which was scheduled to take part from 20-24 April 2020 in Fuencaliente de La Palma (ES). There were more than 170 registrations were received and 140 abstracts submitted. A pre-meeting for early career scientists was also organised before the meeting with an excursion to a lava cave and 2 field trips (a bus tour to the telescopes on Roque de los Muchachos and a walk on the Ruta de los Volcanes) had been scheduled. Unfortunately, all that arrangement had to be cancelled due to the Covid-19 outbreak and the meeting was adjourned to 25-29 April 2022. Luckily, all invited speakers for the 2020 Assembly (with one exception) agreed to give talks at The General Assembly 2021 will be held electronically on 5 October 2021.

We also planned a meeting of early career astrobiologists in cooperation with AbGradE just before BEACON 2020 at the same location. Co-funding was secured from Europlanet and the French Astrobiology Society. This meeting will also be held in 2022 just ahead of BEACON 2022. It will consist of 3 days of scientific programme and a day of excursions. A team of 7 early career scientists will act as the Scientific Organisation Committee for the event.

Furthermore, a meeting on the subject of "Astrobiology in ongoing and future space missions" with the aim to forge new links and co-operations between the astrobiology and space mission technology community was planned in Sweden for November 2020 and also had to be cancelled. It is planned to take place in Tartu (EE) in late 2022.

Training

Unfortunately and due to the Covid pandemic situation, the training school, RED'20 has been cancelled and was held online from June 21 to 25th, 2021. See http://www.exobiologie.fr/red/index.php/en/red16-astrobiology-course/ for details. This online version generated several hundred registrations from all countries, and nearly 230 participants have taken all of the courses. We got very good feedback from the students about the organization of the school and the content of the lectures. Due to the difference of time between countries, students could either participate at the live Q&A sessions, or watch the replays of the lectures. All the courses are now available to everyone on the Youtube channel of the French Astrobiology Society at the following address: https://www.youtube.com/playlist?list=PLp1fzS4SN_eUFdTDAYwXcOf-n_HDR-SCB.
These videos also join the online database of astrobiology course videos on the Astrobiovideo site: https://astrobiovideo.com/fr/

Due to the great success of the 2018 workshop on "Micro- and nanosatellites in planetary science" a follow up event was planned in Tartu from which 4 different mission plans were planned to be discussed by the attendees, A training programme for the next year has been developed at the European Astrobiology Campus and will be presented to the General Assembly 2021 (see the Action Plan for 2022).

Also, the preparation of the EAI Academy was on the way during the time covered by the report, which consists of a series of 16 didactic talks on the following four topics:

- Trips to the Outer Solar System

- Habitability of exoplanets
- Life in the dark
- Co-evolution of planetary geospheres, atmospheres and biospheres".

The seminars will be offered for free and will be streamed online every two weeks.

A summer school on “Formation of planetary systems and detection of habitable planets and moons” was planned to take place in Torun (PL) was prepared for August 2020 but also had to be cancelled. It will be held in August 2022 instead. Preparations for this event have already started.

Outreach and corporate identity

The preliminary website of the EAI was launched in autumn 2019. A team for creating a new website was formed and has worked on the new design. A focus was on inclusion of social media announcements being visible on the swebsite. The new website was made public in summer 2021 with the same URL (www.europeanastrobiology.eu). It will allow the Working Group leaders and project team coordinators to manage their own webpage or the webmasters of the Working Groups under the EAI website. A training event for the different Working Groups and Project Teams has already been offered and one – by one meetings with ESF consultant Shorouk ElKobros (who has been creating the website) will be organised for the webmasters of the different Working Groups and Project Teams. This will enable them to manage the webpages of their entities on their own.

A Facebook and a Twitter account was created and entries were published on a daily basis. At Facebook we have now (September 2021) more than 4000 followers and usually get 10-20 “likes” for each entry. At Twitter we have well over 1500 followers. The EAI is also present on LinkedIn.

The *WG on Outreach, Publicity and Corporate Identity* also engaged in preparation of the exhibition “Strange worlds, Oceans on the Earth and beyond” at the Fuencaliente de La Palma, the venue of BEACON 2020. The exhibition will cover 3 themes:

- Extreme environments on the seafloor: hydrothermal and volcanic vents
- Life on the seashore
- Subsurface oceans as the possibly most widespread potential habitat in the universe
- Search for exoplanets and extraterrestrial life

The exhibition will be displayed in the old lighthouse of Fuencaliente de La Palma and remain there, thus leaving a permanent heritage of BEACON 2020. An exhibition coordination team was formed and first talks were organised with the community authority of Fuencaliente. A first presentation of the exhibition concept was held at a meeting with island and community authorities in May 2021.

An update of the book "Young Sun, Early life and the Origins of life » (Gargaud et al, Springer, 2012) and its publication in Japanese (Nishimura publisher , 2021) were launched. In addition, the anthology “Strangest of All” was developed in by Julie Nováková. This is an anthology of astrobiology-themed science fiction stories aimed to both entertain and educate. It takes one on

a journey to encounter life in the universe, as imagined in SF stories by award-winning authors, and our chances of finding it outside of the Earth, detecting it remotely, learning its limits and more in original nonfiction essays following each story. The "Strangest of All" anthology was also published on the web.

We will continue and extend the already very successful work with social media (LinkedIN, Facebook, Twitter).

Funding and policy
A major activity was the preparation of the bid for a Horizon 2020 Starting Community Grant. First discussions happened in November 2019 and a preparatory team led by Karen Olsson Francis (Open University, UK) and Wolf Geppert (Stockholm University, SE) was constituted. The proposal preparation involved a multitude of EAI institutions and was submitted in May 2020. Unfortunately the proposal was not funded and a resubmission is planned in 2022 under the Horizon Europe programme.
.

Other activities

Administration
The administration was carried out by our host organisation (European Science Foundation). The following line of actions were undertaken for the period of the report:

EAI management
Maintain EAI Funders Directory

- Participating Organisations: MoU (Reception, Archiving, Reminders)
- FOs: Invoices (generation and follow up)
- Discussions about the layout of the website
- Billing information retrieval

Organisation of BEACON 2020

- Management of the registrations for the meeting
- Meeting preparation
- Work associated with cancellation and reimbursement

Website management

- Organisation of hosting
- Set-up of website
- Training of future webmasters of Project Teams and Working Groups

It is expected that in the future costs for meeting organisation will be reduced by introduction of a commercial registration/billing system (in order to avoid double checking payment/billing details, which took a lot of personnel time).

A detailed financial and administrative report from ESF will be distributed to delegates at the EAI and presented at the EAI General Assembly.