EUROPEAN ASTROBIOLOGY INSTITUTE
(Executive summary)

Background

Fundamental questions in science like "How and when did life emerge on Earth?", "How did our solar system and life evolve and how will it develop in the future" and "Is there life on other celestial bodies" will not be answered by one discipline alone but require a concerted and coordinated approach involving many researchers with seemingly unrelated scientific backgrounds. Also, the European research landscape is rapidly changing on a global scale. Boundaries between disciplines disappear and new cross-disciplinary fields emerge. Astrobiology is one of them. Research in such field requires interaction and exchange of ideas and new results between scientists from many countries and fields, something that only larger research communities like the European Research Area can accomplish. In order to take astrobiology-related research forward and to prevent a counterproductive fragmentation of the European Astrobiology research community through duplicate or excessively overlapping initiatives and structures the AstroMap Report (drawn up under the EU FP7 programme) unequivocally recommends the creation of a pan-European platform for research, training outreach and dissemination in Astrobiology. The European Astrobiology Institute (EAI) aims to function as such an entity. Such an institute is required to keep Europe's leading position in this interdisciplinary field relatively to other countries and regions. EAI will closely collaborate with several related European organizations including ESA, EANA, Europlanet etc. but as a network of institutions fundamentally differs from existing bodies**.**

Mission

The European Astrobiology Institute (EAI) will be a consortium of European research and higher education institutions and organisations as well as other stakeholders aiming to carry out research, training, outreach and dissemination activities in astrobiology in a comprehensive and coordinated manner and thereby securing a leading role of the European Research Area in the field.

Objectives

The EAI will have the following aims:

- Perform ground-breaking research on key scientific questions in astrobiology (which will be periodically reviewed) requiring a cooperative interdisciplinary approach.
- Disseminate high-quality results of these efforts effectively in the scientific community
- Provide interdisciplinary training for students and early career scientists in astrobiology
- Engage in education on astrobiology on all levels
- Liaise with industry to foster collaborate on technological developments that are relevant to astrobiology research and beneficial to Europe as a whole
- Coordinate outreach activities of European astrobiologists to the general public, industry and all other relevant stakeholders.
- Act as advisory body and provide high-quality expertise to European research organisations and decision makers on European
- Ensure the necessary financial means to carry out these activities through a coordinated approach to European funding agencies.

Key research areas to be aims of the EAI

Formation of planetary systems and detection of habitable planets and moons

How are planetary systems formed? How do the conditions of the formation environments (galaxy, protoplanetary disk) influence the formation of habitable planets? Which factors define habitability? How can we detect extrasolar habitable planets and satellites?

Co-evolution of early Earth's geosphere, atmosphere and biosphere

How did physical, chemical and geological and biological processes co-evolve on Earth? How did habitability evolve on early Earth? Which conclusions can we draw for other planets?

Early life and life under extreme conditions

In which environment did life first emerge (Darwin's little warm pool or some more extreme environment? Which boundary conditions exist for life and what can they tell us about early terrestrial and the possibility of extraterrestrial life?

The pathway to complexity: From simple molecules to first life
Where and how did the complex organic molecules necessary for life originate (space, atmosphere, surface) and how they were delivered? How does the environment affect production and stability of complex organic molecules ? How did the formation of biopolymers and self-assembly of first cells proceed?

Search for life in early and extreme terrestrial environments and on other planets
Which strategies should we employ for tracing early terrestrial as well as extraterrestrial live in environments? Which (combination of) individual biosignatures (chemical, geological, spectroscopic, others) and tracers of life present in these environments would be seen conclusive? Which novel methods and technologies can be developed to detect life

Historical, philosophical, societal and ethical issues in astrobiology
How did out ideas about the origin of life develop? Which views about extraterrestrial life exist in different cultures? Which philosophical, societal, political, juridical and ethical issues are raised by the search for life on other planets and moons?

All these fundamental research questions require a concerted effort by scientists from different fields.

Proposed activities of the EAI
To achieve the above-mentioned aims, the following activities are planned by the EAI:

- Foster interdisciplinary research projects in the field, especially by early career scientists
- Hold high-level general conferences in astrobiology as well as smaller workshops on specific subjects to provide a forum to discuss and plan innovative research projects
- Enable and facilitate access to European research infrastructures and field sites for astrobiologists and organise expeditions to such sites
- Provide a comprehensive multidisciplinary European astrobiology training for students and early career scientists offering both basic and specialised training events in the field as well as training in generic skills (proposal writing, planning of scientific projects) and a mentoring programme
- Organise web-streamed seminars by leading scientists in astrobiology, and also provide an interface (web based tools) to collect and share astrobiology lectures.
- Create a network for astrobiology education and provide training material for basic, secondary and higher education in Europe.
- Produce high quality reference works (e.g. the Encyclopedia of Astrobiology).
- Create and effectively promote excellent outreach material in cooperation with entities engaged in public education (museums, schools and adult training centres).
- Promote contacts to media and ensure high quality coverage of astrobiology-related European research by maintaining an expert pool which journalists can contact.
- Use the wide interest of the general public to coordinate and promote involvement of citizen scientists in astrobiology research projects.
- Create a team for liaison between research and industry with representatives on both sides.
- Approach and inform decision makers in governmental and non-governmental organisations about astrobiology research in Europe.
- Formulate and continuously update a long-term planning of a research strategy in astrobiology for the European Research Area.
- Coordinate the approach to funding agencies to finance the activities of EAI and astrobiology research in the European Research Area
- Include both “top level researchers” and early career scientists in all activities.
- Act as a strong voice for the European astrobiology community.
- Collaborate with astrobiology networks and institutes outside Europe Area.

Current state of preparation
An Interim Board was formed consisting of members and employees of the main stakeholders in this field in the European Research Area (ESA, ESF, ISSI, German Aerospace Centre, CNRS, CNES, INAF, Europlanet, EANA, etc.) to prepare the creation of the EAI. It has elaborated a draft Action Plan mapping out the tasks, structure, governing bodies, activities, funding and administration of the EAI. This Action Plan is to be finalised in Spring 2018 and discussed with the whole European astrobiology community. Recruitment of institutions will take place in autumn and winter 2018/19 and the launch of the EAI is planned for spring 2019.