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European landscape in astrobiology, results of the AstRoMap consultation [☆]



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ABSTRACT

Astrobiology is a multidisciplinary field of research, which encompasses scientists ranging from cosmology, astronomy, planetary sciences, physics, chemistry, geology, paleontology to biology. In order to map the existing astrobiological expertise in Europe a comprehensive community consultation has been performed within the AstRoMap (Astrobiology Road Mapping) project that is supported by the European Commission FP7 framework. From this information a data base of scientists (European and beyond) interested in astrobiology and planetary exploration (see: <http://www.astromap.eu/database.html>) has been established. It reflects the demography and research and teaching activities of the astrobiology community, as well as their professional profiles and involvement in astrobiology projects. The database provides an ideal platform for networking between scientists interested in the various fields of astrobiology. Considering future aspects of astrobiology in Europe, the need for more astrobiology-dedicated funding programs at the EU level, especially for cross-disciplinary groups, was stressed. This might eventually lead to the creation of a European laboratory of Astrobiology, or even of a European Astrobiology Institute.

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1. Introduction

Astrobiology is a rapidly growing research area that addresses questions that have intrigued humans for a long time: “How did life originate?”, “Are we alone in the Universe?”, and “What is the future of life on Earth and in the Universe?” Those questions are jointly tackled by scientists converging from widely different fields, reaching

from astrophysics to molecular biology and from planetology to ecology, among others.

About 15 years ago the term “astrobiology” was created for this combined field of research with the establishment of NASA’s Astrobiology Institute (NAI) [1] which then has coordinated and funded astrobiology-dedicated research programs in the USA. Soon after its foundation, NAI developed an Astrobiology Roadmap which provided guidance for research and technology development across the NASA enterprises that encompass the space, Earth and biological sciences [2,3].

In Europe, there is also a growing community of scientists that is dedicated to astrobiology and astrobiology related research. Despite the fragmented nature of infrastructure and the geographical fragmentation of nations the European astrobiology community has achieved significant progress. Here, we document the current situation of astrobiology in

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Europe, the progress made and we show how improvements could still be made.

Considering the growing international interest in astrobiology, but the lack of sufficient coordination between the different groups to share expertise and facilities at the European level, a European network was established in 2001 during the First European Workshop on Astrobiology co-organized with ESA at the ESRIN research facility in Frascati, Italy [4]. Currently, astrobiology communities from 19 European nations are represented within this European Astrobiology Network Association (EANA): Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, The Netherlands and United Kingdom (<http://www.eana-net.eu/index.html>). EANA holds annual workshops in one of its member countries and publishes papers presented at its annual workshops [4–10]. In such a way, EANA provides for more than 14 years a continuous forum for astrobiologists in Europe and beyond. EANA keeps worldwide relations to several non-European astrobiology organizations, such as NASA's Virtual Astrobiology Institute NAI, the Brazilian Center of Astrobiology (Núcleo de Pesquisa em Astrobiologia, NAP-Astrobio), the Chinese Commission of Astrobiology of the Chinese Society of Space Research, the Japanese Astrobiology Network, and the Mexican Society of Astrobiology (Sociedad Mexicana de Astrobiología SOMA). EANA has also provided the platform for the development and performance of astrobiology projects, such as AstRoMap, and has offered the project teams a place to meet and to present their results. Since 2005 EANA with the technical assistance of ESA has established an Astrobiology Lecture Course Network (ABC-Net). It started with the involvement of 4 European universities in 2005 and increased its scope to 12 universities (2007, 2009, 2011, and 2013). The universities were interconnected via direct television satellite, videoconference systems, e-learning Internet tools and a streaming Internet video network provided by ESA. The lectures were part of the university curricula with the possibility of getting European credit points for the students after examination. The frame of lectures reach from the origin of the universe through prebiotic chemistry and origin of life and its adaptation to extreme environments to search for life in the Solar System and beyond, and technology required for astrobiology missions. Lectures are available at (<http://www.youtube.com/playlist?list=PLbyvawxScNbtA9s5konCrvXPtyYzIA5zy>) and the first series is published [11]. Several additional astrobiology textbooks were published by European scientists, e.g. [12–15]. However, so far, few PhD programs award astrobiology degrees and most students, interested in astrobiology, earn their degree in other fields, such as astronomy, geology, chemistry or microbiology, but focus on astrobiology for their thesis, as demonstrated by a world-wide survey for Nature Careers [16].

A survey on astrobiology research and teaching activities within the UK conducted in 2007/08 by use of a questionnaire distributed to members of British astrobiology groups (e.g., Astrobiology Society of Britain, UK Planetary Form and Astrosurf Network) showed that astrobiology had already achieved a strong degree of penetration into the UK academic community [17]. This is the first systematic national survey published on astrobiology activity. Based on their experience, the authors hoped that in the near

future a survey on astrobiology research and teaching in Europe as a whole would be organized.

This hope came true with the AstRoMap project (Astrobiology Road Mapping) that is funded within the European Commission FP7 framework (<http://www.astromap.eu>). The main objectives of AstRoMap are: (i) to map the scientific knowledge related to astrobiology in Europe, (ii) to identify the main astrobiology issues to be addressed by Europe in the next decades in relation with astrobiology and space exploration, (iii) to identify potential mission concepts that would allow addressing these issues, (iv) to identify the technology developments required to enable these missions, and (v) finally to provide a prioritized roadmap integrating science and technology activities as well as ground-based approach. Here we present the results of the community consultation on the demography of astrobiological research in Europe and the profile and interests of the scientific community as evaluated within the AstRoMap project.

2. Methods

The AstRoMap questionnaire on the European landscape on astrobiology was developed by DLR, EANA and ESF in close consultation with the members of the EANA Executive Council. It was set up by the ESF and posted on the AstRoMap website.

The data base was officially launched in June 2013 (<http://www.astromap.eu/astromap-database-of-researchers.html>) and advertised to the European astrobiology community through its different national and European organizations, e.g. EANA, Europlanet (<http://www.europlanet-eu.org/>) as well as national astrobiology organizations. The database has been structured in order to register specific profiles and to perform detailed targeted search with the use of well-defined criteria to be useful for further steps in the project, e.g., experts workshops for discussing on specific scientific issues. Its aim was to provide a comprehensive view of astrobiology research across Europe and within the international scenario, which is invaluable in defining a European research-activity roadmap for Astrobiology to be needed for the Horizon 2020 program of the European Union (EU).

As of November 22, 2013, the AstRoMap database of scientists included the profiles of 105 European and international scientists, of which 52 registered also in the database on their scientific profile and activities. The data were anonymized and evaluated.

This number of profiles (105) analyzed provides a modest, but representative cross-section of scientists across astrobiology's academic disciplines. In total, the analysis provides some general orientation about the astrobiology community in Europe, especially on demographic issues. It might be that several scientists adhere to their original discipline (e.g., astronomy, astrophysics, geoscience, chemistry and biology) and do not (yet) feel that they also belong to one or the other field of astrobiology. In view of the relatively small number of professional profiles available (52), a detailed analysis of specificities of communities interested in different fields of astrobiology was not possible. Nevertheless, the survey provides information on the demographic profile of the European astrobiology community represented by the AstRoMap database, including gender and age issues. In addition, it provides

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