

JULY 2013

Newsletter



FOREWORD

Time flies and the first half of 2013 is over. We have been very busy the past six months starting with the 1st Strategic conference taking place in Basel in the beginning of the year, preparing the 1st joint call for transnational research proposals, which was finally launched in May and organizing the first common ERASynBio ST-Flow summer school, which finished just before the start of SB6.0 in July.

It's summer and hopefully you will have more time to read through our newsletter, learn about our past and future activities, have a deeper look into the 1st Strategic Conference, learn about protein origami, check out the 2013 "Modeling in Systems Biology and Synthetic Biology" ERASMUS IP course and inform yourself on the state of synthetic biology in Austria and current developments in some of our partner countries.

... And to be in sync with today's technology try downloading and using the new synbio mobile app.

We hope you enjoy the read.

On behalf of ERASynBio we wish you a relaxing summer,

Kim Turk Križanec

Annette Kremser



ERASynBio Newsletter Editor
Ministry of Education, Science and Sport - MIZS
Slovenia

ERASynBio Coordinator
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Germany

DEVELOPMENT AND COORDINATION OF SYNTHETIC BIOLOGY IN THE EUROPEAN RESEARCH AREA

ERASynBio aims at promoting the development of synthetic biology by structuring and coordinating national efforts and investment, with the final goal of creating a sound European research community in the field avoiding national fragmentation from the very start.

MAIN ACTIVITIES

- ✿ Supporting the emergence of national synthetic biology programs based on a strategic research agenda
- ✿ Transnational funding activities via joint calls (2 joint calls planned)
- ✿ Strengthening the scientific community by offering training and educational possibilities
- ✿ Developing recommendations on governance concepts and regulatory models by integrating ethical, legal, societal and technical aspects of synthetic biology
- ✿ Promoting close cooperation between academia and industry
- ✿ Providing extensive dialogue options and exchange fora in which all stakeholders are to participate

DURATION

36 months (1.1.2012 – 1.1.2015)

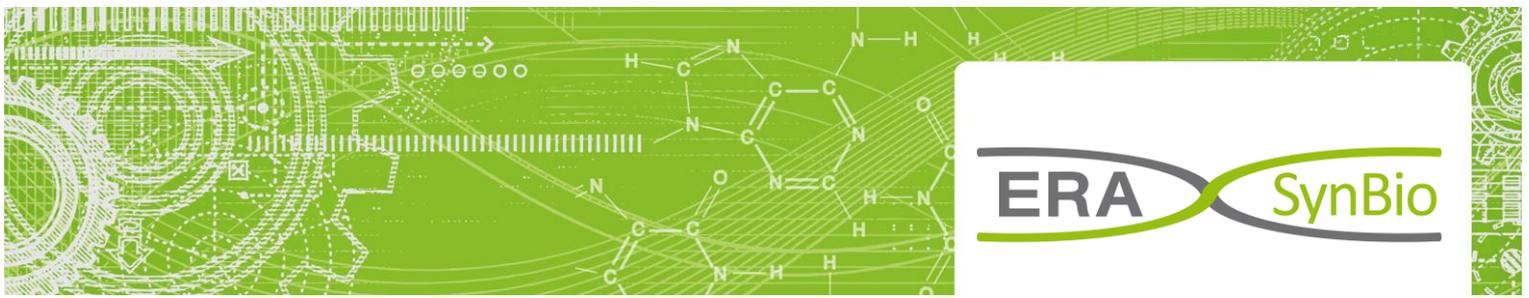
EC FUNDING

1.997.022 Euros

PARTNERS

16 from 14 European countries





ERASynBio IN ACTION

DEVELOPMENTS SO FAR

- ✿ The [joint Workshop on public dialogue and governance](#), Vienna, March 2013
- ✿ [2nd call for twinning](#) aimed at building new collaboration between researchers in synthetic biology successfully completed
- ✿ [1st workshop for synbio research and technological centers](#), London, July 2013

1ST JOINT CALL REMINDER

The deadline for applications is **August 26, 17.00 CET**. Don't forget to **contact your national contact points** to get the details on your national requirements and to visit www.erasynbio.eu for the international call documentation.

Thanks to everyone who have contributed to the [Survey on infrastructure for synthetic biology](#). Anyone who did not get a chance to contribute can contact [Andy Boyce](#).

LOOKING INTO THE FALL AND BEYOND

- ✿ [2nd Strategic conference](#), UK, September 2013
- ✿ [Workshop on fostering a multi/inter-disciplinary research environment](#), Athens, December 2013
- ✿ [2nd transnational call](#), early spring 2014 to address the strategic gaps and opportunities identified in the white paper

FOSTERING CAREER OPTIONS

We are collecting information on research labs and companies, who offer options of internships and practical training for students and early career researchers in synbio.

We intend to make this information available on request to interested participants of the European iGEM 2013 and 2014 competition, thereby acting as a catalyst for enhanced cross-sectoral and international exchange.

We assure to treat all provided information confidentially. Thank you very much for your support! For further information please send an email to [Annette Kremser](#).

ERASYNBIO'S DEFINITION OF SYNTHETIC BIOLOGY

Synthetic Biology is the engineering of biology: the deliberate (re)design and construction of novel biological and biologically based parts, devices and systems to perform new Functions for useful purposes, that draws on principles elucidated from biology and engineering.

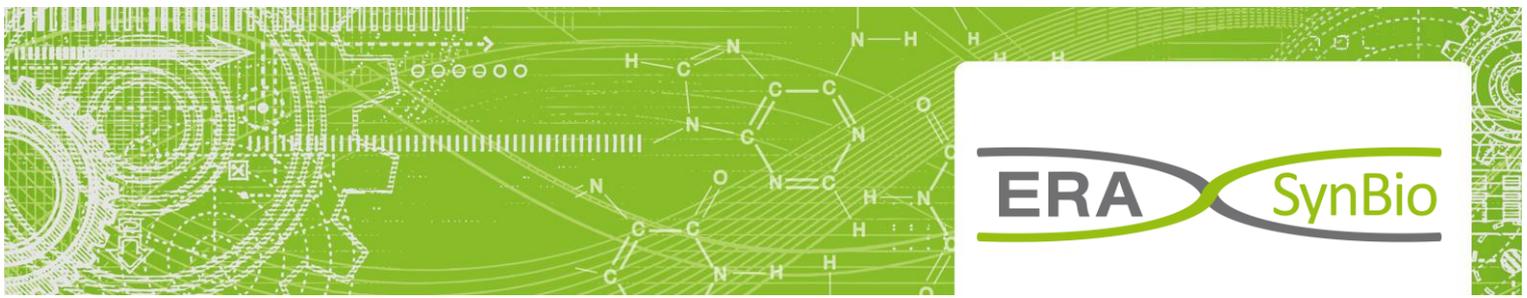
WHAT'S AN ERA-Net?

ERA-Net actions are part of the [ERA-Net scheme](#) under [FP7](#) whose objective is to develop and strengthen the coordination of national and regional research programs supporting the development of the [European Research Area](#).

[ERA-Net actions](#) provide a framework for actors implementing public research programs (ministries, research agencies) to coordinate their activities e.g. by developing joint activities and by mutually supporting joint calls for transnational proposals.

The funding of projects selected is provided by national agencies, while the funds obtained by the EC are used exclusively for the coordination and management of the network and its activities.





READ ABOUT NEW DEVELOPMENTS

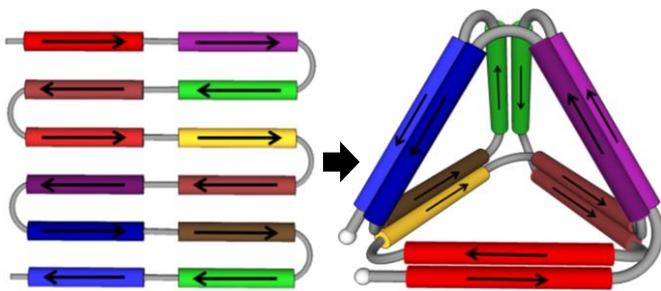
PROTEIN ORIGAMI – A MODULAR APPROACH TO NEW PROTEIN FOLDS

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Proteins are the engines and structural organizers of life. Tertiary structure of proteins, encoded by their amino acid sequence, underlies their versatile functionality, yet it is still very challenging to design new protein folds de novo. Designed proteins have many potential technological applications as proteins can be produced cost-effectively and sustainably by biotechnological methods.

We reasoned that the engineering principles of synthetic biology could be applied to the design of new polypeptide-based bio-nanostructures using modular elements, in many ways resembling the DNA-based self-assembly. Coiled-coil dimers composed of pairs of intertwined polypeptide helices were selected as the most appropriate orthogonal building elements. The underlying idea was to encode the desired self-assembling structure into the linear sequence of coiled-coiled dimer-forming modules. The principle was tested on the simplest three-dimensional object – tetrahedron, a three-sided pyramid. Single polypeptide chain designed to fold into a tetrahedron comprised 12 concatenated coiled-coil-forming segments, separated by flexible peptide hinges. Those segments were selected from the set of orthogonal coiled-coils, including both natural and designed peptides.

The path of the polypeptide chain is according to our design guided by the precisely defined order of segments so that it traverses each of the 6 edges of the tetrahedron exactly twice, forming coiled-coil dimers with their corresponding partner segments within the same chain (see Figure). Correct self-assembly of the protein material produced in bacteria was demonstrated by the secondary structure, stability and size determination, imaging by electron microscopy and AFM. Coincidence of the N- and C-terminus of the chain in the same vertex of the formed tetrahedron was demonstrated by the reconstitution of the split fluorescent protein, while the polypeptide with the scrambled segment order fails to self-assemble correctly. This design platform provides the foundation for the construction of new smart materials based on the set of orthogonal interacting polypeptide segments.

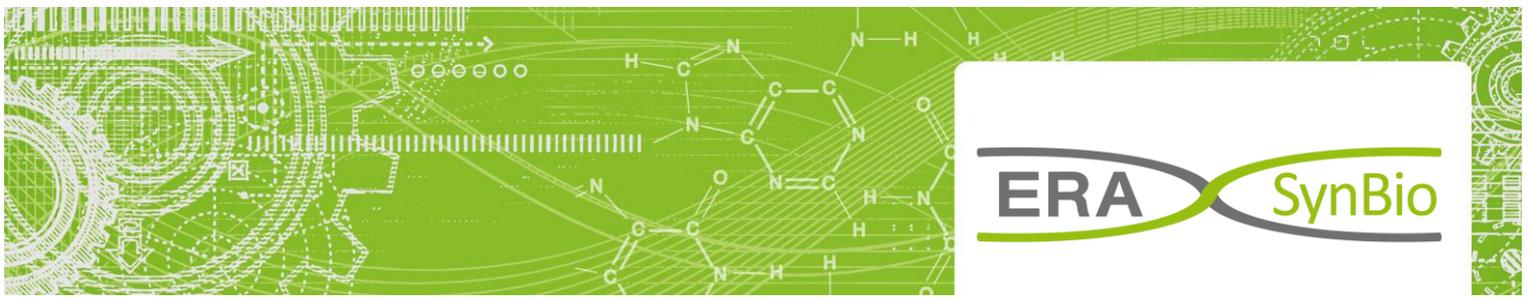


This technology could be used for a range of applications, such as utilizing designed cavities and arrangement of the amino acid side chains for the controlled drug delivery, creation of artificial catalytic sites or designed vaccines to list only few. The reach and impact of this technology will probably depend on the availability of orthogonal building elements to compose more complex designed nanostructures varying in shape, size and functional properties.

SCHEMATIC REPRESENTATION OF THE DESIGNED PROTEIN ORIGAMI: *Coiled-coil dimer forming segments are concatenated in a defined order into a single polypeptide chain with flexible peptide linker hinges. Polypeptide self-assembles into a tetrahedron, where the chain traverses each edge exactly twice, so that the path interlocks the structure into a stable shape.*

Want to know more about designed protein origami: Consult Helena Gradišar, Sabina Božič, Tibor Doles, Damjan Vengust, Iva Hafner-Bratkovič, Alenka Mertelj, Ben Webb, Andrej Šali, Sandi Klavžar, Roman Jerala (2013) Design of a single-chain polypeptide tetrahedron assembled from coiled-coil segments. *Nature Chem. Biol.* Jun;9(6):362-6, (doi: 10.1038/NCHEMBIO.1248).





EXPAND YOUR KNOWLEDGE

REPORT FROM THE 2013 ERASMUS IP COURSE MODELING IN SYSTEMS BIOLOGY AND SYNTHETIC BIOLOGY Egils Stalidzans, LAS

The two week ERASMUS IP course "Modeling in Systems Biology and Synthetic Biology" organized by the Latvian University of Agriculture took place in Jelgava, Latvia between the 10th and the 21st of June, 2013 (see <http://biosystems.lv/biomodlat>).

The course was truly international attracting 12 local and 20 foreign students. The foreign students came from the UK, Germany, Slovenia and Lithuania. 15 out of 17 teachers came from the UK, Germany, Slovenia, Lithuania and the Netherlands representing 8 universities in total.

The modeling topics covered mostly metabolic engineering and regulatory circuits building. In addition to theoretical issues many software tools were demonstrated in practicals by software developers giving an overview of the current state of modeling applications.

The course contents and two year experience of the Latvian team can be used to organize similar modeling oriented courses in other locations as well.

For more information, please contact [Egils Stalidzans](#).

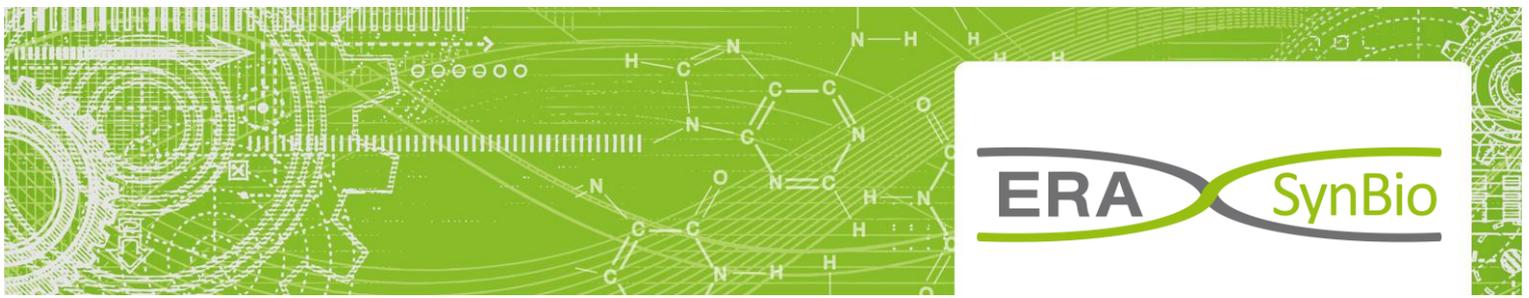


Joint ERASynBio and ST-Flow SUMMERSCHOOL *Synthetic Biology in action!*

National Biotechnology Center, Madrid
23.6.-6.7.2013

16 participants, selected from more than 70 applicants, enjoyed a hands-on course of advanced genetic engineering of bacteria at the onset of the synbio era. They were divided into different groups covering different sections of the assembly line (from conceptualization to construct readout). Providing a platform for exchange of knowledge, tools and standards, the course hosted many prominent synbio experts (see [poster](#)) and a virtual appearance of Drew Endy.





Synthetic Biology in Austria

The Research community of Austria in the field of Synthetic Biology is in comparison to other countries like Great Britain, France, etc. very small. In Austria it is still rather unclear who exactly is working in this thematic field. There are some very productive working groups but due to the special widespread character of synthetic biology, the existence of a wider range of potentials remains difficult to identify. Research fields range from biosecurity, to research on proteins and ribosomes (membrane proteins, non-canonical amino acids, chemically modified RNA,...) and to the research of genetic networks. In addition, there is well-established research in the field of ethical and social science aspects. For Austria, it is important to keep in touch with promising technologies, to support the researchers in these fields and give them the possibility to develop their expertise. There is currently no specific Synthetic Biology program, but Austria joined the first ERASynBio call through FWF (Austrian Science Fund).

In May 2013 the Austrian Academy of Sciences (ÖAW) organized a symposium on Synthetic Biology ([program in German](#)) to provide an overview of some focus areas in this field. A discussion with the public and scientists showed their reception in the public and opened the possibility for a general discussion about some synthetic biology research aspects, the innovation potential, and general aspects of ethics and biosecurity.



The FFG is the Austrian Research Promotion Agency located in Vienna. It is the national funding institution for applied research and development in Austria. FFG offers a comprehensive range of services for Austrian enterprises, research institutions and researchers – from the management of public funding programs to

consulting services in all phases of technology development and innovation, from support for integration into European research programs and networks to the promotion of Austria's interests at the European and the international level.

Gamifying Synthetic Biology: Austrian company Biofaction launches a synbio mobile app as part of the ESF and FWF funded SYNMOD project

The non-commercial and freely available app for Apple and Android allows a broad public to learn about modularity in synthetic biology and look into how peptides can be constructed and shuffled.

The app is based on a real scientific project that uses synthetic biology to design new antibiotics.



With the app its users can:

- create peptide modules by assembling amino acids
- combine and test these peptide modules in a slot machine
- discover antibiotic substances to kill some nasty bugs

[Learn more about SYNMOD through an entertaining video](#)

[Learn more about science gamification](#)

[Download the app](#)

Click on the [green underlined text](#) for more information.





News from Denmark

- Biohackers collaborate with Danish Synthetic biology professor– Novozymes supports with donation**
 Paving the way for innovative collaboration between marked leading companies, established scientists and the Do-It-Yourself environment, Synbio Professor Birger Lindberg Møller from University of Copenhagen/Center for Synthetic Biology has become advisor for the Copenhagen-based bio-hackerspace BiologiGaragen while Novozymes has given a generous donation to help the thriving DIY community upgrade their basement laboratory.
- New plant-based Synthetic biology project at University of Copenhagen: Light-driven synthesis of complex high-value compounds featured in ACS Synthetic Biology**
 Industrial biotechnology is essential for the welfare of an efficient, sustainable, knowledge-based economy. This project aims to generate a novel light-driven production system for high-value plant products for the pharmaceutical and other key sectors. The goal is to produce high amounts of the valuable, highly complex molecules terpenoids which are often used for medicinal purposes. The scientists will transfer enzymatic pathways for specific terpenoids from higher plants to cyanobacteria and moss, and these pathways will be optimized by re-targeting them to the chloroplasts and directly coupling them to the photosynthetic system – leading to light-driven production.

Solar powered and plant based synthetic biology is featured in ACS Synthetic Biology singling out Danish Synthetic Biology and the above mentioned project with a [cover article](#) accompanied by a [podcast interview](#) with first author Agnieszka Zygadlo Nielsen from University of Copenhagen, Center for Synthetic Biology.



News from the UK

- Call for multidisciplinary research centers in synthetic biology open as part of Synthetic biology for growth package**
 The UK is developing a synthetic biology for growth package, which will support a set of multidisciplinary research centers (SBRCs), provide provision for training cohorts of skilled researchers, enhance the UK's DNA synthesis capability and accelerate the route to market for innovative synthetic biology research. The call for SBRCs is currently open, with support for the remaining areas to be announced over the next six months. BBSRC and EPSRC are planning to establish up to six SBRCs over two years by providing a large capital and resource investment. The SBRCs will possess the vision, breadth of intellectual leadership and research resources required to integrate disciplines including bioscience, engineering, chemistry and IT into programs of synthetic biology research of the highest international quality. They will deliver added value by drawing capital and resource investments together within each Center and will integrate research activities of experimental scientists with those working on ethical, legal, societal and other issues within the context of responsible innovation.
- UK scientists use synthetic biology to develop a new type of nanoparticle with potential applications in chemistry, biology and medicine**
 The findings of the study published in [Science](#) and led by a multidisciplinary team of researchers from the University of Bristol, could potentially be used to deliver bioactive molecules, such as drugs, to cells and eventually diseased tissues in the body.

*Click on the news title and [underlined green text](#) for more information





News from Germany

* SYNMarburg - Summer School for Microbial Science in Marburg, August 2013

The Summer school on microbial Cell Biology and Synthetic Signaling Systems is organized by the LOEWE Center for Synthetic Microbiology, SYNMIKRO, a joint scientific center between the Philipps-Universität and the Max Planck Institute (MPI) for Terrestrial Microbiology. It is the long-term aim of SYNMarburg to educate a new generation of young scientists who identify with the versatile approaches in synthetic microbiology. SYNMarburg is applicable for students at the end of their studies of natural sciences (MSc) and for PhD-students, who will participate in the manifold and interdisciplinary research activities in the center and will gain access to the new area of synthetic microbiology/biology. SYNMarburg is an important building block to promote young academics in the area of microbiology and molecular cell biology.

* International symposium on Synthetic Biology in Heidelberg, December 2013

The international symposium "Synthetic Biology - from understanding to application" is a joint event of the community of synthetic biologists in Germany, covering a diversity of synbio topics ranging from fundamental research to applications in health research and biotechnology. Featuring an exciting scientific program with internationally renowned scientists, the 2013 winning iGEM Teams and an art & science exhibition, the symposium is organized by the recently established Helmholtz Initiative on Synthetic Biology in cooperation with Berlin-Brandenburgische Akademie der Wissenschaften, BIOSS - Centre for biological signaling studies, DECHEMA, HEiKA - Heidelberg-Karlsruhe Research Partnership and NSB Upper-Rhine network in synthetic biology.

* The Interdisciplinary Research Group of the Berlin-Brandenburg Academy of Sciences and Humanities publishes a supplement on Synthetic Biology as part of the Gene Technology Report

The Supplement of the Gene Technology Report titled *Synthetic Biology - Is a new kind of biological engineering emerging* discusses synthetic biology in a critical fashion from a scientific-historical perspective in connection with synthetic-technical traditions in biology, examines the current state of scientific knowledge with a focus on chemical-synthetic research methodologies as well as new applications in biomedical science. It also discusses new philosophical and ethical implications that arise in association with synthetic biology and addresses the public's perception both in related contemporary media reports and in a survey of German and European public opinion. The individual contributions are complemented by joint key statements and recommendations for action by the members of the Interdisciplinary Research Group.



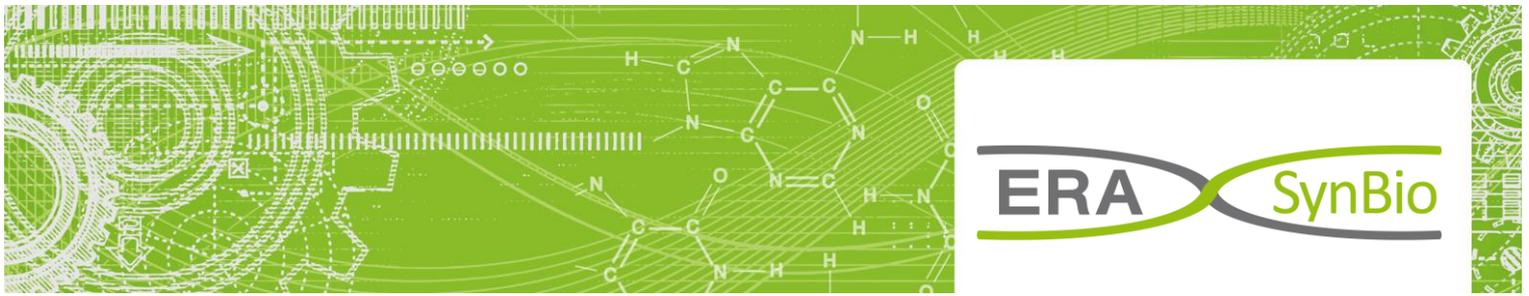
News from Finland

* FINSynBio to fund 5 individual projects and 6 consortia

The Academy of Finland will fund the Synthetic Biology Research Program (FinSynBio) with a total of EUR 9 million. In all five individual projects and six consortia are funded within the program. Two of the projects will be carried out in cooperation with the Indian Department of Biotechnology (DBT). The objective of the FinSynBio program is to integrate Finnish-based researchers into an internationally competitive scientific community that would exceed a critical mass and actively work to develop synthetic biology and apply the research knowledge from the community. International cooperation and further promotion of emerging international networks through active researcher mobility, for instance, is an integral part of the program.

*Click on the news title and underlined green text for more information





MEET THE PARTNERS*

*Click on the partner names to learn more about them

Austria



France



Germany



The Netherlands



Portugal



Spain



United Kingdom



Denmark



Finland



Greece



Latvia



Norway



Slovenia



Switzerland



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Comments? Suggestions? Please contact Kim @ kim.turk-križanec@gov.si

