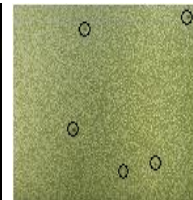
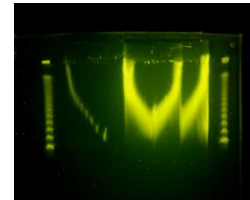
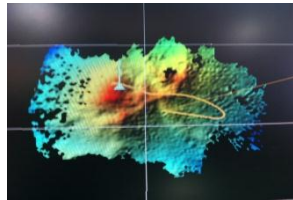




MAMBA stands for “**Marine Metagenomics for New Biotechnological Applications**”, a collaborative project to mine for and use of new microbial activities, in particular for targeted production of fine chemicals, antioxidants and anti-cancer drugs. This Project builds up on the previous efforts of European Framework Programs and National research initiatives for exploiting the catalytic activities of marine microorganisms and microbial communities and to gain the new knowledge on the mechanisms of survival of living organisms in extreme environments.



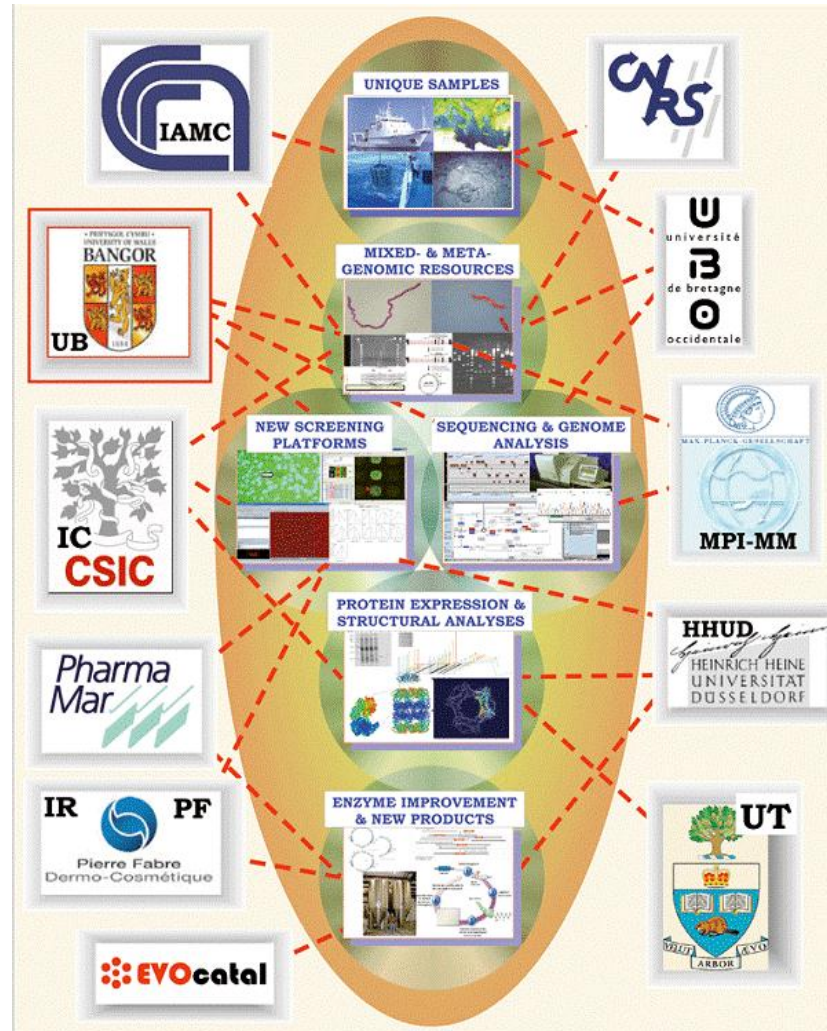
11 Participants

Bangor University, Bangor, Wales, UK

IAMC, Istituto per l'Ambiente Marino Costiero, Messina, Italy

IC CSIC, Institute of Catalysis, Madrid, Spain

Industrial partners:
Spain "PharmaMar"
France "Pierre Fabre"
Germany "Evocatal"



CNRS, Laboratoire d'Océanographie Biologique de Banyuls, France

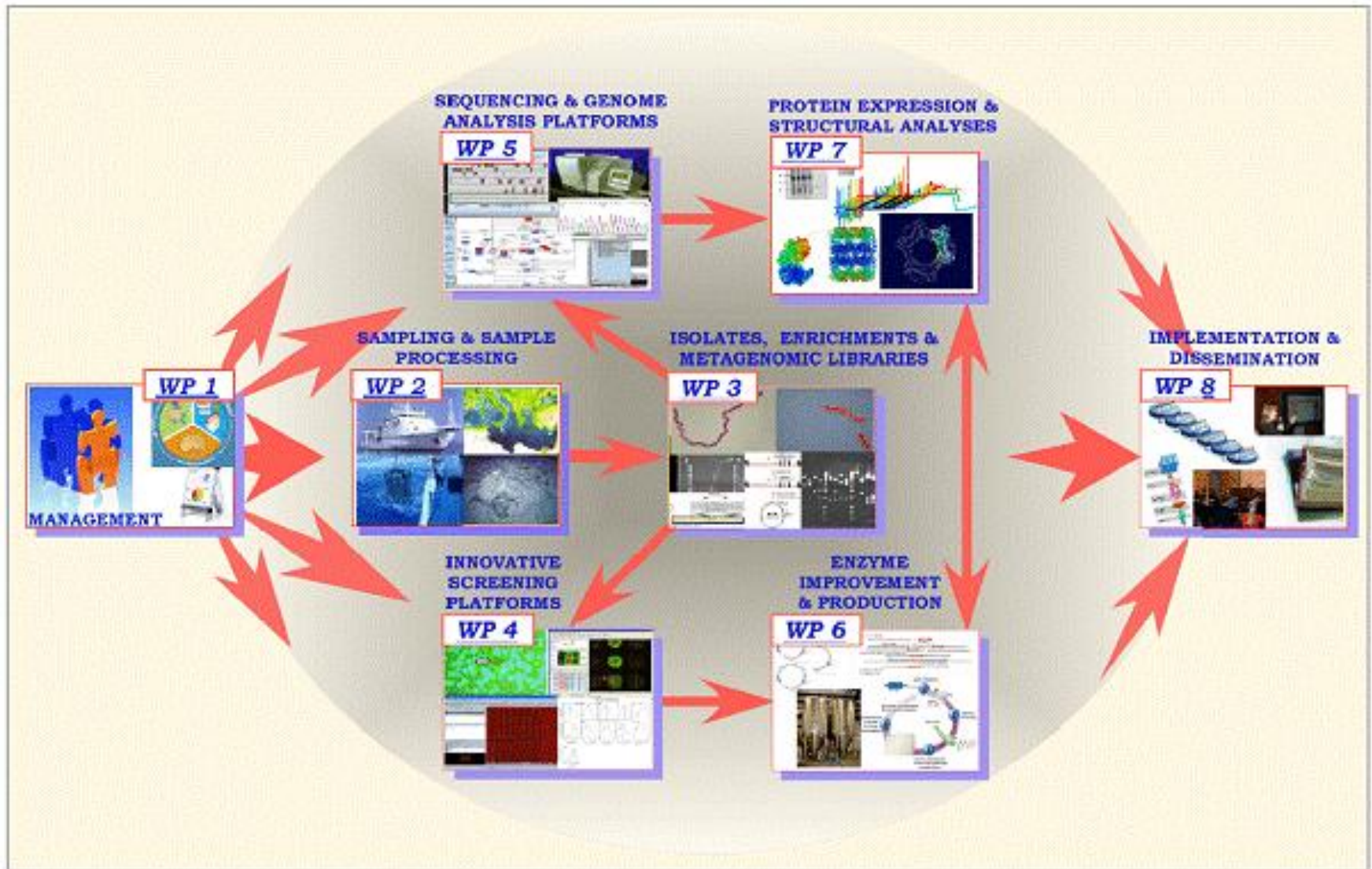
UBO, Université de Bretagne Occidentale, Brest, France

MPI-MM, Max Planck Institute for Marine Microbiology, Microbial Genomics Group, Bremen, Germany

Institute of Molecular Enzyme Technology, Heinrich-Heine-University of Düsseldorf, Germany

Ontario Centre for Structural Proteomics, University Health Network, University of Toronto, Canada (in-kind)

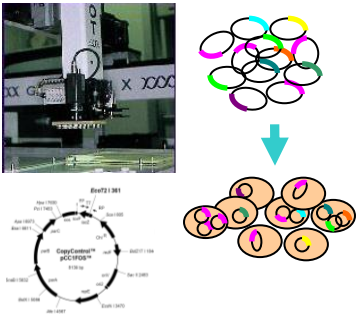
General description



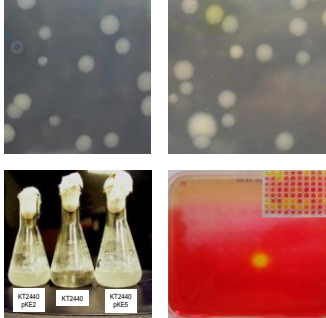
The function-driven analysis of (meta-) genomes guarantees identification of enzymes acting on defined substrates



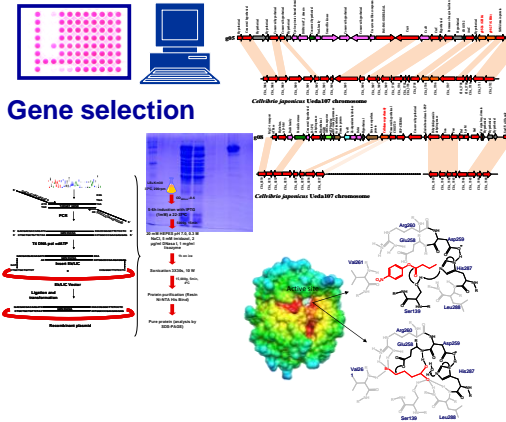
Extreme environmental settings



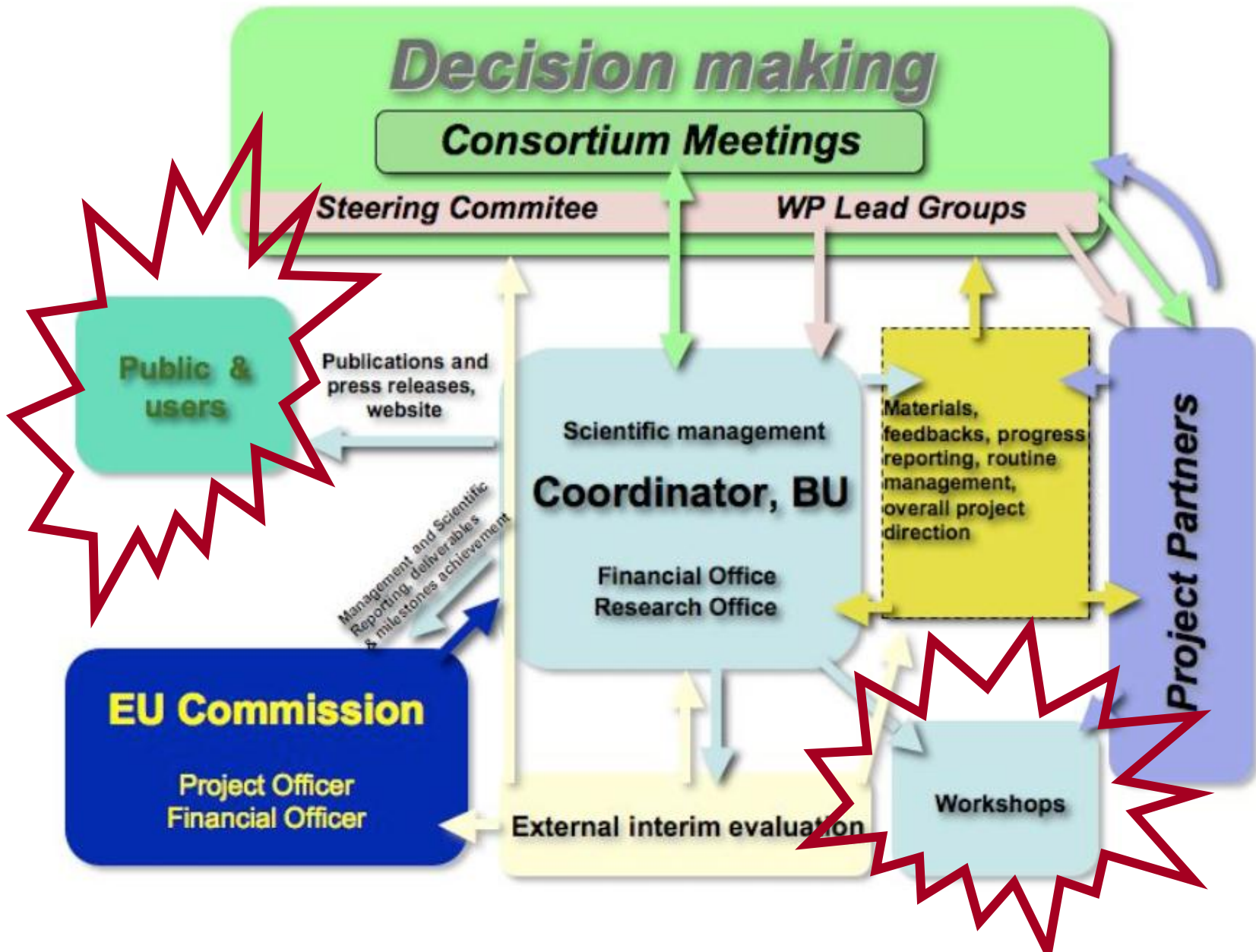
Unique vectors and libraries



Reliable solid- and liquid-media screens



Unique collection of natural and engineered enzymes



Tools of implementation: Scientific Publications

Marine Metagenomics for New Biotechnological Applications

Publications 2012

Ferrer M., Werner J., Chernikova T.N., Bargiela R., Fernández L., La Cono V., Waldmann J., Teeling H., Golyshina O.V., Glöckner F.O., Yakimov M.M., Golyshin P.N.; MAMBA Scientific Consortium. 2012. *Unveiling microbial life in the new deep-sea hypersaline Lake Thetis. Part II: a metagenomic study.* *Environ Microbiol.* 14(1):268-281.

Stock A, Breiner HW, Pachiadaki M, Edgcomb V, Filker S, La Cono V, Yakimov MM, Stoeck T. 2012. *Microbial eukaryote life in the new hypersaline deep-sea basin Thetis.* *Extremophiles.* 16(1):21-34.

Lemak S., Tchigvintsev A., Petit P., Flick R., Singer A.U., Brown G., Evdokimova E., Egorova O., Gonzalez C., Chernikova T.N., Yakimov M.M., Kube M, Reinhardt R., Golyshin P.N., Savchenko A., Yakunin A.F. 2012. *Structure and activity of the cold-active and anion-activated carboxyl esterase OLEI01171 from the oil-degrading marine bacterium Oleispira antarctica.* *Biochem J.* in press DOI:10.1042/BJ20112113.

Troeschel S.C., Thies S., Link O., Real C.I., Knops K., Wilhelm S., Rosenau F., Jaeger K.E. 2012. *Novel broad host range shuttle vectors for expression in*

- >20 peer-reviewed publications
- 7 submitted (under review)
- 6 in preparation

The ISME Journal (2011), 1–17
© 2011 International Society for Microbial Ecology All rights reserved 1751-7362/11
www.nature.com/ismej

ORIGINAL ARTICLE

Contribution of crenarchaeal autotrophic ammonia oxidizers to the dark primary production in Tyrrhenian deep waters (Central Mediterranean Sea)

environmental microbiology

Environmental Microbiology (2012) doi:10.1111/j.1462-2920.2012.02827.x

Metagenomic analysis of hadopelagic microbial assemblages thriving at the deepest part of Mediterranean Sea, Matapan-Vavilov Deep

environmental microbiology

Environmental Microbiology (2012) 14(1), 268–281 doi:10.1111/j.1462-2920.2011.02834.x

Unveiling microbial life in the new deep-sea hypersaline Lake Thetis. Part II: a metagenomic study

BJ Structure

Biochem. J. (2012) 445, 193–203 (Printed in Great Britain) doi:10.1042/BJ20112113

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Structure and activity of the cold-active and anion-activated carboxyl esterase OLEI01171 from the oil-degrading marine bacterium *Oleispira antarctica*

A EUROPEAN JOURNAL

CHEMBIOCHEM

OF CHEMICAL BIOLOGY

A. Belqoui, J. Palains, J. M. Vietes, D. Reyes-Duarte, R. Torres, O. V. Golyshina, T. N. Chernikova, A. Waliczek, A. Aharoni, M. M. Yakimov, K. N. Timmis, P. N. Golyshin, M. Ferrer*
1975–1978
Novel Hybrid Esterase-Haloacid Dehalogenase Enzyme

Promiscuous proteins: The identification and characterization of a wild-type promiscuous hydrolase that efficiently catalyzes the hydrolysis of ester bonds and haloacids in a single protein has been reported. This study has demonstrated the utility of metagenomics to access novel catalytic activities.

Tools of implementation: popular science magazines

Of extreme interest

While it represents the largest environment on Earth, little has been known about the potentially-exploitable properties of deep sea extremophiles, until now, as Professor Peter N. Golyshin explains

Deep-sea hydrothermal vents have been identified as a source of novel enzymes and biotechnological products. The first step towards the mining of extreme microorganisms, perhaps from a hydrothermal vent, is the identification of novel enzymes and biotechnological products. The first step towards the mining of extreme microorganisms, perhaps from a hydrothermal vent, is the identification of novel enzymes and biotechnological products.

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Life at the limits

The Earth's seas and oceans hold countless tons of that is referred to as a broad range of research. The MAMBA project at the University of Bangor is harnessing state-of-the-art tools for new biotechnological and biomedical applications

With the MAMBA project, a comprehensive programme of research is being carried out to explore the limits of life on Earth. The project is led by Professor Peter N. Golyshin, who is also the director of the MAMBA project at the University of Bangor.

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From the deep

MAMBA is a collaborative project exploring new microbial activities for the production of fine chemicals, antioxidants and anti-cancer agents, as Bangor University's Professor Peter N. Golyshin explains

MAMBA stands for Marine Microbiology for New Biotechnological Applications. The project builds up on the previous work of Bangor University's Professor Peter N. Golyshin, who is also the director of the MAMBA project at the University of Bangor.

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PROFILE

Phred Griffiths

Since the beginning of the project in 2003, Dr MAMBA continues to progress and expand its research into the deep-sea environment. The project is led by Professor Peter N. Golyshin, who is also the director of the MAMBA project at the University of Bangor.

Phred Griffiths is a leading expert in the field of marine microbiology. He has been involved in the MAMBA project since its inception in 2003. He is currently a senior research fellow at Bangor University.

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International innovation

Science and research are the very basis of our environment policy

EU COMMISSIONER FOR ENVIRONMENT

James Pate highlights the EU's many new strategies designed to combat both regional and global environmental problems

Research is the frontier of knowledge

EXCLUSIVE INTERVIEW WITH PROFESSOR HILGARD NIMMIG, PRESIDENT OF THE EUROPEAN RESEARCH COUNCIL

INTERNATIONAL INNOVATION

World Water Council - Director of Activities, Marine Life - Sustainable Energy Work - Commission on Biological Diversity - Scientific Commission on Oceanic Research

International innovation

Through the application of state-of-the-art technologies, MAMBA plans to achieve a comprehensive understanding of the limits of life on Earth. The project is led by Professor Peter N. Golyshin, who is also the director of the MAMBA project at the University of Bangor.

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Biotechnologie aus dem Meeres

Functional Genomics - Activity-Based Screening

Biotechnologie aus dem Meeres is a collaborative project exploring new microbial activities for the production of fine chemicals, antioxidants and anti-cancer agents, as Bangor University's Professor Peter N. Golyshin explains

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Biotechnologie aus dem Meeres

Activity-Based Screening - Functional Genomics

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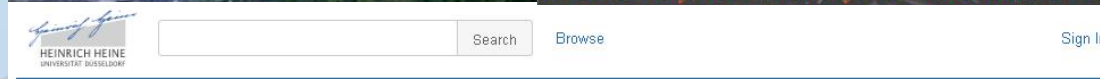
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Tools of implementation: conferences/workshops/webinars



MAMBA Workshop Introduction

Prof. Dr. Peter Golyshin

Major objectives of the Project
 To build up the consortium encompassing

- (i) the state-of-the-art facilities and expertise to sample unique and hardly accessible marine environments
- (ii) modern sequencing, sequence annotation and the cutting edge bioinformatics resources
- (iii) high-end activity screening technology
- (iv) high quality protein crystallization and structural analysis facilities
- (v) advanced technology for construction of metagenomic libraries
- (vi) companies with solid market positions in biocatalysis, drug discovery and cosmetics production

To deliver a series of new biocatalytic processes, novel lead products with anti-tumor activities and new solutes and antioxidant compounds within the project timeframe.

To elucidate new mechanisms of the functioning of extreme marine microbial consortia, their contribution to the global element cycling and possible impact of their activities on the global climate patterns, and, not least, the genomic basis of niche specificities that allow microbes to thrive in the extreme marine environments.

Prof. Dr. Peter Golyshin
 Bangor University (UK)

Introduction
 [MAMBA: Marine Metagenomics for New Biotechnological Applications / 06.02.2013]

Uploaded by MMZ at 2/7/2013 - recorded at 2/7/2013

51 Report

Information Embed

Speaker:
 Prof. Dr. Peter Golyshin

Description:
 MAMBA Workshop: Marine Metagenomics for New Biotechnological Applications. Introduction by Prof. Dr. Peter Golyshin, Bangor University, Wales, 06.02.2013

Category:
 Vorlesungen

Tags:
 MAMBA Marine Metagenomics Biocatalysis Drug Discovery

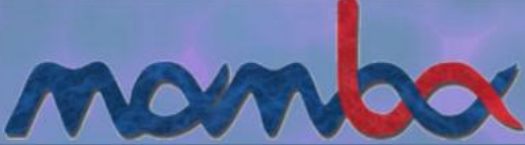


MAMBA Workshop

- Exploration of microbial...**
 Prof. Dr. Peter Golyshin | 2/6/2013
 32 views by MMZ
- Metabolomics approach to...**
 Dr. Manuel Ferrer | 2/6/2013
 40 views by MMZ
- Tools for functional exp...**
 Prof. Dr. Karl-Erich Ja... | 2/6/2013
 47 views by MMZ
- Effects of UV radiation ...**
 Dr. Sabine Matalana-Su... | 2/6/2013
 35 views by MMZ
- Dark primary production:...**
 Dr. Michail Yakimov | 2/6/2013
 70 views by MMZ
- Working with metagenomic...**
 Dipl.-Ing. Johannes Wer... | 2/6/2013
 44 views by MMZ
- Deep-Sea ecosystems: bio...**
 Prof. Dr. Mohamed Jebba... | 2/6/2013
 27 views by MMZ
- Identification of new en...**
 Dr. Andrea Weckbecker | 2/6/2013

- >20 presentations at international symposia
- 2 workshops
- 2 webinars

Pathways of further implementation



Marine Metagenomics for New Biotechnological Applications


Home Page	
Project Summary	
Project Concept	
Project Objectives	
Project Participants	
Publications	
Cruises and Work on Board	
Webinars	
Sampling Photo Gallery	
For potential end-users	

To the end-users and collaborators

The MAMBA consortium uses **>30 screens** to score the metagenomic libraries for enzymatic activities and has developed and optimized **4 new screen tests** for enzymes catalyzing the oxygenation of C-H bonds, for general monooxygenase activity, for enzymes catalyzing the epoxidation of styrene and for enzymes catalyzing the formation of unsaturated fatty acids.

Up to now, the consortium has established **13 fosmid** and **11 lambda phage** libraries from metagenomes and genomes of extremophilic microbial communities and microorganisms.

We have screened about **4 million clones** from above resources and identified **1.100 positive clones**, covering **19 single or multiple activities**



Up to now, we have de-novo sequenced and automatically annotated six metagenomes and five bacterial genomes from which few hundred candidate genes from which about 100 were genes coding enzymes of interest.

The access to protocols, data, or clones can be granted to third parties upon request to the Coordinator, Prof Peter Golyshin p.golyshin@bangor.ac.uk

MAMBA Intranet



Pathways of further implementation



Contact

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CLUSTER INDUSTRIELLE BIOTECHNOLOGIE

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- Bayer Technology Services GmbH
- Evonik Industries AG
- Henkel AG & Co. KGaA
- LANXESS AG

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- AQura GmbH
- ARTES Biotechnology GmbH
- Autodisplay Biotech GmbH
- Bio Base Europe Pilot Plant

Bayer MaterialScience AG

Bayer MaterialScience AG
Communications, Geb. K12, Kaisers Wilhelm Allee
51368 Leverkusen
Germany

Phone: +49 214 30 1

Bayer MaterialScience (BMS) is a leading producer of high-performance materials. The focus lies on innovation-driven products and technologically demanding processes.

CLIB²⁰²¹ NEWS

12.02.2013 | Review CLIB Forum Cosmetic Ingredients

05.02.2013 | Dr. Thomas Schwarz to strengthen the CLIB team

» read all news ...

MEMBERS NEWS

07.03.2013 | Bio-based polymers - Production capacity will triple from 3.5 million tonnes in 2011 to nearly 12 million tonnes in 2020

12.02.2013 | CLIB member Taros Chemicals part of €196 million pan-European drug discovery platform

» read all news ...

SCHEDULES

Pathways of further implementation

Example:

Patent application of MAMBA



US 2012/0231972A1

(19) **United States**
(12) **Patent Application Publication** (10) **Pub. No.: US 2012/0231972 A1**
Golyshin et al. (43) **Pub. Date: Sep. 13, 2012**

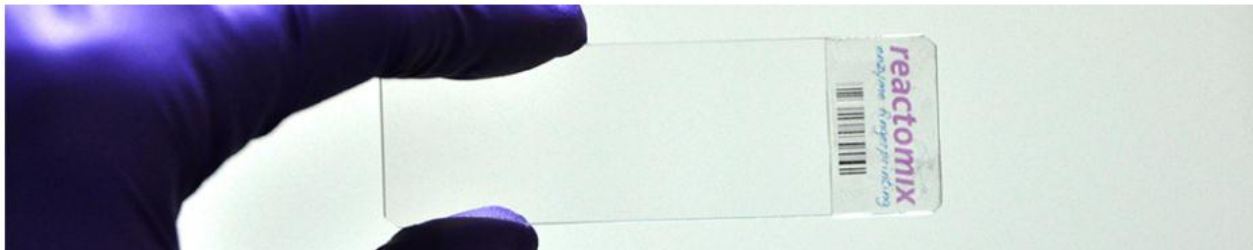
(54) **PROBE COMPOUND FOR DETECTING AND ISOLATING ENZYMES AND MEANS AND METHODS USING THE SAME** **Publication Classification**
(51) **Int. Cl.** *C10B 30/08* (2006 01)

Exclusive licensing through the start-up enterprise

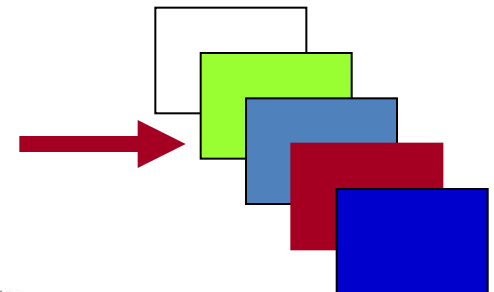


TECHNOLOGY ▾ APPLICATIONS ▾ PRODUCTS AND SERVICES ▾ PARTNERING ▾ **NEWS AND EVENTS** ABOUT US CONTACT

News and events



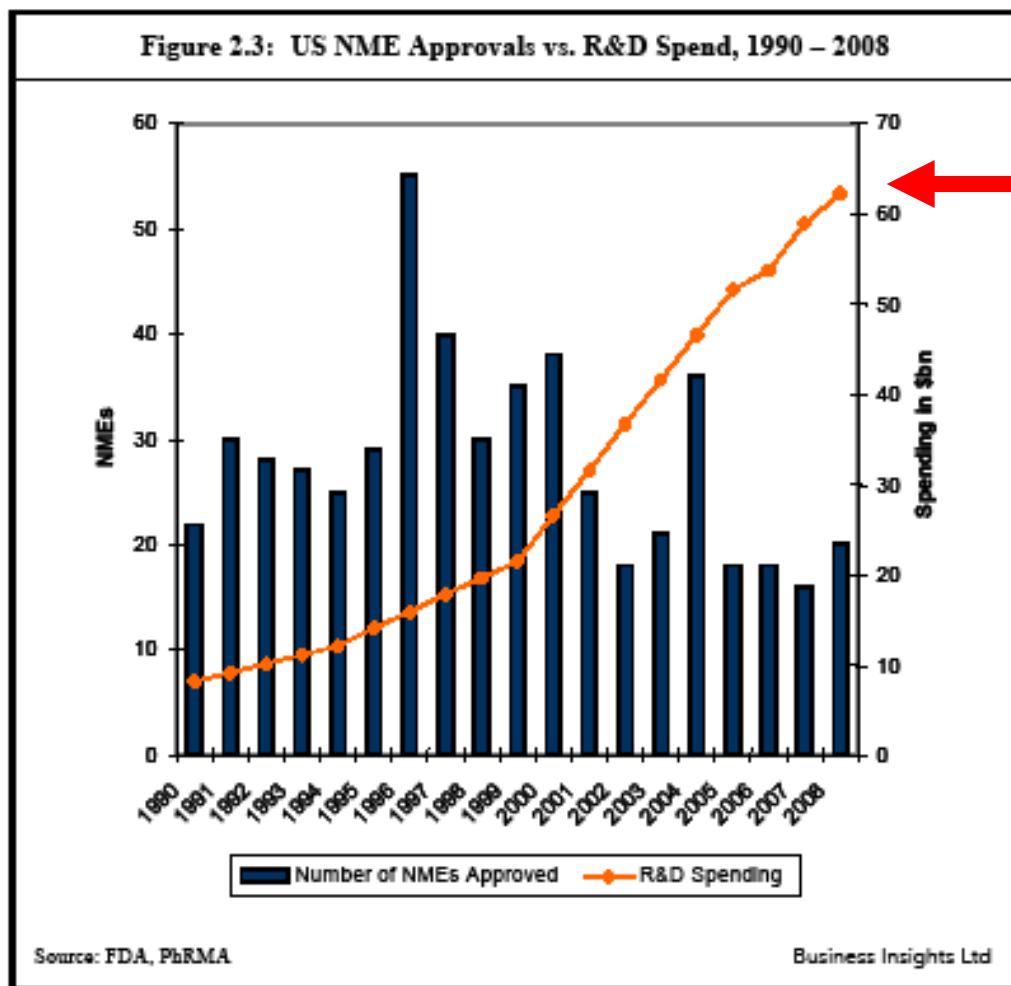
End users from academia and industry



Reactomix has launched its first >3000 synthetic metabolome microarray to undertake fingerprinting analysis of cell, tissues, biological fluids, etc. from any species

Some R&D bottlenecks

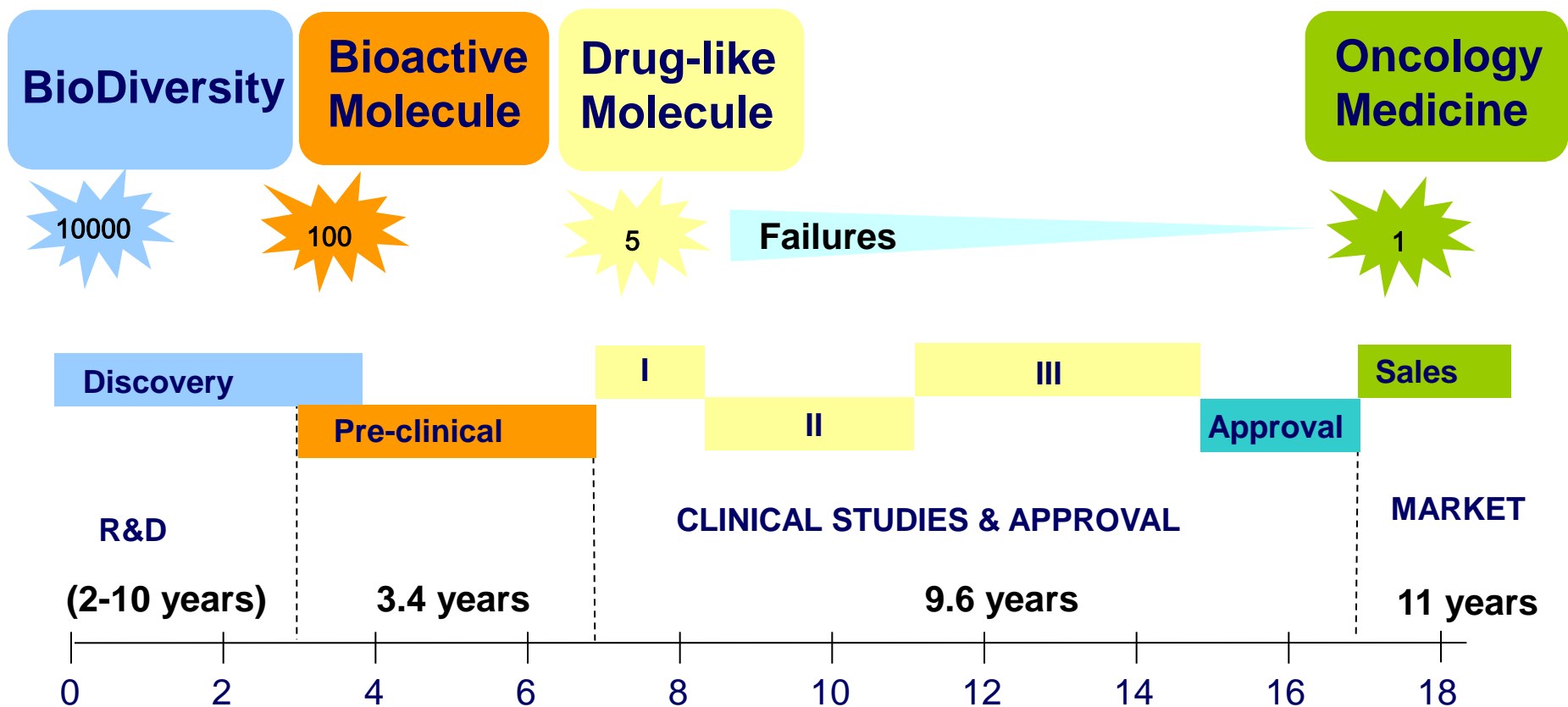
The natural products' discovery pipeline requires a larger investment...



US\$ 3 Bn per NME

Some R&D bottlenecks

...and a longer time



Yondelis (ET-743): 15 years

Paclitael (TAXOL) : > 20 years

Cost > \$ 802 mill.* Only 2 in 5 Marketed Drugs recover costs

From Structural Determination

(Bioactive molecule) to FDA approval

* Estimates for 2003

Lessons from cooperation with non-EU partners

North American partners:

- a very high added value, can contribute in-kind
- difficult to bring on board (esp. Govt-funded institutions)
- involvement requires serious efforts:

synchronization of applications

matching funding



External Funding of MetaGenomics Projects



Marine Metagenomics for New Biotech Applications
2009-2013



Molecular Approaches and MetaGenomic Investigations for optimizing Clean-up of PAH-contaminated sites
2010-2013



Unravelling and expLoiting MedIterranean Sea microbial diversity and ecology for xenobiotics' and pollutants' clean up
2011-2013



Marine Microbial Biodiversity, Bioinformatics and Biotechnology
2012-2016

Biodiversity. Bioinformatics. Biotechnology.



Integrated Biotechnological Solutions for Combating Marine Oil Spills
2013-2017