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Knowledge capture mechanisms studies as a tool to facilitate European Blue Biotech analysis

Daniel Pardo, CNRS/MNHN, France

In collaboration with Sophie Arnaud-Haond (Ifremer France),

Jesus M.Arrieta (CSIC-UIB Spain),

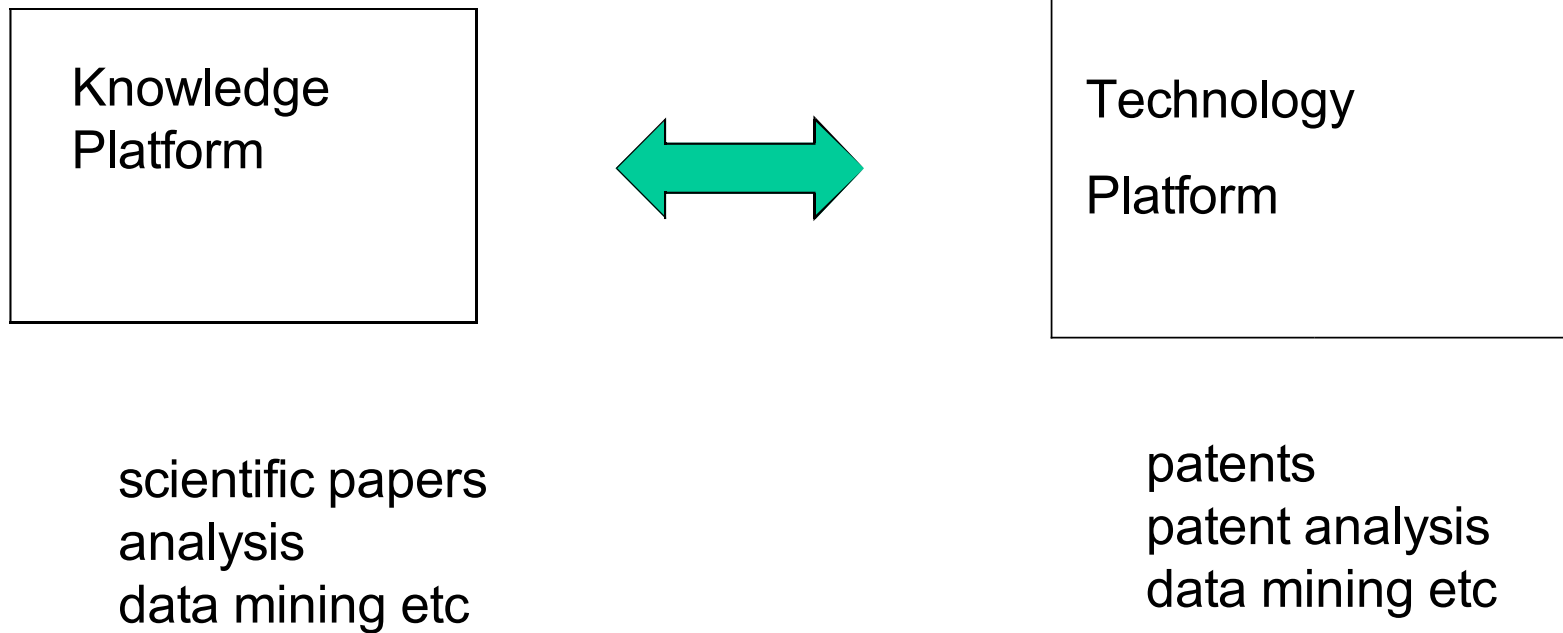
Antoine Schoen and Patricia Laurens (Université Paris-Est, IFRIS, France).

Knowledge Capture Mechanisms (KCM) are very similar to "Allosteric reaction" involving different parameters, control and feed back control. Analysis of KCM, at the core of technology transfer, contributes to a better understanding of interactions between University and Industry, Technology and Knowledge.

The present communication is focused on KCM involving Marine Genetic Resources and results obtained by Sophie Arnaud-Haond et al. It will present a research project and preliminary results describing some examples of knowledge transfer pathways.

1. Arnaud-Haond S, Arrieta JM, Duarte CM (2011) Marine Biodiversity and Gene Patents. *Science* 331: 1521-1522.
2. Arrieta JM, Arnaud-Haond S, Duarte CM (2010) What lies underneath: conserving the oceans' genetic resources. *Proc Natl Acad Sci U S A* 107: 18318-18324.

Knowledge Capture Mechanisms



« allosteric like »

Marine Biotechnology

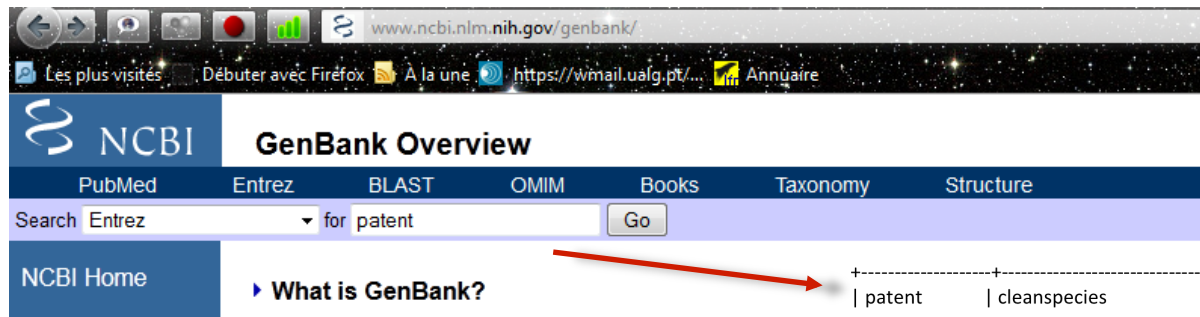
- From Marine to Blue
- From Devices to Biology
- From « University » to « Industry »
- ***MGR (marine genetic resources)***

MGRs

- Marine Biodiversity and Gene patents
- Sophie Arnaud-Haond ,
Jesus M.Arrieta,
Carlos M.Duarte.
- Science 2012: 331: 1521-1522
- Proc Natl Acad Sci U S A 2010: 107:
18318-18324.

Patents Screening (Sophie Arnaud et al)

- GenBank Patent Database (GenPAT)

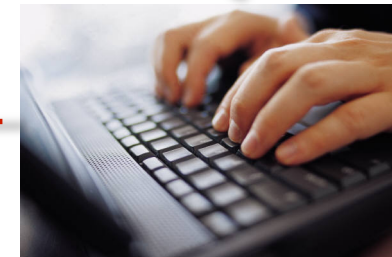


- Annotated by hand for marine sp.

- Base de donnée de brevets associés à des séquences d'origine marine

patent	cleanspecies	unique_seq_id
WO 9113978-A	Aeromonas salmonicida	3340843597
WO 9311263-A	Aeromonas salmonicida	763763463
EP 0502271-A	Desulfovibrio desulfuricans	3312016574
EP 0502271-A	Desulfovibrio desulfuricans	794242745
EP 0502271-A	Desulfovibrio desulfuricans	3312016574
EP 0502271-A	Desulfovibrio desulfuricans	4132214291
WO 9951771-A	Anabaena sp.	750210673

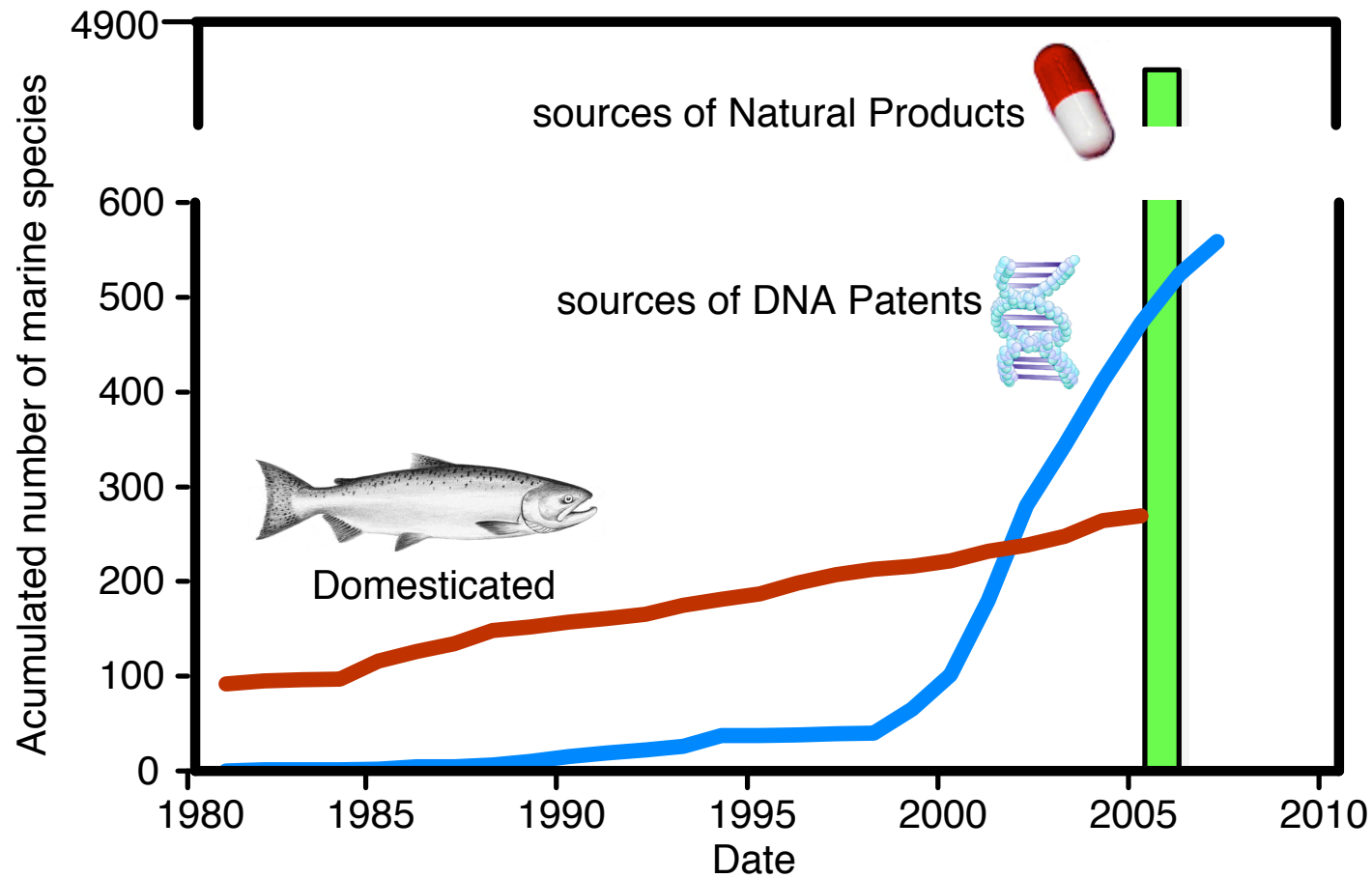
ScientificName	Environment
Abies magnifica	terrestrial
Absidia caerulea	terrestrial
Abudefduf declivifrons	marine
Acacia ampliceps	terrestrial
Acer rubrum	terrestrial
Achatina fulica	terrestrial
Acipenser brevirostrum	marine
Acorus calamus	terrestrial
Acropora formosa	marine
Acropora sp.	marine
Adiantum capillus-veneris	terrestrial
Adoxophyes honmai	terrestrial



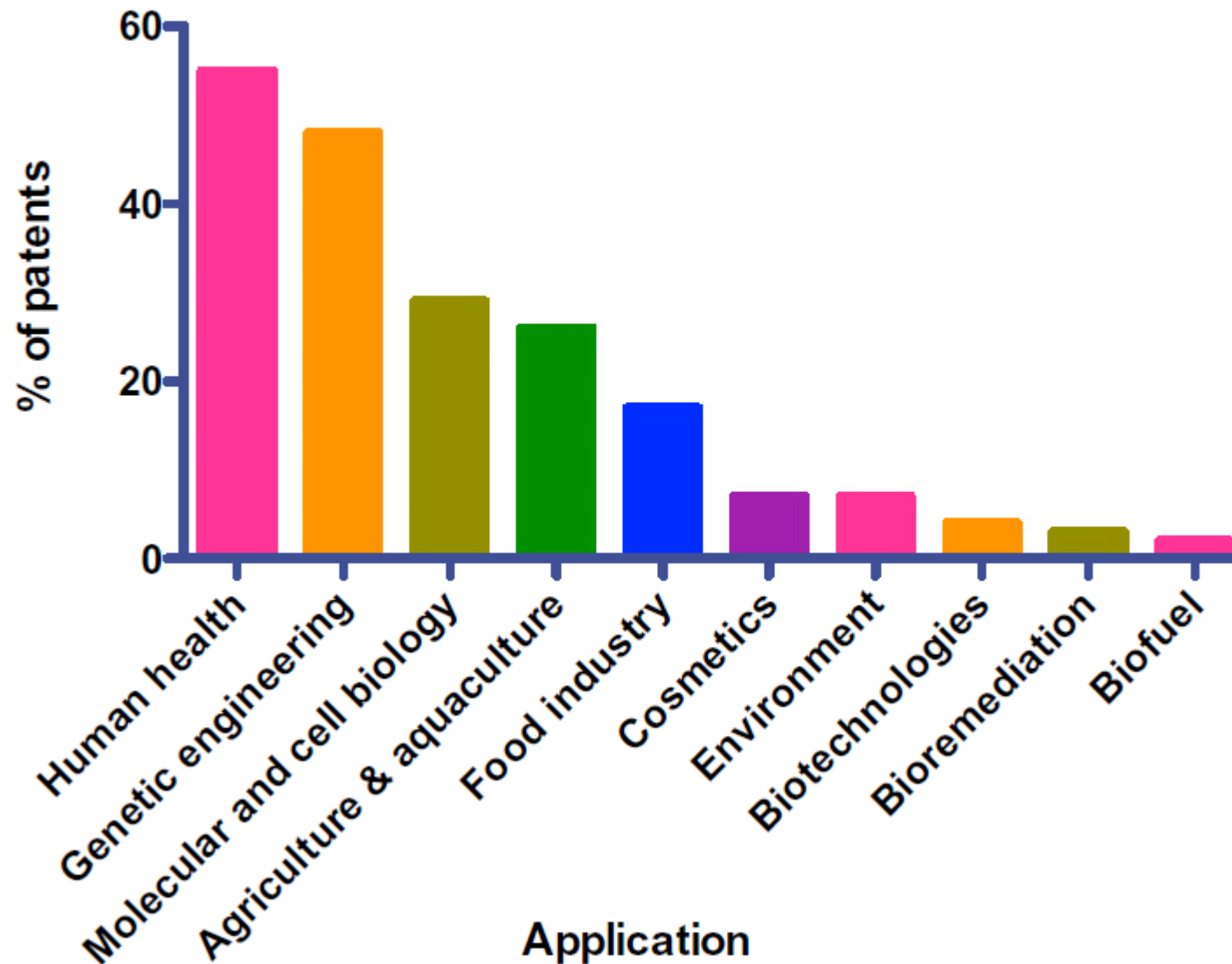
- Origin of patents claims traced using Patentscope (World Intellectual Property Office database)



Results

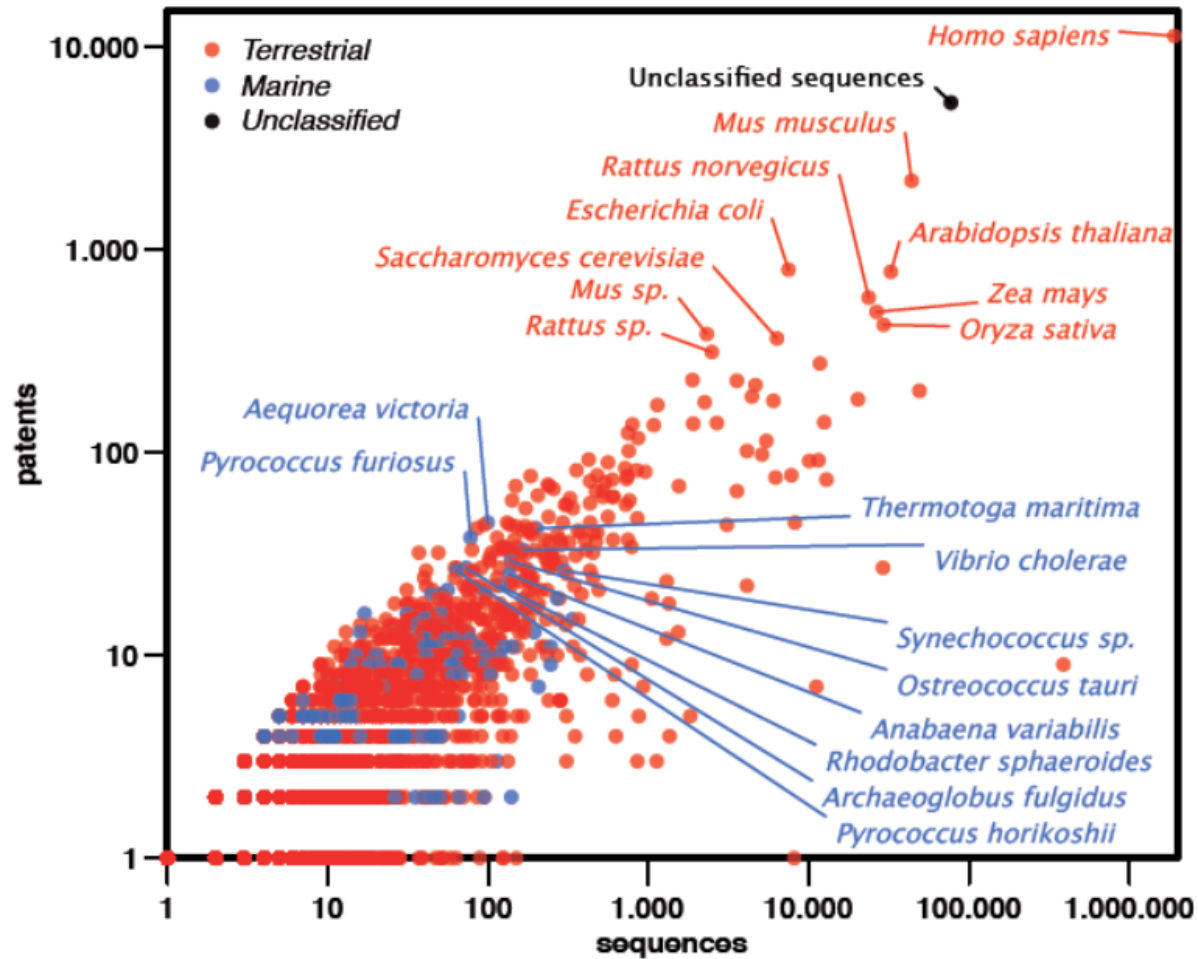


Arrieta JM, Arnaud-Haond S, Duarte CM (2010) What lies underneath: conserving the oceans' genetic resources. PNAS 107: 18318-18324.



Arrieta JM, Arnaud-Haond S, Duarte CM (2010) What lies underneath: conserving the oceans' genetic resources. PNAS 107: 18318-18324.

Top 10 marine and terrestrial organisms in WIPO gene patent:



Arrieta JM, Arnaud-Haond S and Duarte CM. Unpublished result

Daniel Pardo.Kiel Submariner 9 May
2012

PATENT CLAIMS FOR A GENE OF MARINE ORIGIN WITH SOURCE

Country	Marine organism patent claims
USA	199
Germany	149
Japan	128
France	34
United Kingdom	33
Denmark	24
Belgium	17
Netherland	13
Switzerland	11
Norway	9

Arnaud-Haond S, Arrieta JM, Duarte CM (2011) Marine Biodiversity and Gene Patents. Science 331: 1521-1522

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Knowledge Capture Mechanisms (approach)

- Key words extraction from Patents:
an image of technology Platform
- Authors (A)/Inventors (I) identification
- A & I scientific production (WoS)
- Key words extraction from Scientific
publication:
an image of knowledge platform

Expectation

- MGRs Technology Platform vs Knowledge Platform
- Mapping
- Blue Biotechnology Landscape

KCM/MGRs Case Study Project

- Germany Key Player
(149 patents)
- BASF (54 patents)

BASF at a glance

BASF is the world's leading chemical company – The Chemical Company.

With about 111,000 employees, six Verbund sites and close to 370 production sites worldwide we serve customers and partners in almost all countries of the world.

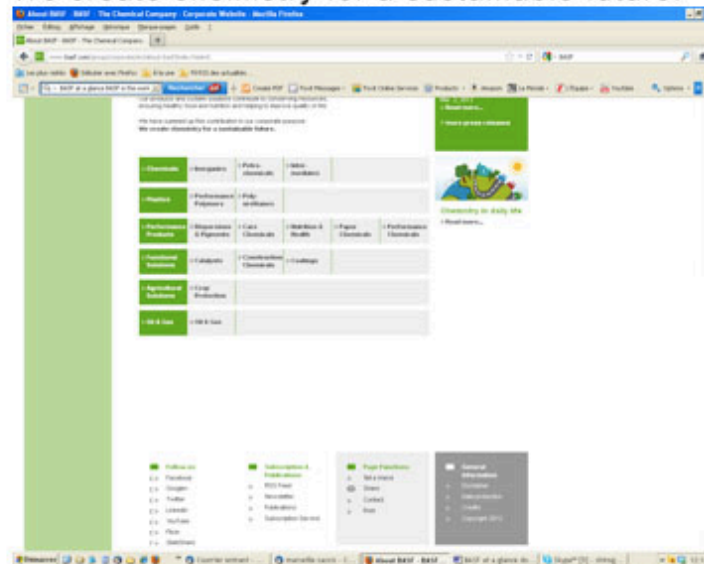
In 2011, BASF posted sales of €73.5 billion and income before special items of approximately €8.4 billion.

We combine economic success, social responsibility and environmental protection. Through science and innovation we enable our customers in almost all industries to meet the current and future needs of society.

Our products and system solutions contribute to conserving resources, ensuring healthy food and nutrition and helping to improve quality of life.

We have summed up this contribution in our corporate purpose:

We create chemistry for a sustainable future.



KCM/MGRs Case Study Project

- BASF

Technology Key Words identified

A/I identified

Analysis in progress

WO 2007093776

as an example

- **Inventor(s):**
 - NAPIER JOHNATHAN [GB]; SAYANOVA OLGA [GB]; VENEGAS CALERON MONICA [GB] +
- **Applicant(s):**
 - BASF PLANT SCIENCE GMBH [DE]; NAPIER JOHNATHAN [GB]; SAYANOVA OLGA [GB]; VENEGAS CALERON MONICA [GB] +

The invention relates to nucleic acid derived from *Perkinsus marinus* which encodes a 9-elongase, a Δ^8 -desaturase and a Δ^5 -desaturase *enzyme*. All of the coding sequences can be transcribed as a single transcript.

Perkinsus marinus is a prevalent pathogen of oysters, causing massive mortality in oyster populations. The disease it causes is known as "Dermo" (or, more recently, as "Perkinsosis"),[1] and is characterized by proteolytic degradation of oyster tissues. Due to its negative effect on the oyster industry, parasitologists interested in helping oyster farmers are trying to find novel strategies to combat the disease. *P. marinus* are found in marine water, and grow especially well in warm waters during the summer months. Its genome has been sequenced by TIGR, but as of Nov, 2010 no publication describing this can be found in PubMed. The size of the genome is estimated to be ~86 megabases.

elongase (plural elongases)

- 1. (biochemistry) Any enzyme that catalyzes the elongation of an aliphatic chain, but especially one that elongates a fatty acid

Technology Key Words

Perkinsus marinus

9-elongase, $\Delta 8$ -desaturase and a $\Delta 5$ -desaturase enzyme

Fatty acids and triacylglycerides

transgenic plants

.....

Knowledge Key Words

- **Professor Johnathan Napier**
- Biological Chemistry Department, Rothamsted Research,, Harpenden, Hertfordshire
- Sayanova O, Haslam RP, Calerón MV, López NR, Worthy C, Rooks P, Allen MJ, Napier JA (2011) Identification and functional characterisation of genes encoding the omega-3 polyunsaturated fatty acid biosynthetic pathway from the coccolithophore *Emiliana huxleyi*. **Phytochemistry** 72(7): 594-600

The role of D6-***desaturase*** acyl-carrier specificity in the efficient synthesis of long-chain polyunsaturated fatty acids in ***transgenic plants***

Olga Sayanova, Noemi Ruiz-Lopez, Richard P. Haslam and Johnathan A. Napier*

Department of Biological Chemistry, Rothamsted Research, Harpenden, Herts, ***UK***

Data

- Patents in genbank
- Identification of patents on marine genes
- Germany - largest patent holder in Europe
- BASF, largest patent holders from Germany: 68 distinct patents (with relevant information) and 112 distinct inventors

Data Analysis

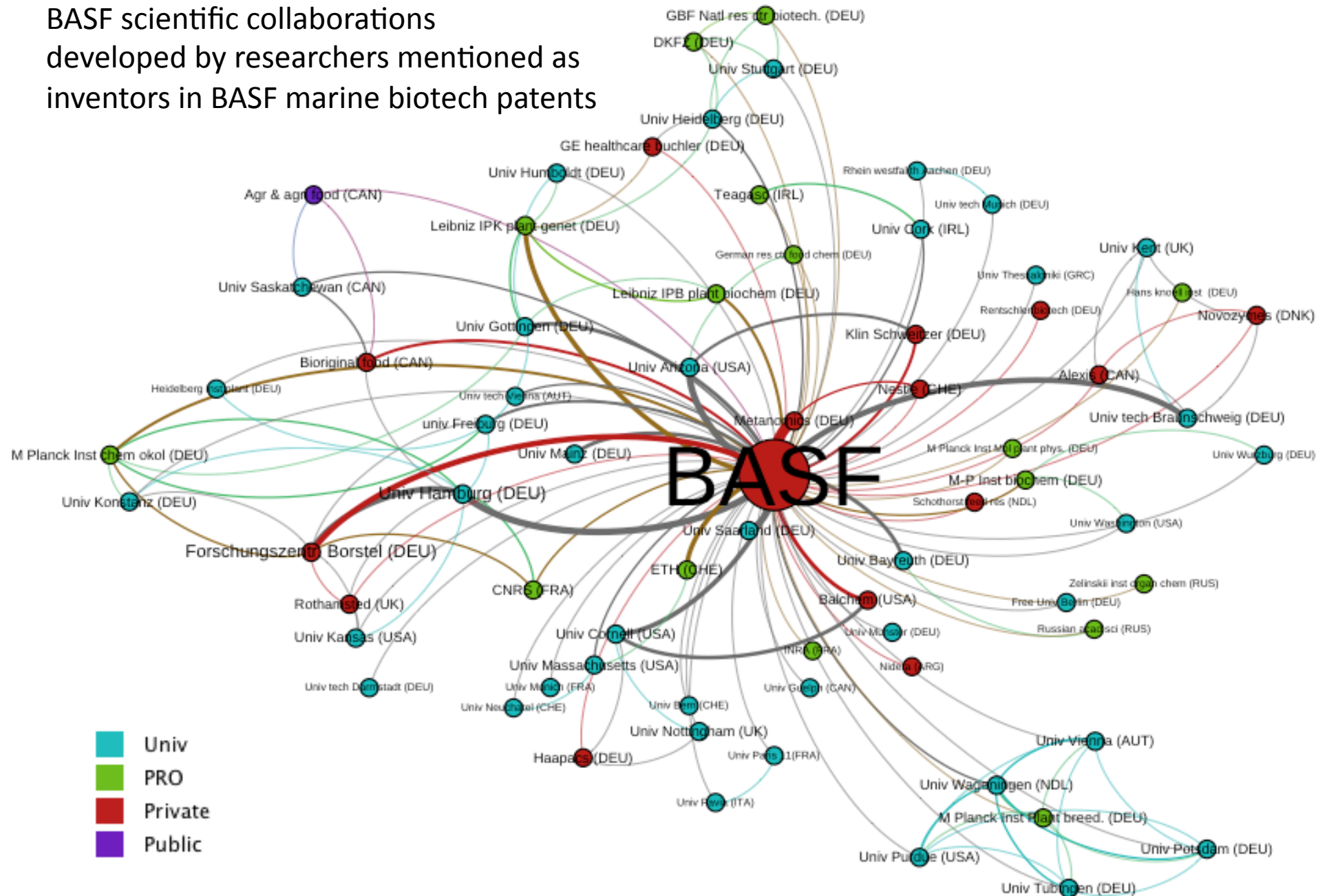
- 112 inventors in the 68 BASF patents
- 86 distinct scientific papers, where one of these 112 inventors appear as coauthor (374 in total) & where BASF is one of the signing institutions
- Analysis of this data as Graphs / Networks
- institutions & institutions, institutions & kw; authors & kw

Network analysis of Scientometric Data

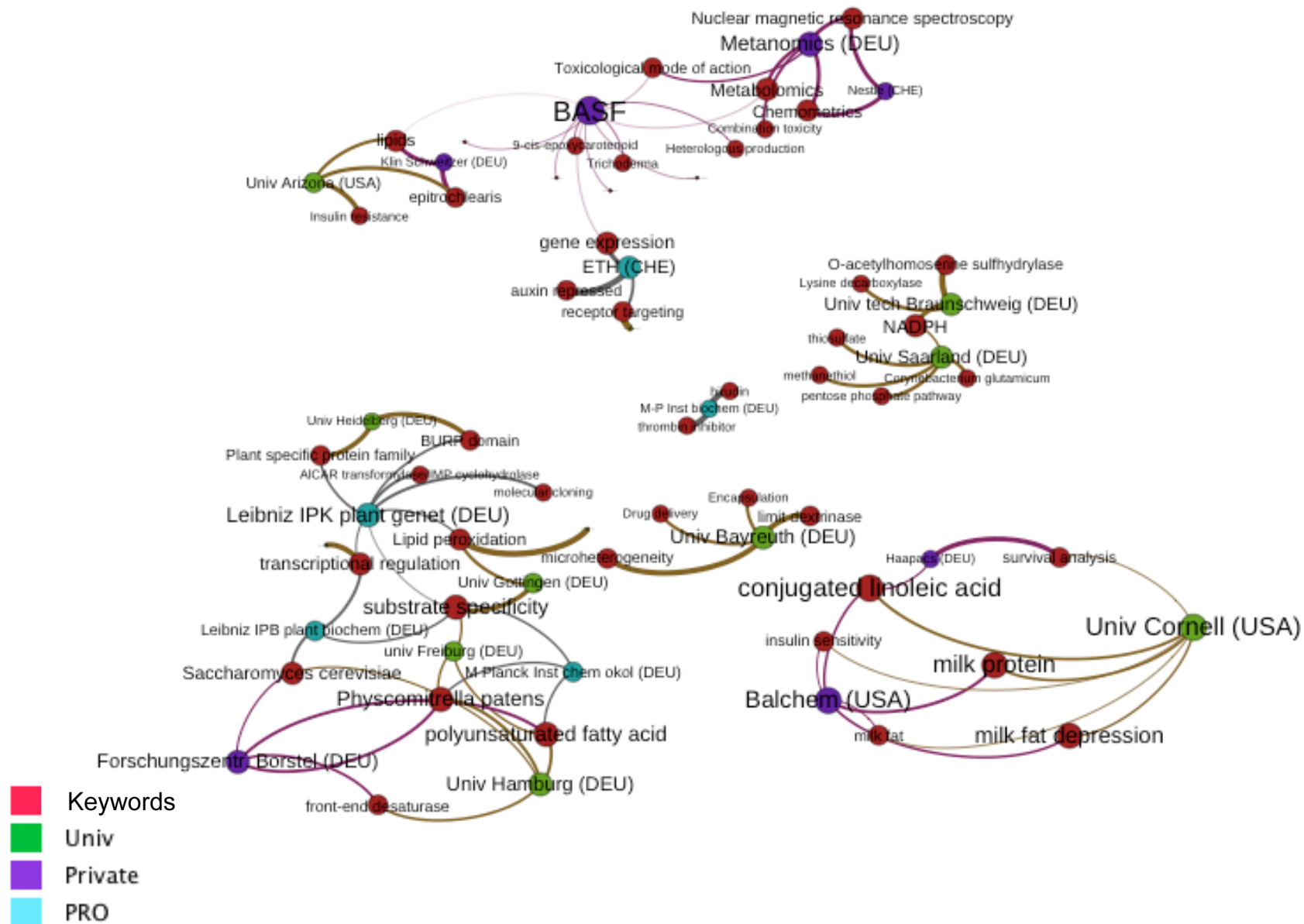
- Data Mining
- GEPHI

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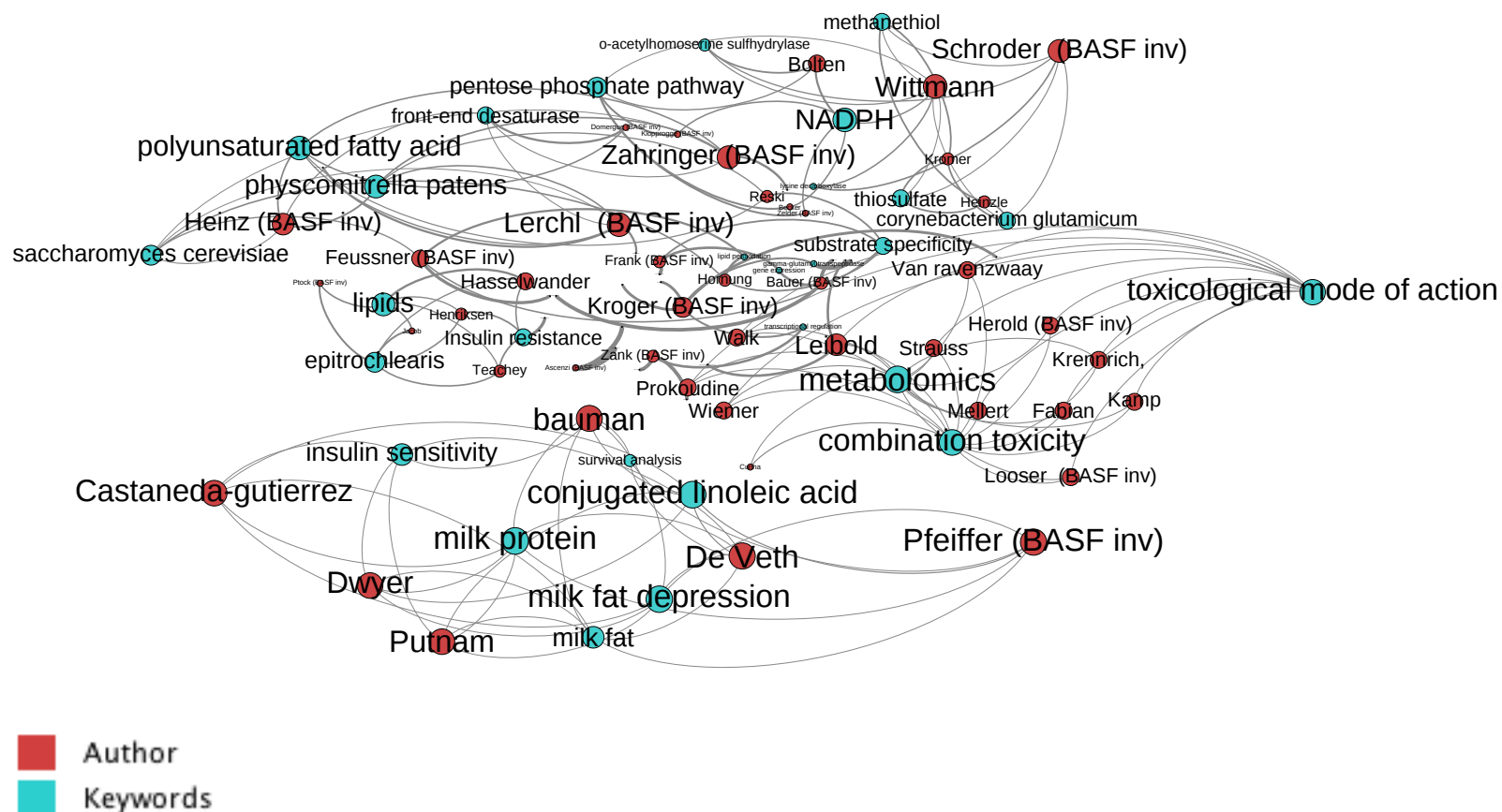
BASF scientific collaborations
developed by researchers mentioned as
inventors in BASF marine biotech patents



BASF scientific research carried out by Researchers mentioned as inventors in BASF marine biotech patents



BASF scientific research carried out by researchers mentioned as inventors in BASF marine biotech patents - researchers



Research project Road Map

- BASF fine tuning
- Germany
- Europe