

MarineBiotech



Requirements for successful innovation from marine biotechnology

Session: Where do we go?

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ENTREPRENEUR & PROFESSOR

The Ocean

71% of Earth's surface

97% of water on Earth

99% by volume of the biosphere

90% mobile carbon on Earth

50% of the oxygen we breath

50% species on Earth

**50% of specimens below 3km depth
from previously un-described species**

30% carbon dioxide emissions absorbed

14 phyla found only in ocean

The European Blue Economy

All economic activities that depend on the sea

5.4 million jobs

€500 billion/year Gross Value Added

75% external trade is seaborne

37% internal trade is seaborne

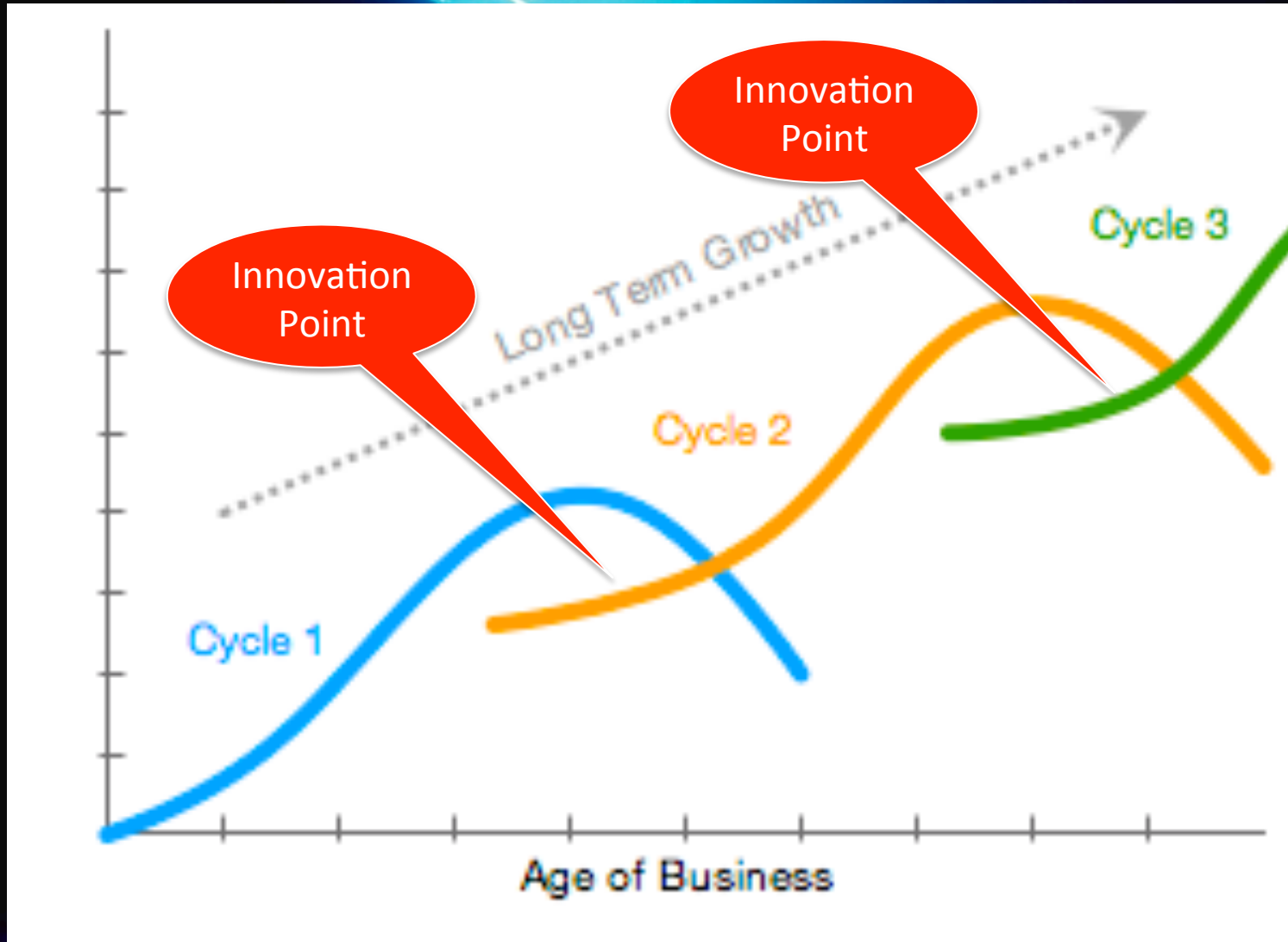
80% of European oil and gas is offshore

95% internet traffic by submarine cables

An underwater scene inside a cave. A diver is visible in the center, swimming away from the viewer towards a bright opening at the top of the cave. The water is dark blue, and the cave walls are silhouetted against the light. The overall mood is mysterious and exploratory.

SO, HOW DO YOU GO FROM
SCIENCE TO MARKET?

BUSINESS CYCLES



Focus Area

BLUE GROWTH FOCUS

Five sectors with high potential for sustainable Blue Growth are to be further developed:



Adapted from BLUE GROWTH AGENDA, 2012

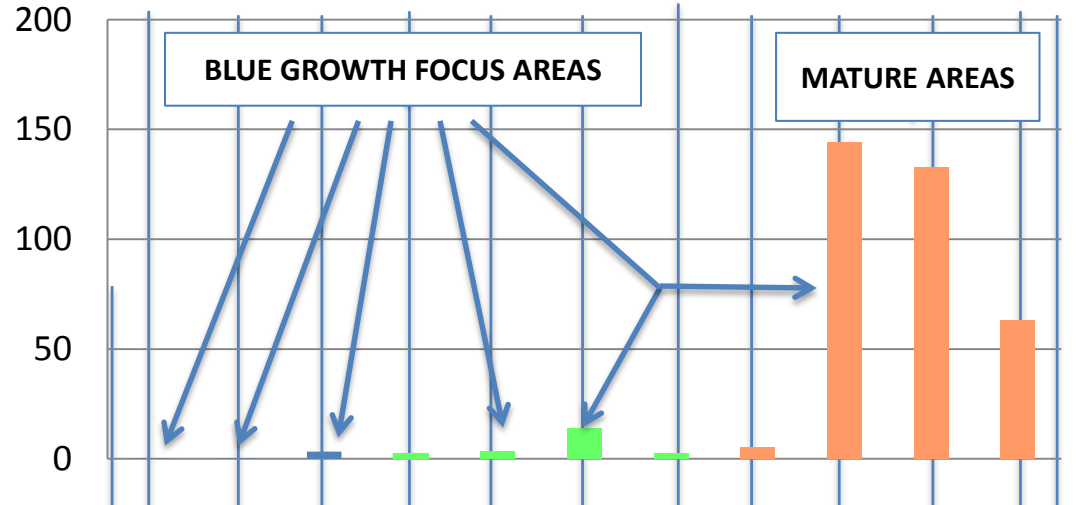
Marine Economic Value Chains



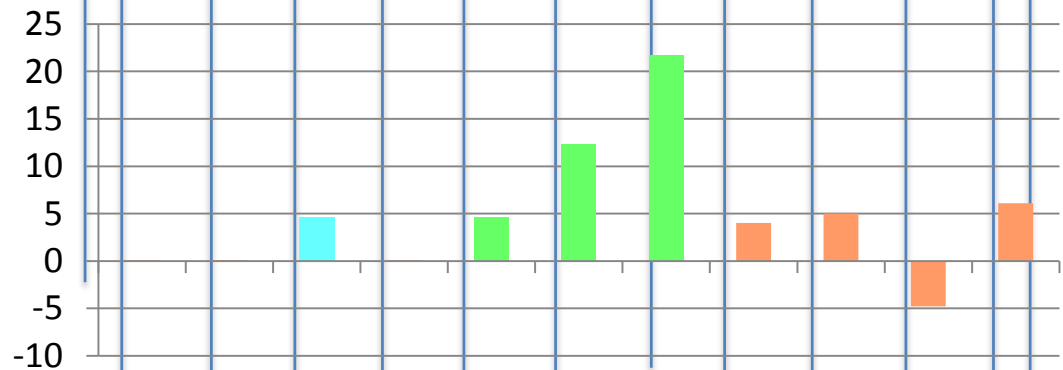
Development Growth Mature

Based on
 "Blue Growth: Scenarios and
 drivers for sustainable growth from
 oceans, seas and coasts" (2012)

Size (Billion Euros)



GDP Growth %



Marine minerals mining
 Ocean renewable energy
 Blue biotechnology
 Maritime monitoring
 Aquaculture
 Cruise tourism
 Offshore wind
 Coastal protection
 Coastal tourism
 Offshore oil & gas
 Short Sea Shipping

WHAT IS INNOVATION?

A diver is seen from behind, swimming through a narrow, rocky underwater passage. The water is a deep, vibrant blue, and light filters in from above, creating a dramatic, ethereal atmosphere. The diver's silhouette is dark against the lighter water, and their fins are visible as they move forward.

INNOVATION = INVENTION + EXPLOITATION

INNOVATION is the CONVERSION OF
KNOWLEDGE & IDEAS into a BENEFIT.

A diver is silhouetted against a bright blue light source coming from an opening in a dark underwater cave. The diver is positioned in the center of the frame, looking towards the light. The water is dark blue, and the cave walls are visible on either side.

WHO CAN IMPLEMENT IT?

ENTREPRENEURS

A diver is seen from behind, swimming through a narrow, dark underwater passage. The passage is illuminated by a bright blue light source at the end, creating a strong contrast and highlighting the diver's silhouette and the surrounding water. The diver is wearing a mask and fins, and the overall scene conveys a sense of exploration and discovery.

Entrepreneurship – the pursuit of an opportunity beyond the resources one currently has under control.

(source: Berkley, 2006)

WHAT IS AN ENTREPRENEUR?

WHY IS IT IMPORTANT?

A diver is silhouetted against a bright blue light source at the end of a narrow underwater passage. The water is dark blue, and the light creates a strong contrast, highlighting the diver's form and the texture of the cave walls.

- WE LIVE IN A NEW “KNOWLEDGE SOCIETY”
- NEW MODELS OF POST-ACADEMIC SCIENCE
- INTERDISCIPLINARY MODELS OF RESEARCH
- “MODE 2 OF KNOWLEDGE PRODUCTION”

(Source: Gibbons et al. 1994)

**ENTREPRENEURSHIP & INNOVATION
ARE INTRINSIC TO THIS REALITY**

HOW DO WE PROMOTE THIS?

A diver is silhouetted against a bright blue light source at the end of a narrow underwater passage. The water is dark blue, and the walls of the passage are rocky and textured. The diver is wearing a full scuba gear, including a tank and fins.

- Entrepreneurship can be thought & learned!
- Education and cultural change are key!
- Experiential models are the most efficient for innovation boost:
 - Immersion, fablabs, prototype labs ...
 - entrepreneurial ecosystems are crucial

HOW DO WE PROMOTE THIS?

A diver is silhouetted against a bright blue light source at the end of a narrow underwater passage. The water is dark blue, and the walls of the passage are rocky and textured. The diver is wearing a full scuba gear, including a tank and fins.

- Anchor success & FAILURE examples nearby
- Cross-disciplinary research and International collaboration networks
- Ocean services awareness & dissemination to wide public major goal
 - applied examples
 - novel ways of dissemination



Blue Growth

Unlocking the potential
of Europe's oceans,
seas and coasts

Maritime
Affairs and
Fisheries

Navigating the Future IV

Position Paper 20



www.marineboard.eu

European
MARINE BOARD
Advancing Seas & Oceans Science

WHAT'S WRONG in MARINE SCIENCES INNOVATION & ENTREPRENEURSHIP?



A clownfish with orange and white stripes is swimming in a sea anemone with green tentacles. The background is dark blue.

NOTHING IN SPECIAL!

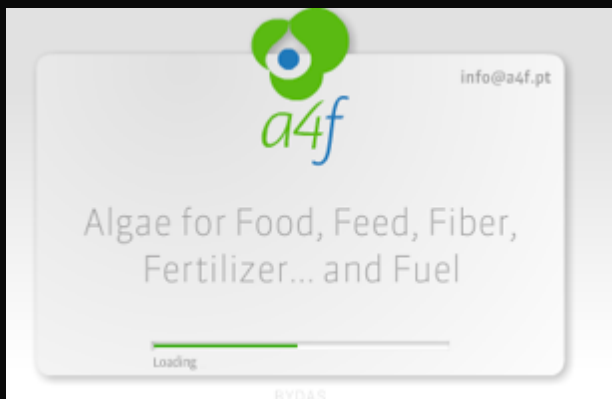
**THE SAME AS MOST OTHER
TECH SECTORS!**

I&E SUCCESS in MARINE BIOTECH

BIOTECHNOLOGY

2093 Companies in EU; REVENUES > US\$20B; EMPLOYEES > 55.000

(Ernest & Young, 2013)



THE OTHER SIDE OF MICROALGAE

I&E SUCCESS AT MARINE BIOTECH

MARINE BIOTECH: US\$4.1B (10% annual growth rate)

(Global Industry Analysts, Inc. 2011)

LET'S TURN
OCEAN
PLASTIC
INTO SOMETHING
FANTASTIC

BIONIC

G-STAR RAW

PARLEY

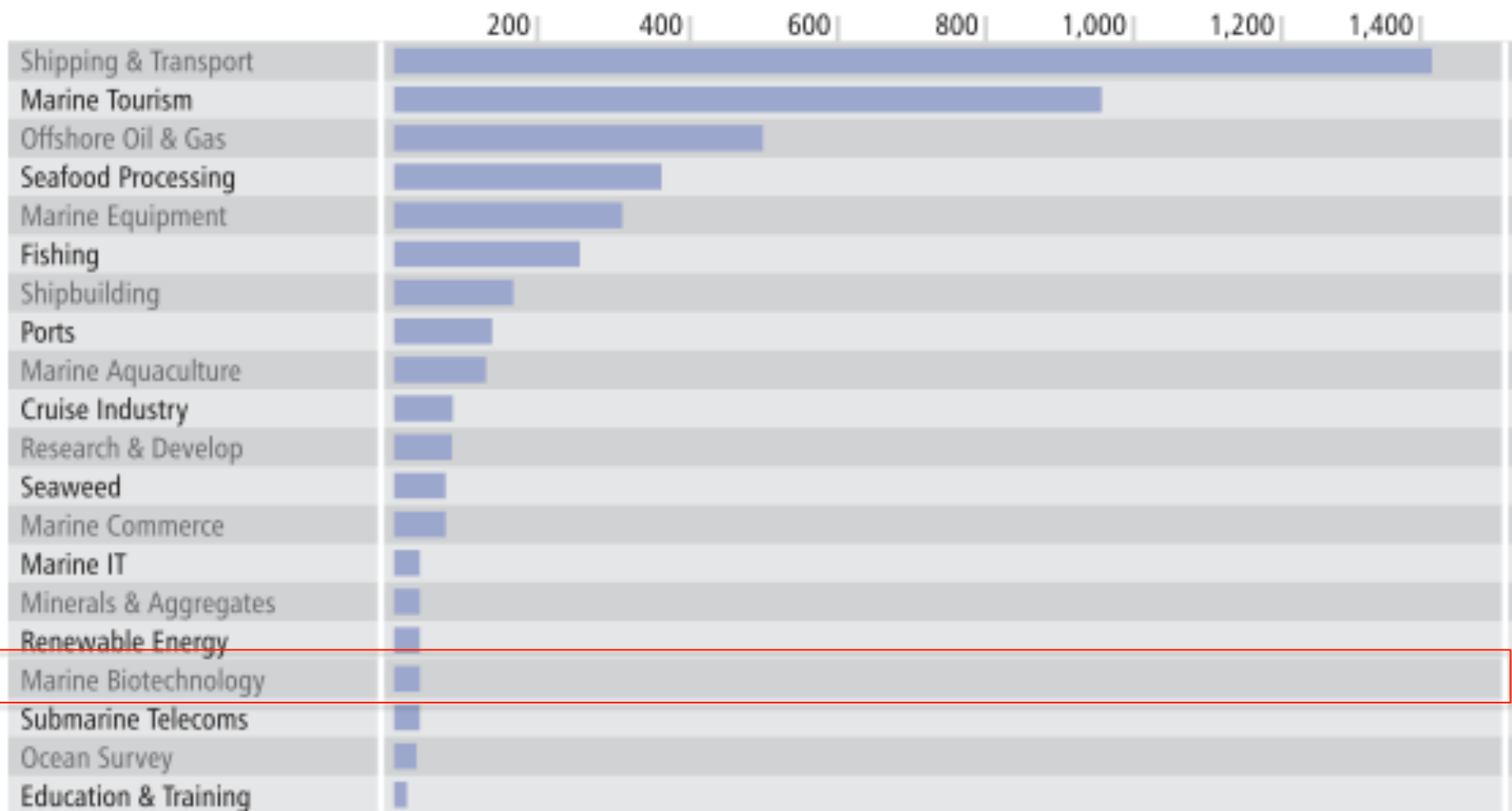


 BIONIC®

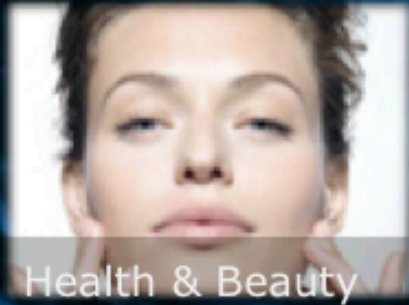
I&E SUCCESS AT SEA

MANY OTHER SECTORS HAVE INNOVATION POTENTIAL

Figure 3.2: World Marine Industry Sector Totals 2005–2009 (€ billion)



MARINE BIOTECH APPLICATIONS



Health & Beauty



Therapeutics



Nutrition



Agrosociences



Textile

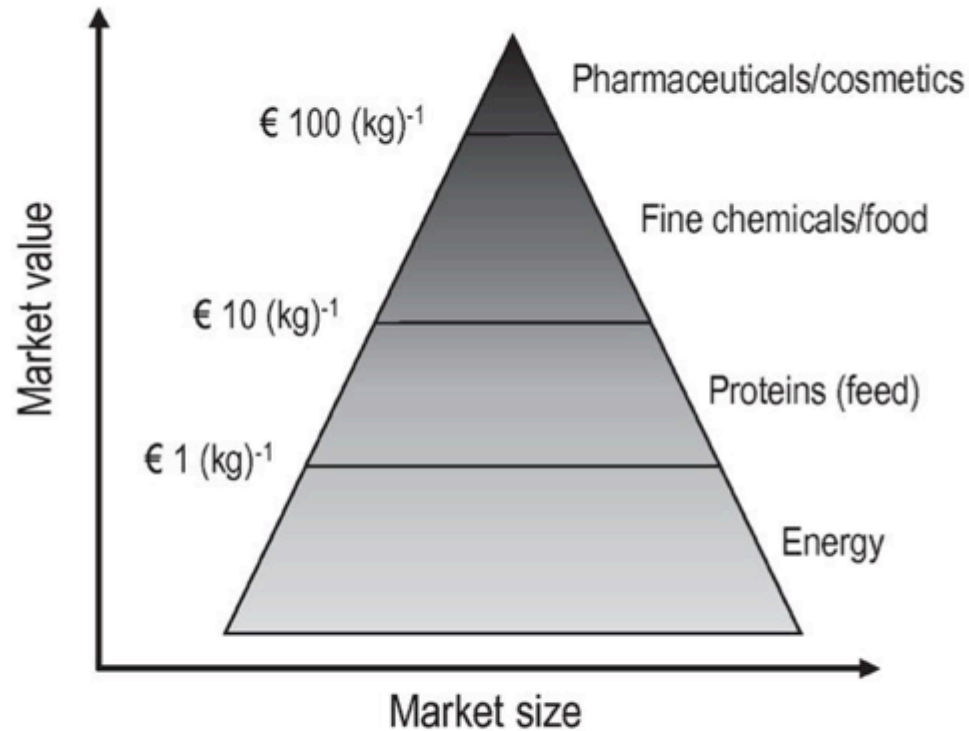


Chemicals & Household



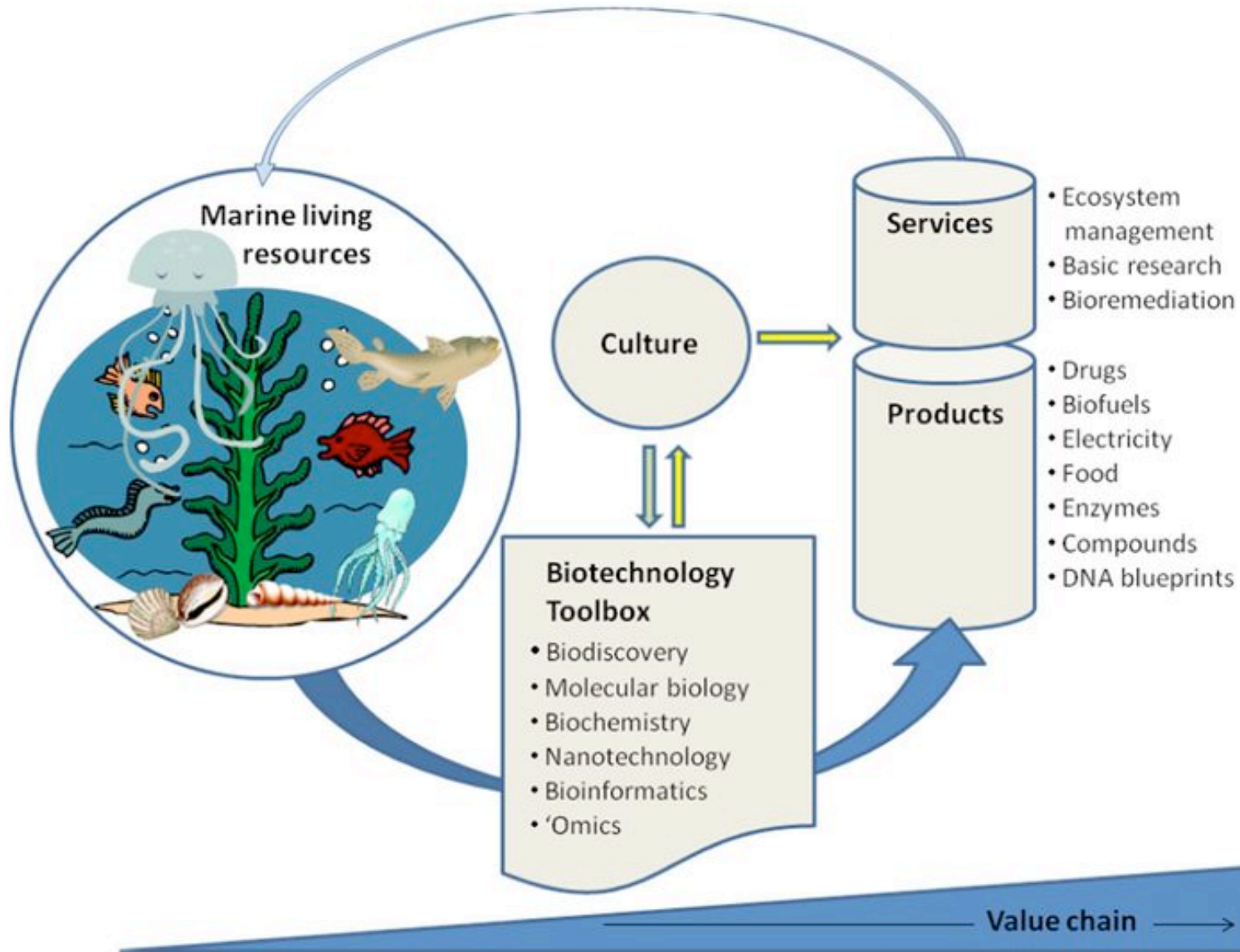
MARINE BIOTECH MARKET

Figure 2.3. Value pyramid for marine biotechnology products



Source: Sustainable Energy Ireland (2009), "A review of the potential of marine algae as a source of biofuel in Ireland", *Sustainable Energy Ireland*, Dublin, February.

MARINE BIOTECH POTENTIAL

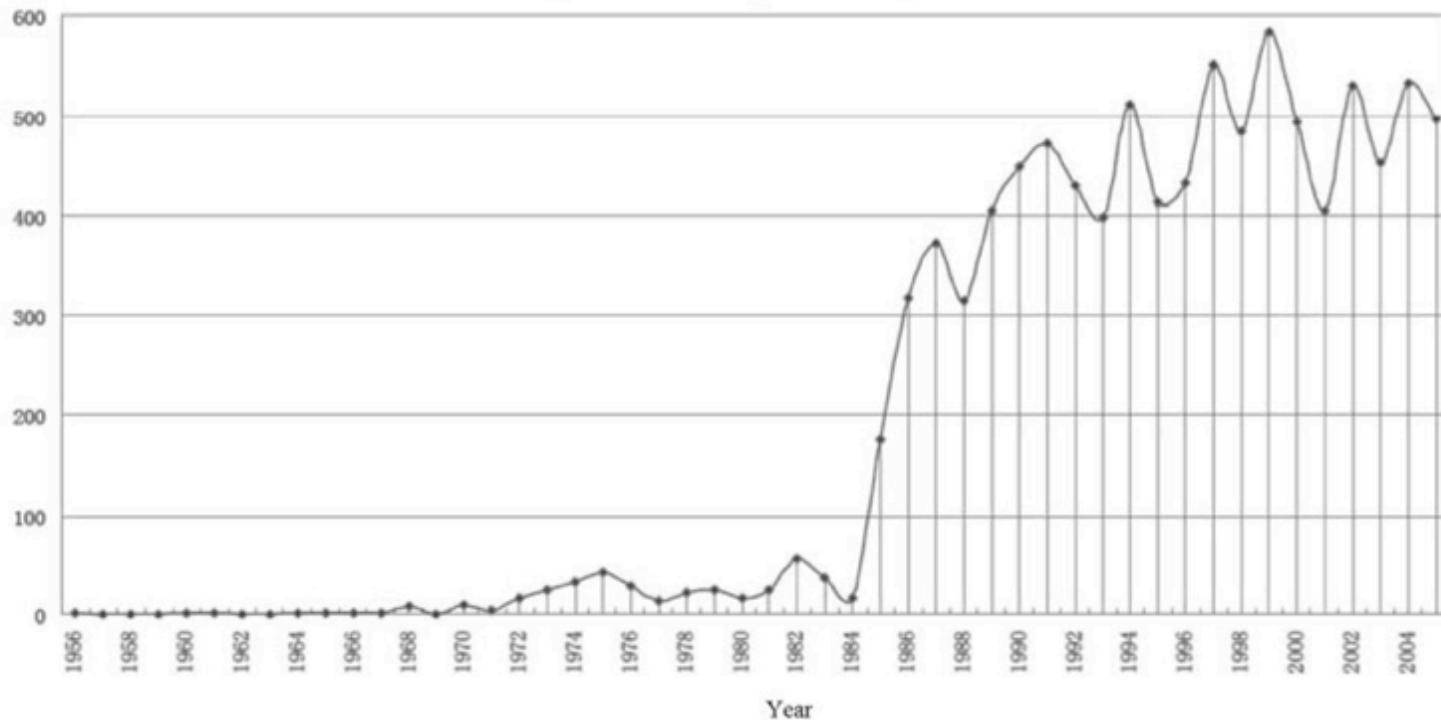


MARINE BIOTECH POTENTIAL

TO DATE >20,000 UNIQUE MARINE BIOACTIVE STRUCTURES IDENTIFIED

(MARTINS et al. 2014)

**Figure 2.2. Trends in novel products obtained from marine organisms
(number of products)**



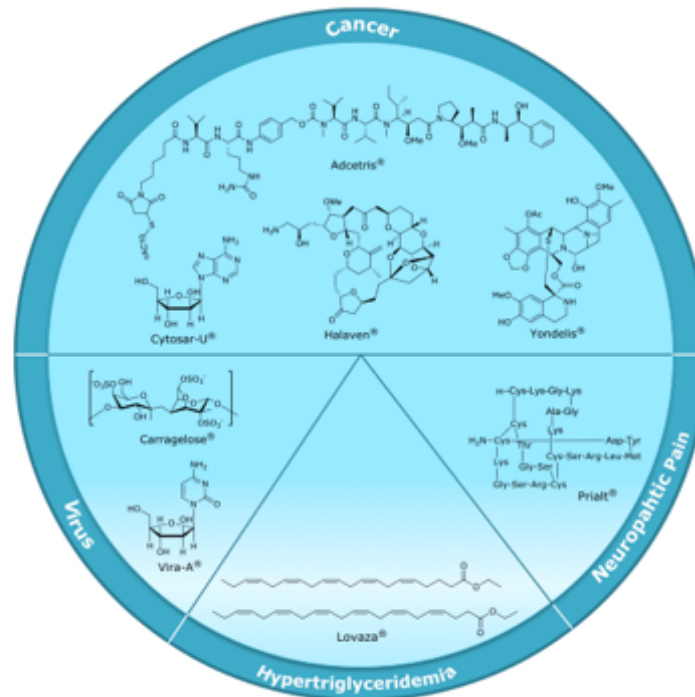
Source: Hu et al. (2011), “Statistical Research on Marine Natural Products Based on Data Obtained between 1985 and 2008”, *Marine Drugs* 9(4): 514–525. doi: <http://dx.doi.org/10.3390/md9040514>.

MARINE BIOTECH POTENTIAL

HOWEVER THE FULL POTENTIAL IS NOT YET TAKEN:

- **PHARMACEUTICAL:** 8 APROVED MARINE DRUGS
12 NP IN CLINICAL STAGE
- **COSMECEUTICAL:** 7 TYPES OF COMMERCIAL INGREDIENTS

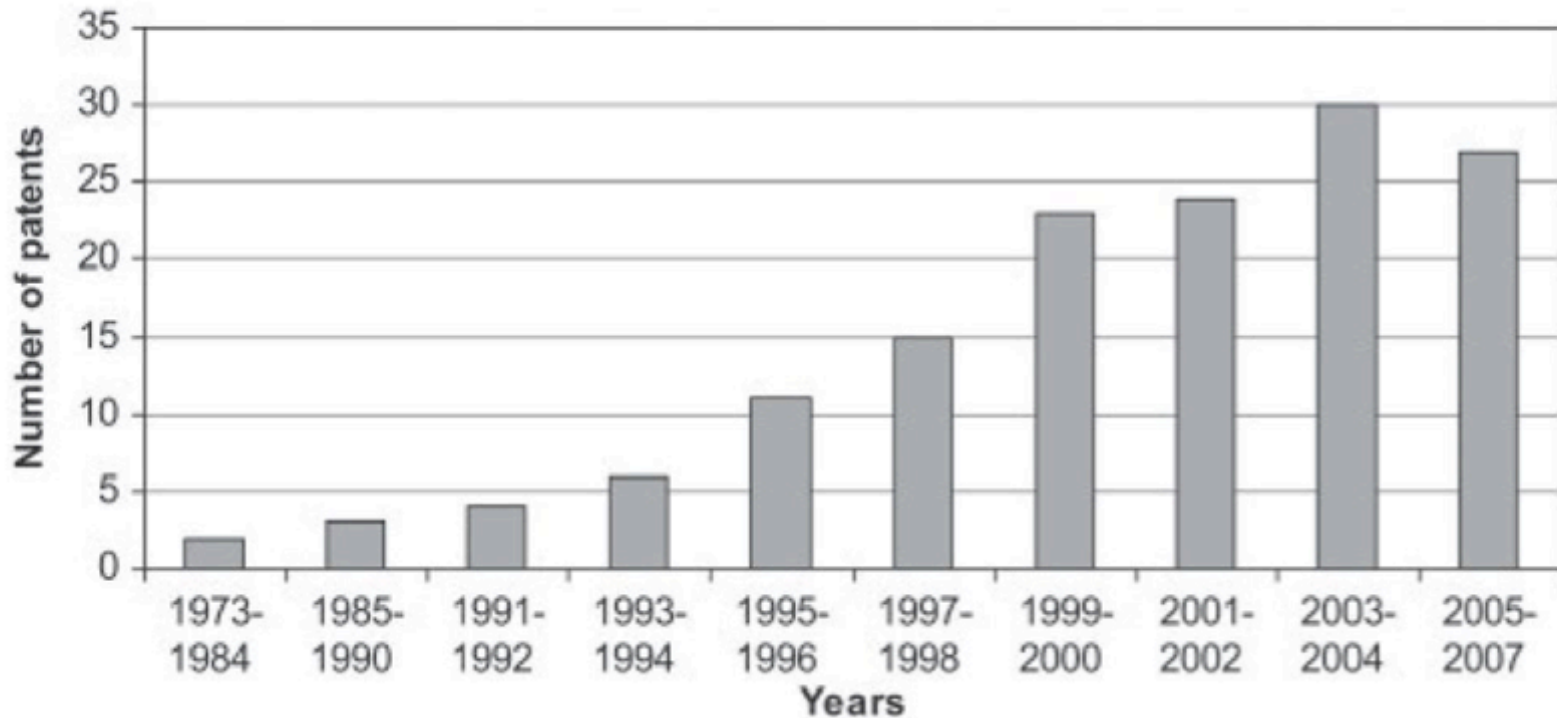
Figure 1. Chemical structures of marine drugs on the market divided by therapeutic area.



MARINE BIOTECH POTENTIAL

ONLY 135 - 300 PATENTS ON MARINE PRODUCTS

Figure 3.1. Marine genetic resource patents (patents files, n=135)



Other sources (in Hunt and Vincent, 2006): 14 000 novel chemicals; 300 patents on marine natural products.

Source: Adapted from Leary et al. (2009), "Marine genetic resources: A review of scientific and commercial interest", *Marine Policy*, 33:183-194.

A diver is silhouetted against a bright blue light source at the end of a narrow underwater passage. The passage is formed by dark, jagged rock walls. The diver is positioned in the center of the frame, facing away from the viewer towards the light. The overall atmosphere is mysterious and challenging.

**SO MAYBE THERE ARE SOME
CHALLENGES?...**

MARINE BIOTECH CHALLENGES



THERE ARE 3 MAJOR TYPES OF CHALLENGES:

1. BIODIVERSITY CHALLENGES

- SAMPLING
- TAXONOMIC
- SUSTAINABILITY

2. MARKET CHALLENGES

- NEEDS
- COMPETITION
- IP
- REGULATORY
- MARKET FITNESS ANALYSIS

3. SUPPLY & TECHNICAL CHALLENGES

- VARIABILITY/NOVELTY
- SUSTAINABLE & SUSTAINED SUPPLY
- SCALABILITY
- TOXICOLOGICAL PROFILES

OTHER GENERAL CHALLENGES OF BLUE STARTUPS

A diver is silhouetted against a bright blue light source at the end of a narrow underwater passage. The water is dark blue, and the walls of the passage are dark and rocky. The diver is wearing a full scuba gear, including a tank and fins. The light creates a strong contrast, highlighting the diver and the texture of the water.

- 1. FINANCIAL (cash intensive development, wrong financial partners)**
- 2. INCORRECT BUSINESS MODEL**
- 3. ADEQUATE EXPERTISE/BALANCE IN TEAMS (just scientists, wrong partners...)**
- 4. POOR MARKET ACCESS/NETWORKS**
- 5. NOT ACKNOWLEDGE THE INTRINSIC RISKS TO MARINE BIOTECH**

CAN WE LEVERAGE BLUE GROWTH USING INNOVATION MODELS?

- Marine research is not only about controlling threats
- IT MUST deliver Opportunities for People & Industry – build BLUE OCEAN INNOVATION
- SEVERAL INNOVATION & ENTREPRENEURIAL OPPORTUNITIES RISE FROM CURRENT MAJOR SOCIETAL CHALLENGES
 - SUSTAINABLE DEVELOPMENT
 - FOOD REQUIREMENTS
 - HEALTHY AGEING...

CAN WE LEVERAGE BLUE GROWTH USING INNOVATION MODELS?

- STRENGTHEN EU response capacity to:
 - Develop novel products and services from strong marine knowledge outputs
 - Promote and Leverage Patent protection & Exploitation
 - **Train Entrepreneurial minded marine scientists**
 - Promote Interdisciplinary & multi-experience teams & research
 - Reinforce Technology Transfer, Innovation and Entrepreneurial paths and capacities in marine biotech linked projects and programs

A vibrant clownfish with orange and white stripes is swimming among the green, bulbous tentacles of a sea anemone. The background is dark, making the colors of the fish and anemone stand out.

THANK YOU !

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