Biotechnology potential (**BlueTech**): creating new options for **economy** and **employment**?

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Why are sponges important for Blue Biotech?

BLUE BIOTECH

7000+

sponge-derived compounds

- Most prolific source of marine-derived chemicals with pharmaceutical applications

- How & why do they produce these chemicals?
- What role do their microbial symbionts play?

SponGES project

Key knowledge gaps:

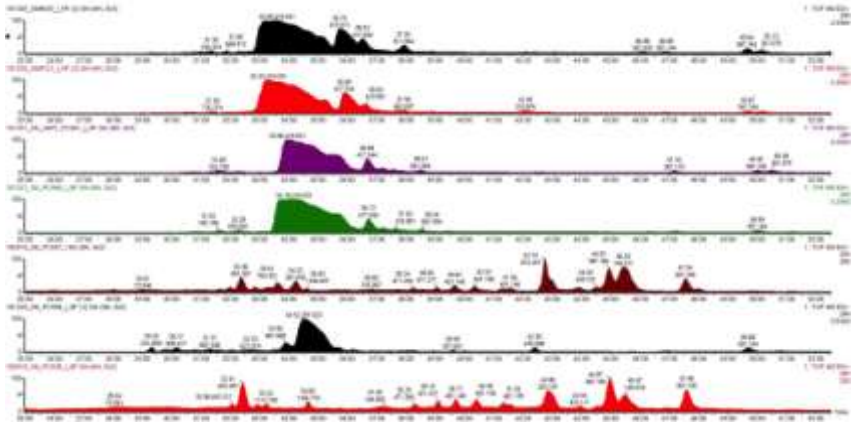
- Sponge-grounds have been poorly explored: opportunity for discovery of novel chemicals with important relevance to human health and industrial applications.

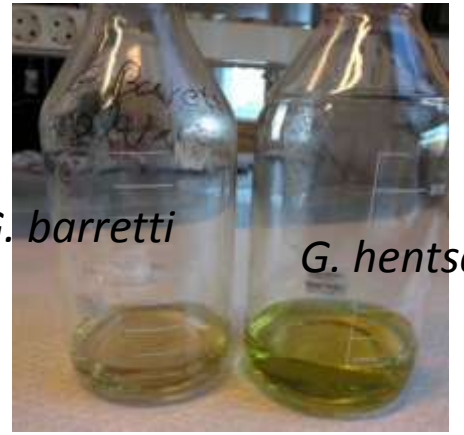
Focus:

- ***Biology*** of deep-sea sponges & associated microorganisms to identify products or processes with pharmaceutical and biotechnological potential.

SponGES: Expected Major Biotech Outputs

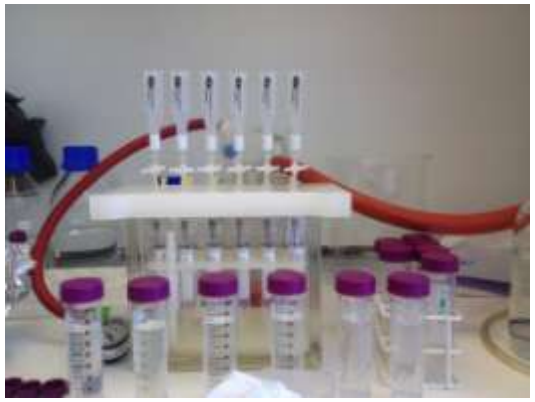
- Assess the metabolic diversity of key sponge ground species using metabolomics to **identify** sponge ground **bioproducts** with **industrial potential**

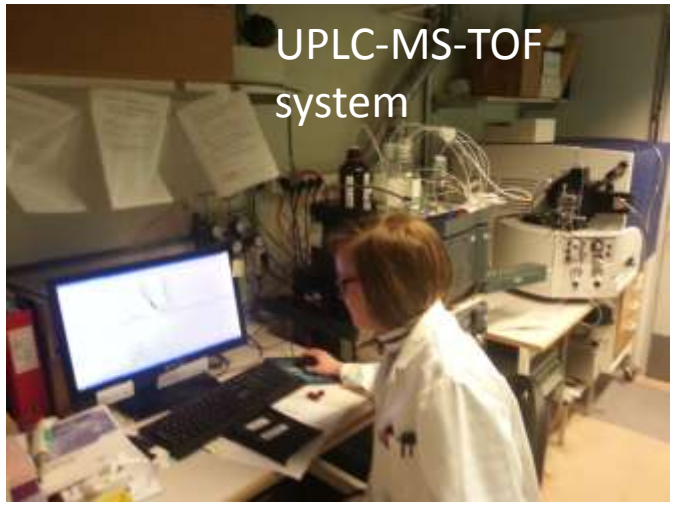




G. barretti

G. hentscheli



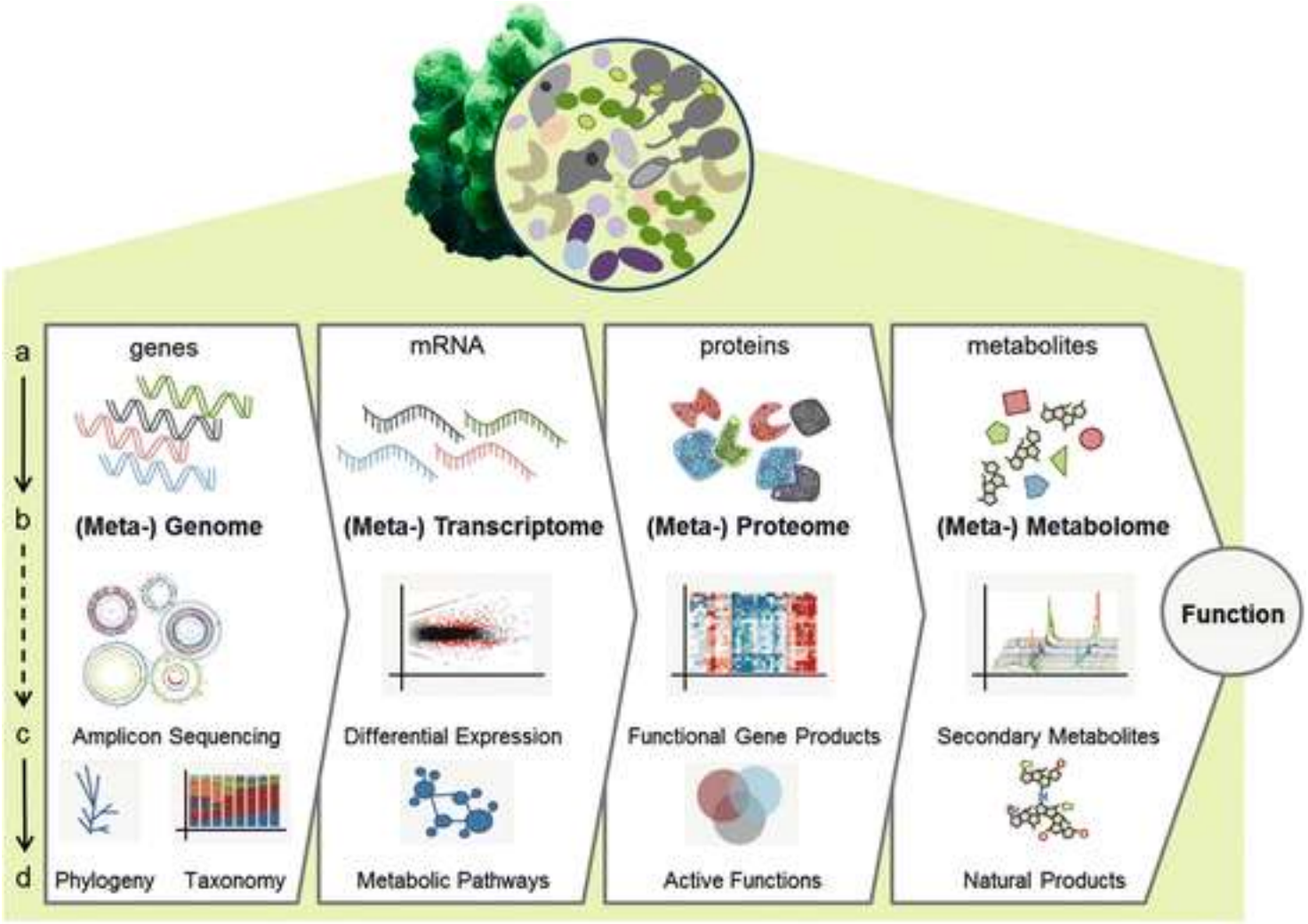


UPLC-MS-TOF system

MALDI-TOF

SponGES: Expected Major Biotech Outputs

- Use an integrated “omics” approach to **create databases** of enzymes and gene clusters involved in **production of compounds** with pharmaceutical and industrial relevance



Steinert G. et al. (2018), https://doi.org/10.1007/978-3-319-69075-9_13

Why are sponges important for Blue Biotech?

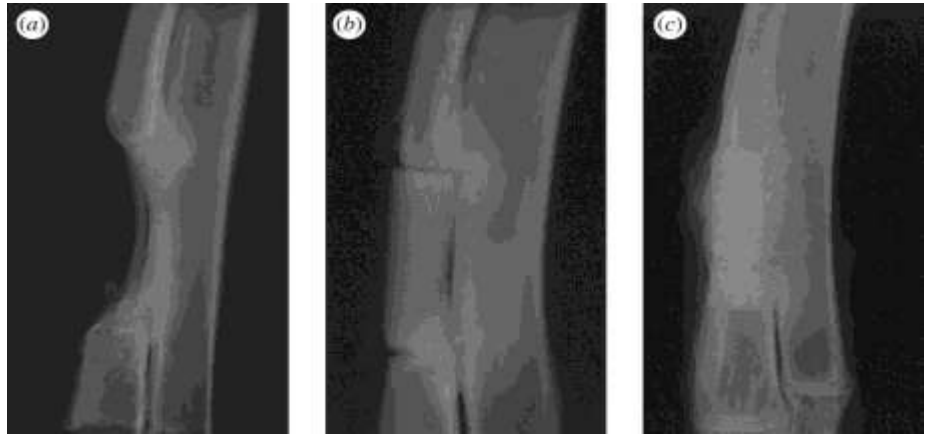
BLUE BIOTECH

7000+
sponge-derived compounds

Biomaterials
collagen, biosilica

Biomimetic
inspiration

- Deep sea sponges produce intricate and hierarchic silica skeletons.
- Inspire research on bone tissue engineering & regenerative medicine.



SponGES project

Key knowledge gaps:

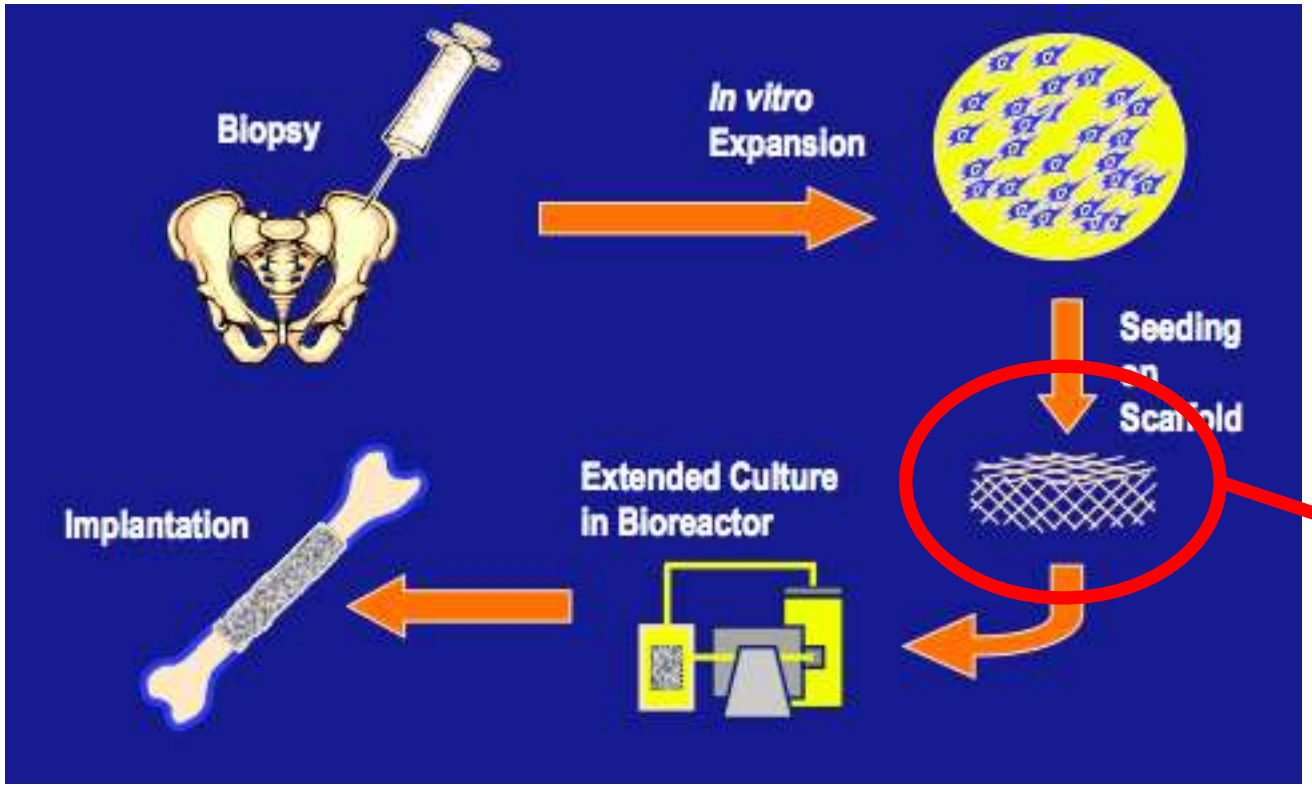
- Use of marine-derived biostructures is very recent: marine sponges have not yet been fully characterized. Exciting potential for development of innovative biomaterials for tissue regeneration.

Focus:

- ***Chemistry & morphology*** of deep-sea sponge skeletons – as inspiration for development of materials for tissue regeneration

SponGES: Expected Major Biotech Outputs

- Evaluate the potential of sponge inspired silica-based materials for bone regeneration.



Paradigm shift

Tissue Replacement

Regenerative Medicine

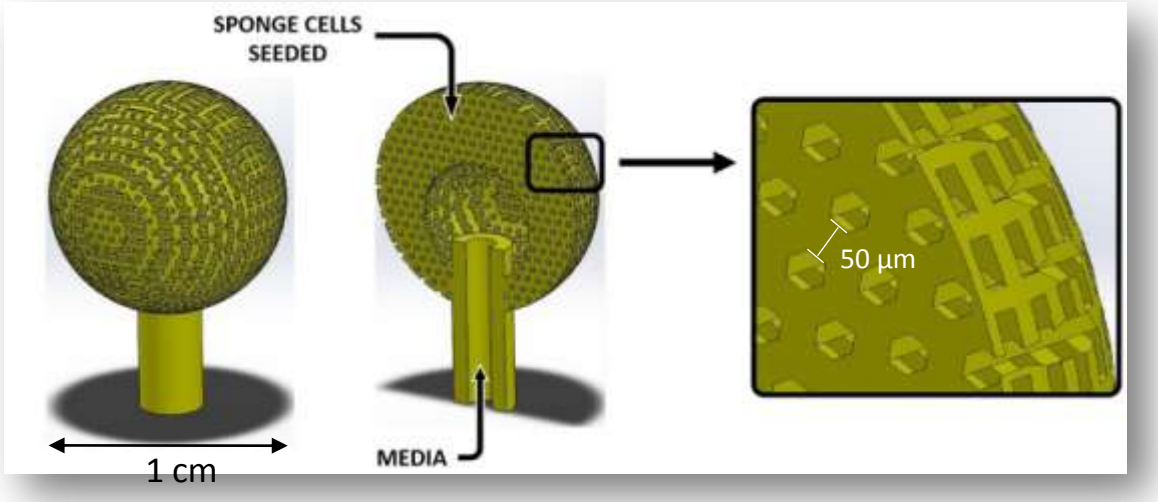
Scaffolds can be made out of collagen and silica (marine sponge components), among others

SponGES: Expected Major Biotech Outputs

- deep-sea sponge inspired architectures as tissue-engineering scaffolds.

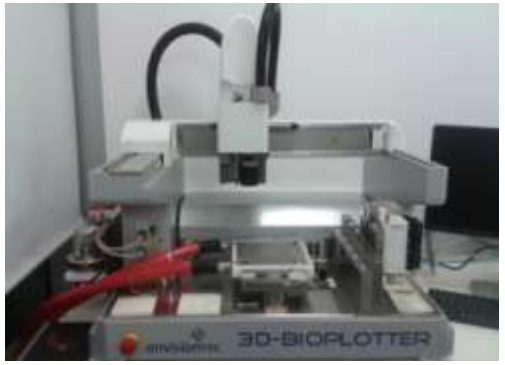
Sponge tissues

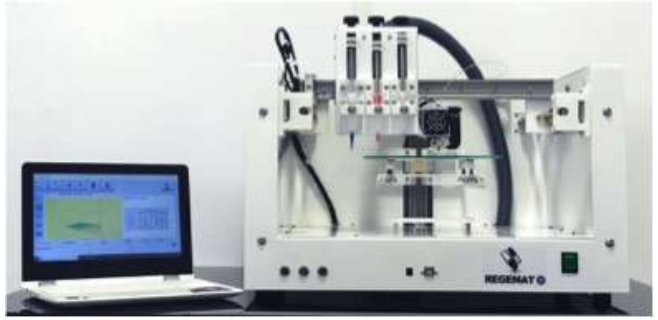
- *In-vitro* production of biomass and compounds
- Preservation of endangerous species

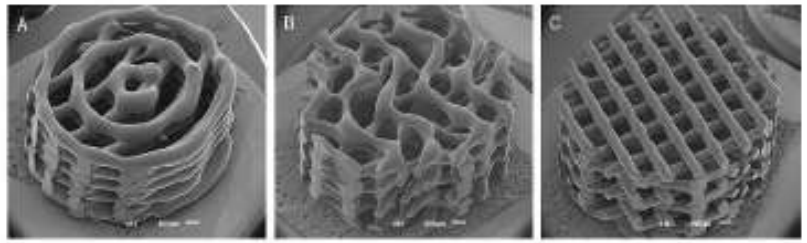


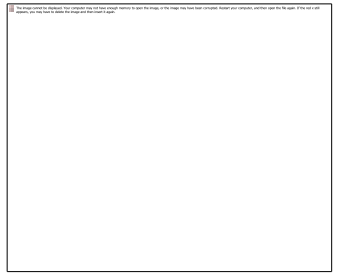
Human tissues

- 3D tissue models: *in-vitro* studies
- Production of new tissues for clinical implantation









D. Fonseca *et al.* (2018), Biomaterials Science

New opportunities on economy and employment

- New bioactive compounds as the basis of:
  - new biotech start-ups
  - investment windows for pharma/biotech companies
- Biomaterials for biomedical application:
  - new products, new therapeutic solutions?
  - Highly trained human resources needed to implement a paradigm shift

- Threat: wild harvest destroying the ecosystems
  - SponGES approach: development of methods supporting sustainable development of the resources
- Challenge: ownership of genetic resources, IPR, licensing/permitting
  - Frameworks have been developed, but implementation is not straightforward