

## BIOMIMETIC BLUE SOLUTIONS NATURE'S BEST PRACTICES FOR MARITIME TECHNOLOGIES

### Bio-Inspired maritime innovations

Are you curious about how your organization can benefit from the large pool of nature's ideas? The Biomimetic Blue Solutions (BBS) Team of the Fraunhofer CML can uncover nature's hidden solutions for you and support in developing your customized bio-inspired innovation.

Three billion years of evolution have produced a multitude of biological solutions to all kind of challenges from optimized manoeuvrability of humpback whale flippers, vibration reduction in seal whiskers, low drag bodies in manta rays, underwater air trapping in water ferns to friction reduction in shark skin. Biomimetics (or bionics or bio-inspiration) is the transfer of natural models into

innovative technical applications. This is done by analyzing working principles of nature's best examples and transferring the core mechanisms into technical applications without necessarily copying them. Bio-Inspired maritime innovations transfer these natural templates to create highly efficient and sustainable biomimetic technologies for e.g. wind turbines, bridge pillars, ship hulls, sailing boats and autonomous underwater vehicles.

### Key issue

Nowadays many technology sectors are driven by novel emission targets, environmental legislation and the rising societal awareness for sustainability to produce outperforming, energy-efficient and eco-friendly products. Setting aside the latest

paradigm of Industry 4.0 and Digitalization the newest trend „Biological Transformation of Manufacturing“ predicts a biological transformation of industrial value creation by morphing traditional manufacturing via bio-inspiration and bio-integration to bio-intelligent manufacturing. Biomimetic Blue Solutions represent this future paradigm change and can already set your product on the forefront of technology.

### Target group

Biomimetic Blue Solutions can be developed for all sectors in the maritime world. Tailored to your specific needs we support you in finding and realizing such innovations. Work with us to use the vast pool of nature's solutions and push your development to the next level.

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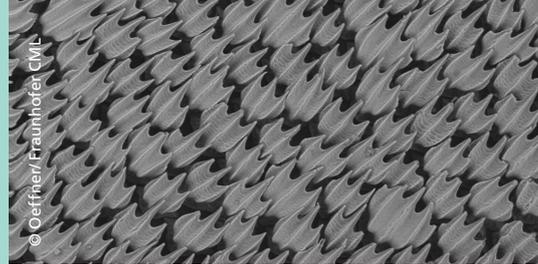
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## IMPRESSUM



## The BBS Value Chain:



## Our Services:

We offer all five BBS value chain modules to get from nature's vast amount of ideas to your final Biomimetic Blue Solution.

### 1. Workshops in your company

We organize customized workshops to identify your specific challenge with professionals from your company. A top-down or a bottom-up process will define the requirements for your innovative solution.

### 2. Internal application analyses

We perform internal studies to identify nature's best practises for your specific requirements, develop a demonstrator case and analyze the technical applicability, feasibility and the process of abstraction.

### 3. Planning your innovation project

We design your entire internal, external or collaborative BBS project. This includes concept, methodology, project plan and management processes as well as impact assessment studies. We can find suitable partners and funding sources and compile project proposals to excel your innovative project (see upper box right).

### 4. Prototyping & testing

We develop the BBS prototype (or parts of it) for you. We design and manufacture the prototype and use experimental and simulation tools to optimize and validate the solution (see lower box right).

### 5. Towards product development

We assist transforming the prototype to a product and bringing it closer to market maturity. Therefore, we investigate the technological readiness of the prototype, elaborate technological advances needed for industrial manufacturing, define production processes, and determine the costs and benefits of your BBS solution.

We offer the whole range or individual modules adapted to your needs.

## Success Story:

The Fraunhofer CML has successfully initiated the 3-year Horizon 2020 project AIRCOAT (Air



Induced friction Reducing ship COATING). In a top-down process the BBS-Team screened nature's templates for a next generation sustainable and energy efficient ship coating. We designed a concept and methodology and compiled an international consortium. The 10 partners together received a 5.3 million Euro grant from the European commission to develop a biomimetic hull coating that reduces the frictional resistance of ship hulls through an innovative passive air lubrication technology that mimics the naturally occurring Salvinia effect.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764553.

## In Focus:

### Prototyping

We design and develop first prototypes focussing on latest low-cost and open source hardware, software and manufacturing tools (e.g. rapid prototyping). This enables quick development and validation iterations to optimize specific characteristics for your BBS technology.

### Fluid Dynamic Experiments

To optimize fluid dynamic characteristics of biomimetic solutions (e.g. ship hull shape) we use various experimental techniques to measure the physical properties (e.g. drag and lift).

### Numerical Simulations (CFD)

Prototypes are scaled up to real domains and the aspired effects are investigated by means of Computational Fluid Dynamics (CFD). Utilizing the state-of-the-art software OpenFOAM we predict the real life impact of your solution.