

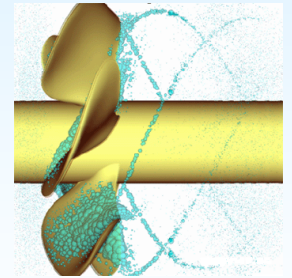
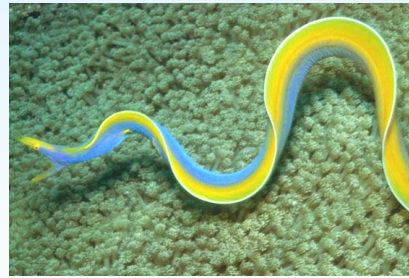


**LAMPETRA** (Life-like Artefacts for Motor-Postural Experiments and Development of new Control Technologies inspired by Rapid Animal locomotion), FP7, ICT-2007.8.3 (Bio-ICT convergence), GA No. 216100

Coordinator: Scuola Superiore Sant'Anna, Pisa (Italy)

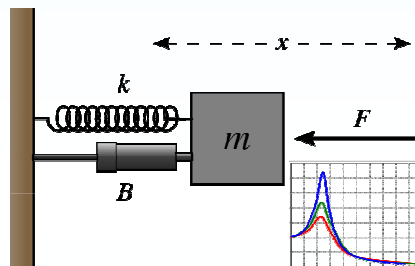
## Bioinspired underwater propulsion

- **fish-like swimming dynamics:** no propellers, **reduced drag and energy dissipation** by complex fluid phenomena (e.g. cavitation)
- **undulatory swimming:** trade-off between **cruising and maneuvering performance** (backward motion allowed); **skin friction contained** by relatively low swimming speed



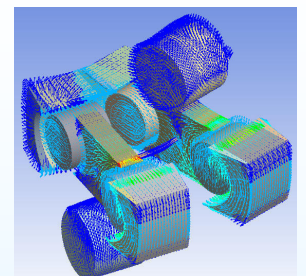
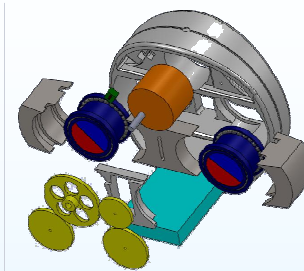
## Energy saving by optimal use/control of inertia actions

- suitable design of the swimming **structure** so as to exploit passive dynamics (proper modes);
- suitable design of the **structure-environment** interface for an efficient coupling
- optimal adaptive motion by implementing a bioinspired **ICT control** strategy (backward actuation wave based on proprioceptive sensors)



## Compliant, high-efficiency actuation

- **muscle-like**, force-controlled novel actuators (patented technology) fitting the system compliance
- **high back-drivability**
- **efficiency: expected more than 50%** (the autonomous artefact can swim for several kilometers by consuming about 35 kJ)



## General applications

Apart the main goals of the Lampetra Project (neuroscientific studies related to goal-directed locomotion, new solutions for high-performance artificial locomotion, in terms of fast-response, adaptability, reliability, energy efficiency, and control) and application areas such as environmental exploration, interesting **general applications** of the proposed technology include:

- **user-friendly, ergonomic and safe** interfaces in "soft robotics" (e.g.: new human-machine interfaces, wearable systems, etc...)
- **clean and energy efficient** substitute for power **pneumatics** and **hydraulics**
- **industrial manipulators**, compliant and safe for the operator

contact: [lampetra@sss up.it](mailto:lampetra@sss up.it)

## References

[www.lampetra.org](http://www.lampetra.org)

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- [2] A. Ijspeert, A. Crespi, D. Ryczko, and J.-M. Cabelguen: "From swimming to walking with a salamander robot driven by a spinal cord model", *Science* No. 315(5817), pp.1416-1420, 2007.
- [3] Patent: "Magnetic actuator for adaptive actuation", Patent no. FI2008A000150 (Italy; international extension foreseen).