



MASTER IN PHOTONICS – “PHOTONICS BCN” ERASMUS+ “EUROPHOTONICS”

MASTER THESIS PROPOSAL

Dates: April - September 2019

**Laboratory : Plasmon Nano-Optics group (PNO)
Institution: Institute of Photonic Sciences (ICFO)
City, Country : Barcelona, Spain**

Title of the master thesis: Optically-driven soft actuators and 4D printing

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Keywords : actuators, 3d printing, 4d printing, prototype, light-driven motion

Summary of the subject (maximum 1 page) :

Recent studies have shown that certain structures can be pre-programmed to dramatically change their form in response to a stimulus - a technology which has been dubbed as “4D printing” (4DP). Here an object is produced, whether via 3D printing or by other means, and when a stimulus such as moisture, or heat or light is applied, the object reconfigures itself into a new form. A range of applications have been suggested for this technology, such as clothes that adapt their form depending on the environment, surgical implants that can react to a change without input from a surgeon, and many more.



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Light is a promising stimulus for 4D printed objects, as it allows action at a distance and can interact with a wide variety of material choices. However, previous studies have limited the light-driven action of 4D printed objects to a single motion. By expanding the scope of this investigation via the use of novel materials and careful design of the lightsources used, we can open up the possibility to control complex sequences of light-driven movements, such as various types of ambulatory motion (walking, swimming), locking/unlocking mechanisms, and many more.

This Masters project will involve exploring several techniques to create light-driven actuators. The work will be performed in the prestigious and well-equipped labs of Profs. Gerasimos Konstantatos and Romain Quidant. Once the most effective technique to create an actuator has been established, the use of multi-movement actuators based around either excitation via novel lightsources and/or use of novel materials will be investigated. Finally, the student will design and build prototypes to demonstrate some real-world applications for this technology. A light-driven locking mechanism might be an example of this, but the student will be free to explore where their own interests take them.

Additional information :

- * Required skills : An open and creative approach.
- * Miscellaneous : This will be a fun project!