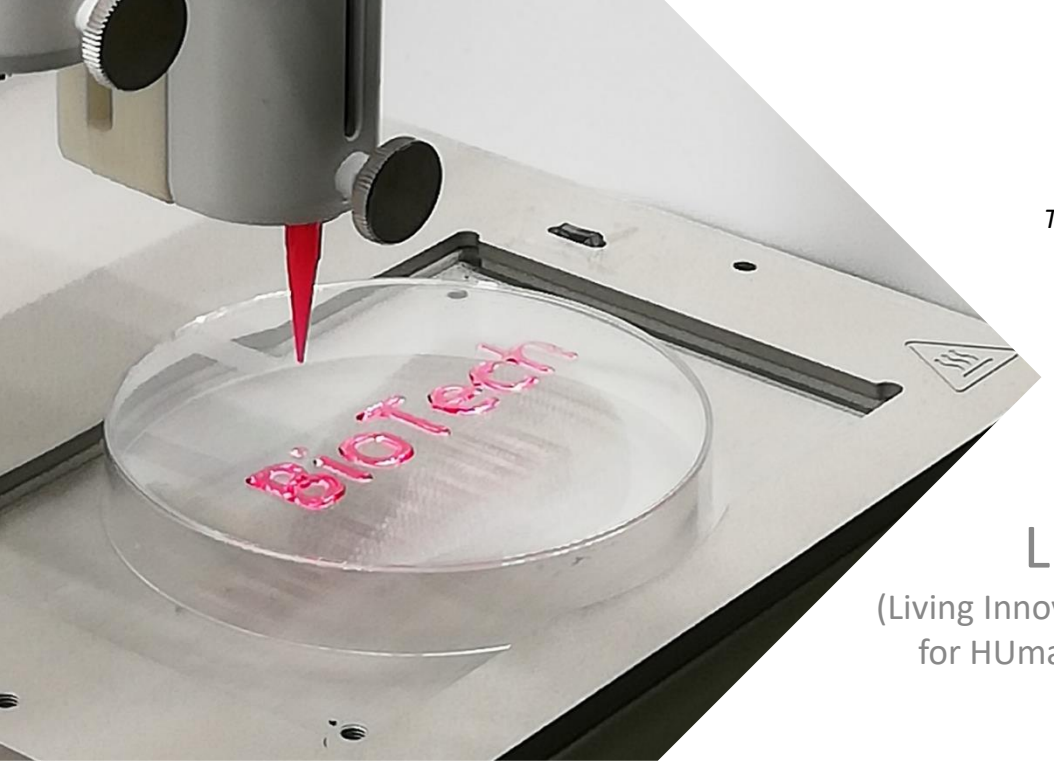

UNIVERSITÀ DI TRENTO | Department of Industrial Engineering | BIOtech Biomedical Technologies

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Wax worms and plastic degrading enzymes: a biotechnological look into the insect world

Speaker:
Prof. **Federica Bertocchini**,
Plasticentropy – France
May 16th, 2024
h. 9:30 am CET
Seminar Room – Povo 2

Abstract

While the prediction of global plastic production is reaching high sky values, the quest for plastic waste managing solutions is becoming one of the urgent priorities for the planet well-being. The current pseudo-solutions are not up to the task, and developing new strategies is an active field of research.

Degradation by biological means, in particular by insects, is a new niche, holding high hopes for a biotechnological solution to the pressing plague of plastic residues accumulation. We discovered the capacity of the wax worm (ww), as the lepidopteran Galleria mellonella larvae are called, to fast degrade polyethylene (PE). The observation that the effect was in some unknown way connected to the ww silk production, opened the way to a research path culminating in the discovery of the first PEases, four enzymes degrading PE and produced by the very same worm. The identification of these proteins within the animal saliva, and the still unknown relation between silk and buccal secretions, represent a gateway for a holistic study of the wax warm and its physiology/ecology features, in a convergence effort between basic and applied research endeavor.

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Bio-sketch

F.B is Chief Technical Officer (CTO) at Plasticentropy France (www.plasticentropy.net, www.federicabertocchini.com).

After a PhD from the Open University London, UK/DIBIT Research Centre S. Raphael Hospital, Milan, Italy, in the department of cell signalling, and basic formation in molecular biology, F.B. specialized in the study of early development of amniote embryos. Setting up her laboratory within the Spanish Research Council in Spain, she worked on basic questions related to the molecular mechanisms driving early development of chick and reptile embryos: applying molecular biology, microscopy and microsurgery manipulation on early embryos, she introduced new concepts in the understanding and interpretation of how early pluripotent cells restrict their potentiality towards specific fates. Further on, F.B. added up to evolutionary-driven questions in the study of these early developmental mechanisms, introducing the reptile *Chameleon caliptratus* (chameleon) as a new experimental system within the developmental biology field.

At the same time, F.B. developed a parallel line of research driven by the interest for environmental protection issues and the bioremediation methodology by biological processes. F.B discovered that the larvae of Lepidoptera *Galleria mellonella* are capable of fast biodegradation of polyethylene (PE) the most resilient and also produced plastic material in the world. This was the beginning of a new research topic centered on the molecular devices responsible for the wax worm plastic degradation. Recently, in F.B laboratory the first PEases were discovered: these are enzymes produced by the larvae and capable of degrading PE within a few hours from exposure. The study of these new enzymatic activities, in view of potential future applications, together with the understanding of their role within the invertebrate physiology and ecology, constitute her current topics of research.