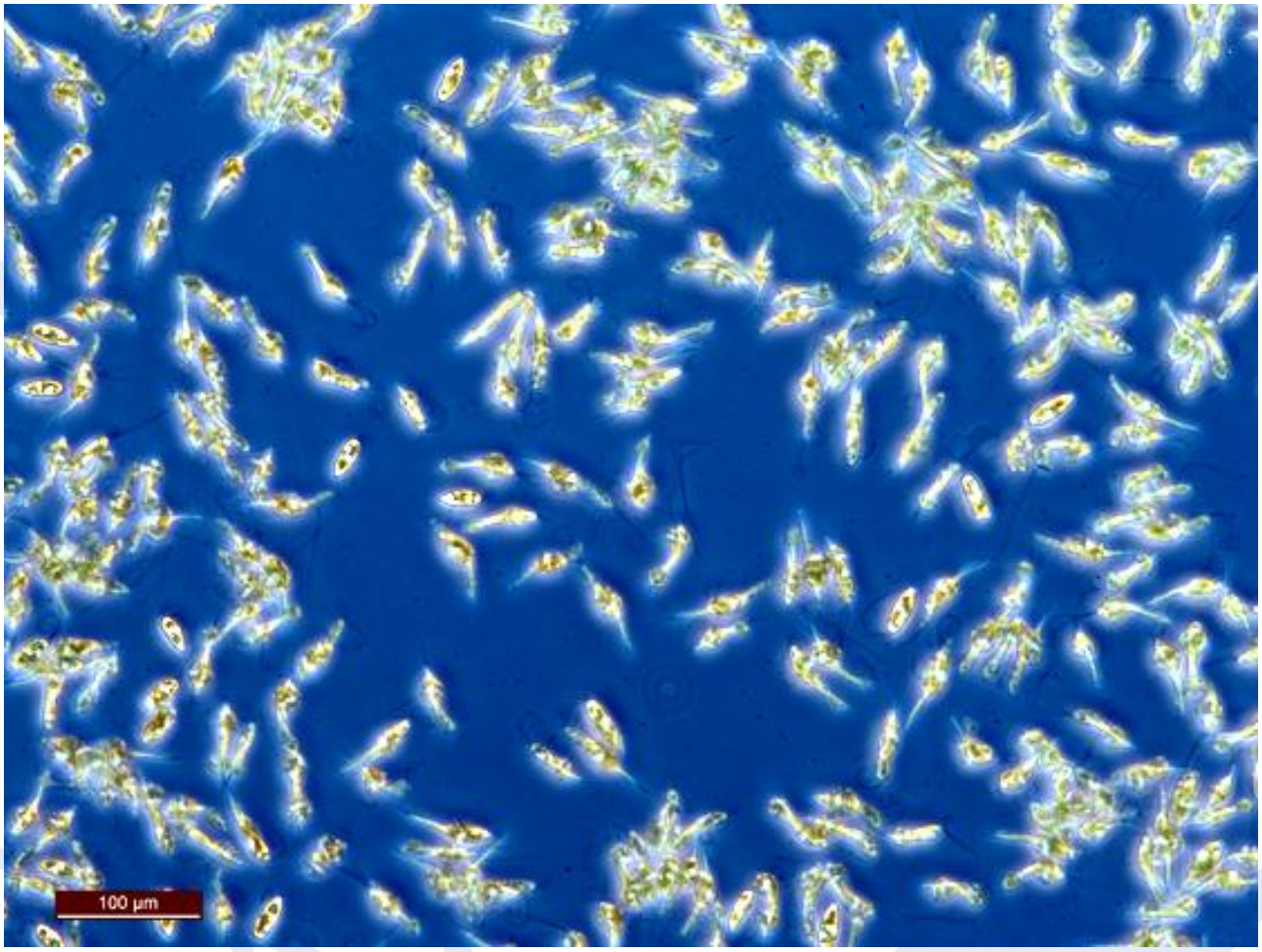
International School for Advanced Studies

Scientists inspired by a microscopic water organism



A group of SISSA scientists suggested a mathematical model for the movement of euglenids

October 9, 2012

Until now it has been a mystery to scientists: how does it work? What is the need of the movement of euglenids, small organisms swimming in any pond? Nobody has ever described it in detail and nobody has ever understood its dynamics. But today, through a mathematical model, scientists at the International School for Advanced Studies (SISSA) and at the Universitat Politecnica de Catalunya have suggested a plausible description of this movement, made by the sliding of the membrane around the outer surface of euglenids.

Euglenids are unicellular protists (neither animal, nor vegetal) living in the sea and in fresh water. Scientists are intrigued by one of their peculiarities, a way of moving called "metaboly", different

from their other movement, i.e. the flagellar one. This is a unique way of moving because it is the result of big deformations of the animal, but not much more is known about it. Actually, not much more was known about it, because a group of SISSA scientists has tried to give an answer to this matter. The results have been published on **October 9**, in the **Proceedings of the National Academy of Sciences of the USA (PNAS)**.

Firstly, the group led by Antonio De Simone, Professor at SISSA, provided a detailed description of this mysterious movement. "We used some microscope videos of those animals and we described their movement quantitatively, using the method of statistical learning", explained De Simone. "Then we used the data to formulate a mathematical model of the movement in which the sliding of the membrane is fundamental".

"We haven't yet a direct proof that this protist moves as described by our model, but we have provided a detailed description of a mechanism according to the data we have observed", clarified De Simone. This work is an example of what scientists call *reverse engineering*, i.e. design of new technologies starting from observation of nature (Velcro is the most famous example of it, it was devised after observing how some seeds "stick", such as burdock).
"Just think of all the possible medical applications of micro-robots and micro-cameras able to move inside the human body", added De Simone. "Studies like this will lay the foundations to develop similar systems, as well as give some answers to biologists on the nature of euglenids and the evolutionary meaning of their way of moving".

"Sliding motion is the basis of the mechanism hypothesized by SISSA", clarified Alfred Beran, biologist at OGS (the Italian National Institute of Oceanography and Experimental Geophysics). "To date we do not have any microscopy technique to observe *in vivo* the stripes on the membranes of euglenids, but we are working on it, and it is one of our main goals".

USEFUL LINKS:
M.Arroyo, L. Heltai, D. Milan, and A. DeSimone, "Reverse engineering the euglenoid movement" PNAS October 9, 2012

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