First Open-Innovation Bio4Comp Award (5000 Euro)	Bio4Comp

We hereby announce the first open-innovation Bio4Comp Award for novel ideas that conceptually or technically advance the field of parallel computing with biological agents in a substantial manner.

Background: The combinatorial nature of many important mathematical problems, including nondeterministic-polynomial-time (NP)-complete problems, places a severe limitation on the problem size that can be solved with conventional, sequentially operating electronic computers. While a number of parallel-computation approaches, such as DNA computation, quantum computation, and microfluidics-based computation, have been reported in the past, these approaches have so far not proven to be scalable and practical from a fabrication and operational perspective. One alternative is network-based computation (NBC) where a given combinatorial problem is encoded into a graphical, modular network that is embedded in a nanofabricated planar device. Exploring the network in a parallel fashion using a large number of independent agents (e.g. cytoskeletal filaments propelled by molecular motor proteins) then solves the mathematical problem. This approach uses orders of magnitude less energy than conventional computers, thus addressing issues related to power consumption and heat dissipation (see: *Nicolau et al., PNAS, 113(10), pp. 2591-2596, 2016*).

Challenge: Encoding and decoding of information from cytoskeletal filaments for parallel computing

For a number of mathematical problems to be solved by NBC approaches, it will be crucial to **efficiently encode information into the cytoskeletal filaments themselves**. The latter will increase the flexibility of network design and open the road to solving a variety of different complex problems. Here, we invite proposals that address the issues of physical and/or (bio)chemical information-encoding and information-readout, e.g. to obtain information about the path a filament has taken through a network. Successful information encoding requires the ability to write information into ("tag") filaments in regions of a few micrometers size, and to read out that information, at the single-filament level, at detection sites that are located hundreds of micrometers or more away from the writing regions. The writing mechanism should allow writing of at least 10, ideally up to 100s of different tags at a minimum of 10, ideally 100s of different sites. The information must be written into individual filaments or molecules carried by those filaments. The read out mechanism must allow the decoding of the recorded information from at least thousands, ideally millions or even billions of individual filaments.

Who can participate: All scientists, students or professionals interested in the field of biocomputation. Persons employed by partner institutions of Bio4Comp (Lund University, Technische Universität Dresden, Linnaeus University, Molecular Sense Ltd, Bar Ilan University, Fraunhofer Gesellschaft) are excluded from the awards. Each person can only get an award once. All participants agree that their contributions submitted to the contest will be placed in the public domain and will be free to be used by anyone, for maximum impact (open innovation). Publication before participating in the contest is possible.

How to participate and award criteria: Participants will submit a description of their idea (max. 3 pages) to the Innovation System Committee (info@bio4comp.org). Applications will be evaluated according to: (i) novelty and excellence of the idea, (ii) potential impact for the research area, and (iii) feasibility. Decision about the winner(s) of the contest will be made by the Innovation System Committee in agreement with the Bio4Comp General Assembly. After announcement, the decision will be final and cannot be contested. The winner will receive a 5000 Euro prize[1] (by bank transfer from Lund University).

Deadline: January 15, 2019 (extended deadline)

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[1] Taxes depend on the winner's tax residence and will be deducted from the prize according to Swedish law.

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