

NATURAL COMPUTING

Selim G. Akl, School of Computing, Queen's University

Kingston, Ontario, Canada K7L 3N6

Recently, Andy Adamatzky and I have shown that the plasmodium of *Physarum polycephalum* can compute a map of the Canadian highway system fairly accurately. Andy, who is based in Bristol, U.K., is well known for his work with nature-inspired unconventional computer models, such as reaction-diffusion computers and cellular automata.

The result contributes to a general research effort currently underway in computer science that is motivated by at least four goals:

1. To provide additional evidence that "Nature computes". More precisely, we endeavor to show that the computational paradigm is capable of modeling Nature's work with great precision. Thus, when viewed as computations, the processes of Nature may be better explained and better understood.
2. To exhibit examples of natural algorithms whose features are sufficiently attractive, so as to inspire effective algorithms for conventional computers. Nature's algorithms may be more efficient than conventional ones and may lead to better solutions for a variety of optimization problems.
3. To identify problems where natural processes themselves are the only viable approach towards a solution. Such problems may occur in environments where conventional computers are inept, in particular when living organisms, including the human body itself, are the subject of the computation.
4. To better understand what it means 'to compute'. Is there more to computing than arithmetic and logic? The processes of acquiring measurements from, and producing information to, the external physical environment; the phenomena of nature, such as the spin of an electron, a chemical reaction, DNA replication and so on—are these computations?

If you are curious about all this, please read the details of our result:

<http://research.cs.queensu.ca/home/akl/NaturalComputing/PhysarumCanada.pdf>

and watch a video of our experiment

<http://www.youtube.com/watch?v=n4jRr7YAzfI>