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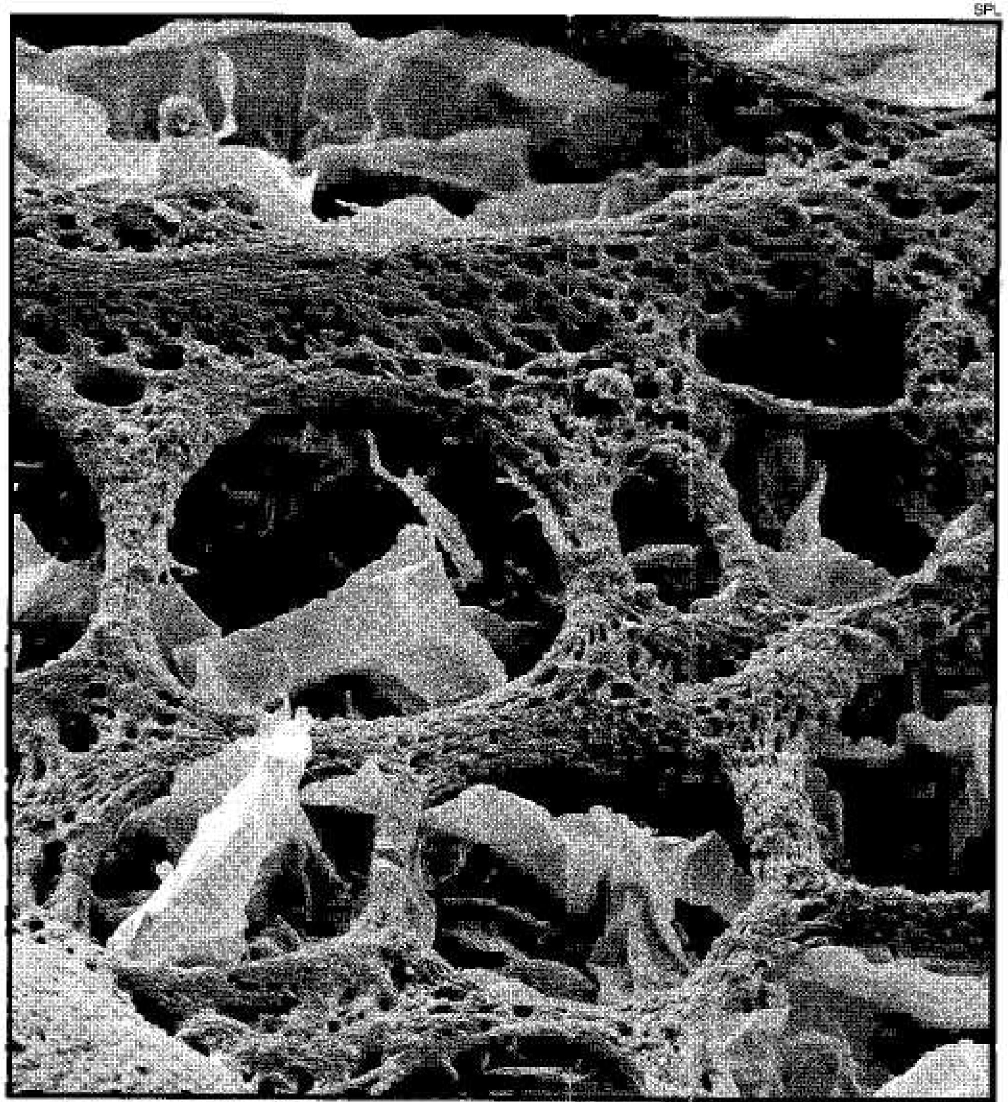

Intelligent network: slime mould growing on the surface of an almond

Could problem-solving mould revive decaying UK transport?

Steve Farrar

The problem-solving prowess of a primitive single-celled organism could soon be helping design communication networks, transport systems and public utility distribution.

Scientists have found that slime moulds, commonplace but often overlooked life-forms that live in soil and vegetation, are capable of working out complex networking puzzles that even leading mathematicians find taxing.

The amorphous organism constructs elaborate networks connecting large numbers of fixed points to maximise food uptake.

But Japanese researcher Toshiyuki Nakagaki believes the slime mould's secret intelligence could be adapted to help humankind.

"Most people pay no attention to slime moulds but, in principle, the way they solve problems could have a major impact on the design of human problems such as transport or communication networks," he said.

Dr Nakagaki, associate professor of Hokkaido University in Japan, is visiting Oxford University to devise a mathematical formula that captures the essence of the trick. He brought with him the slime mould he has been working on for a decade.

Slime moulds have a complex life cycle during which some species can develop into more than two different sexes, can possess millions of separate nuclei within their single cell, can move around in search of food and can grow to a great size.

One at the University of Bonn, Germany, reached 5.5m² — about the size of dinner table.

In their amoeba-like form, they create a network of tubes that enables them to move around, transmit internal signals and consume food.

Dr Nakagaki's slime mould has been prompted to reveal its networking abilities with the lure of up to 120 porridge oats. As it moved the bulk of its form to concentrate on each oat, its tubes maintained its overall integrity.

The pattern of these tubes meet all the requirements of a smart network — short total length, close connections and an arrangement that can tolerate accidental disconnections.

Dr Nakagaki has found that at the heart of this is the ability of the tubes, which are made from filaments of actomyosin, the protein that makes up muscle tissue, to change their physical properties in response to changes in conditions.

This self-organising process can affect the pulsing flow that controls movement within and ultimately the configuration of the overall network.

Dr Nakagaki said it should be possible to represent this form of intelligence in a mathematical form that could then be used in human applications.