NEST Pathfinder

CREEN

TACKLING COMPLEXITY IN SCIENCE

When science makes headlines scientists themselves may be unprepared for the controversy.

Scientific avalanches

Research breakthroughs, controversies and fashions in science can emerge unexpectedly, sometimes with unwelcome political and economic effects. What triggers these so-called 'scientific avalanches'? An interdisciplinary team from five countries will apply insights from physics, mathematics and the social sciences to the complex social networks of science and the media. Why do such critical events occur and can their probability be estimated? The results will be of interest not only to scientists and journalists but also to science policy-makers.

Why did stem-cell research suddenly become such an issue in the 2004 US presidential election? What is fuelling the simmering controversy about genetically modified foods? How are the research choices of scientists influenced by what appears to be fashionable at the time? In short, why do scientific research topics like these suddenly erupt from the labs and saturate the media?

The partners in the CREEN (Critical events in evolving networks) project call these phenomena 'scientific avalanches'. Just as an avalanche of snow can be forecast by careful modelling and study of environmental conditions, it may one day be possible to predict under what circumstances scientific avalanches will happen. And could we even trigger an avalanche in a constructive and desirable direction?

Such questions can only be answered by a truly interdisciplinary effort from many branches of the natural and social sciences. This project, part of a wider NEST PATHFINDER initiative on complexity in science, will draw on many strands of research on how information spreads within social networks. Scientists, like journalists, are individuals, but the collective behaviour of science or the media can be unpredictable, related in a complex way to the actions of individuals within them.

Linking social science and physics

The proposers, from five countries, are theoretical and statistical physicists, specialists in socio-physics, computer scientists, mathematicians, information and communication scientists and sociologists.

Prof. Janusz Holyst, from the Warsaw University of Technology, is coordinating the project. His group will apply the principles of statistical physics to social networks. For example, thermodynamics predicts how liquids boil or freeze – can we learn something about sudden social changes from such analogies? Another approach will look at what happens when a network of scientists interacts with a network of journalists, which in turn interacts with a network of newspaper readers or TV viewers.

The second topic, led by the University of Liège, will deal with how scientists and other people organise themselves into formal and informal networks and how individual decisions can affect collective behaviour. Researchers will look at how ideas spread through the scientific community, leading to an avalanche when topics suddenly become fashionable.

The project will create natural links between physics and social-science methodology. One of these links points to a group led by the Royal Netherlands Academy that will

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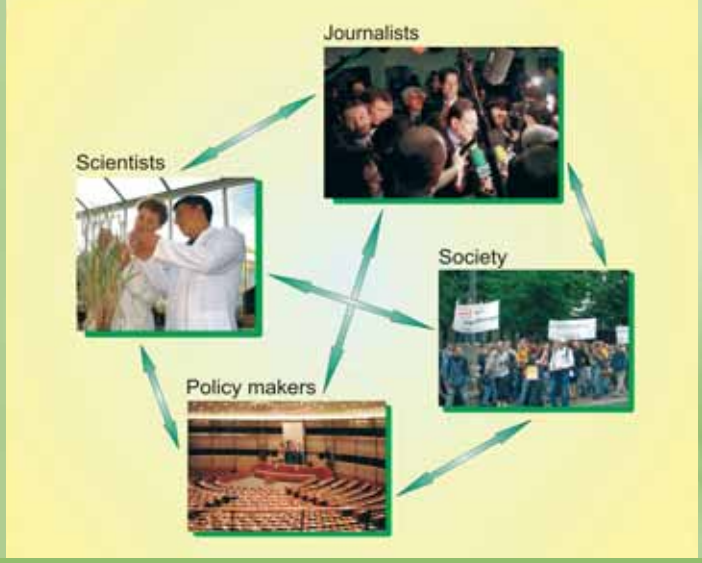

The different interactions between science and society make up a complex relationship.

CREEN

AT A GLANCE

Official title
Critical events in evolving networks

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look at the influence of 'media hype', and seek ways to model and measure avalanches, applying their methods to such real-life controversies as BSE, foot-and-mouth disease, genetically modified foods and stem-cell research.

Influence of 'bloggers'

Meanwhile, the University of Wolverhampton will lead a study into how the world-wide web is being used as medium for scientific debate. They will analyse the content of on-line newspapers, personal web pages and especially 'blogs', to track how the web has influenced recent avalanches and also to spot new avalanches as they take place.
Finally, a group led by the University of Karlsruhe, will develop methods of visualising complex information, based on the results of a previous EU-funded project (COSIN),and applying it to the results from the other groups in CREEN.
The proposers freely admit that what they are trying to achieve is well ahead of the state of the art but the risk of failure is offset, they say, by the promise of major advances leading to social and economic benefits. When the project is complete in three years time, the proposers hope not only to have gained a deeper understanding of how science and society interact, but also to be able to help policy-makers anticipate where avalanches are likely to happen and to deal with them effectively. They even speculate that their findings may have applications in other multidisciplinary studies such as river flooding, protection of species in food webs and trade-network crashes. They will disseminate their findings to policy-makers, journalists and other experts through meetings, brochures and a website.

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