

sense". Evolution did not provide us with a system for directly sensing energy use, but this can be rectified by designing products that announce their energy usage in natural and intuitive ways.

Various examples of such energy sixth-sense products are already in development, including household goods with power cords which light up in proportion to the current flowing through them, and thermostats with thermal images to visualise energy use. Also in the pipeline are industrial tools which change colour in response to heat build-up, and office tools which visualise the energy consumed by IT equipment.

The products use intuitive feedback methods, such as colour and light intensity, to inform people how much energy they are using. Rather than scientific accuracy, the idea is to stimulate interest and emotional engagement to produce long-term changes in understanding and behaviour. If we are serious about reducing energy consumption from buildings we need to add an energy sixth sense to our everyday lives. ■

Joseph Giacomini is director of the Human Centred Design Institute at Brunel University in Uxbridge, UK

could have been built in the 1800s. Since the Analytical Engine shares many elements with Difference Engine No 2, it too would likely have worked, but we won't know until we build one.

I have started a project to build an analytical engine, dubbed Plan 28 after one of Babbage's detailed plans. I'm aiming for £100,000 and hope to complete the project in time for the 150th anniversary of Babbage's death on 18 October 2021. ■

John Graham-Cumming is author of *The Geek Atlas: 128 places where science and technology come alive*. For more information visit plan28.org

One minute with... George Soros

Economics needs fixing, says the controversial billionaire financier who is bankrolling an institute to rethink the subject

You have provided \$50 million to set up the Institute for New Economic Thinking (INET) in New York City. What prompted you to do this?

It was the crash of 2008, which brought home the fact that there is something broken in economic theory. Two ideas - rational expectations theory and the efficient market hypothesis - have a monopoly of thought. Neither prepared us for the crash, yet other ideas don't have enough support. I talked to friends about how to address this and the idea of an institute emerged. Now it's running away with itself. I have never been involved in any initiative with this kind of self-generating interest before.

What does the institute aim to achieve?

A radical reorientation of economic theory. Exactly what shape it will take is impossible to predict, but I hope it will recognise the fundamental uncertainties in our economic system. These uncertainties have been ignored for the past 25 years.

Wouldn't it be better to eliminate the uncertainties, so we can avoid a repeat of the financial crisis of 2008?

We will never be able to do that. There will always be a threat of instability - it's built into the market. You can't avoid it, but you can be aware of it. Perfection might be unattainable, but we can become less imperfect by recognising the imperfections.

Tell me about some of the projects that have been selected for funding by the institute.

I am encouraged by the fact that INET is embracing multiple disciplines. The first round of grants have been given to people with backgrounds in law, history, medicine and science, as well as economics and finance. Several projects are taking concepts directly from science, such as the mathematics behind the spread of contagious diseases, and applying the principles to financial markets. During the financial crisis we saw instances of contagion - how a relatively small number of infected institutions made others sick.



PROFILE

George Soros was born in Budapest, Hungary. He studied at the London School of Economics before moving to the US in 1956. He is chair of Soros Fund Management and founding sponsor of The Institute for New Economic Thinking, led by former fund manager Robert Johnson

Is INET also funding research to examine whether investors make use of all the information available to them?

Yes. The research is looking into how well markets reflect useful and true information about asset prices, given the presence of real-world ambiguities. It is also trying to understand what happens to asset prices when true uncertainty is wrongly discarded.

You have been developing an alternative economic theory, known as reflexivity, for years. Will INET be a vehicle to explore your own ideas?

I won't impose my views on the institute. I provided the initial funds, but I don't want to provide more than a third of the funding. INET has to have its own identity. When the first round of grants were chosen earlier this year I didn't even see the applications. I'm not on INET's board or its advisory board.

Interview by Jim Giles