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New School of Thought Brings Energy to 'the Dismal Science'

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SYRACUSE, N.Y. -- The financial crisis and subsequent global recession have led to much soul-searching among economists, the vast majority of whom never saw it coming. But were their assumptions and models wrong only because of minor errors or because today's dominant economic thinking violates the laws of physics?

A small but growing group of academics believe the latter is true, and they are out to prove it. These thinkers say that the neoclassical mantra of constant economic growth is ignoring the world's diminishing supply of energy at humanity's peril, failing to take account of the principle of net energy return on investment. They hope that a set of theories they call "biophysical economics" will improve upon neoclassical theory, or even replace it altogether.

But even this nascent field finds itself divided, as evidenced by the vigorous and candid back-and-forth debate last week over where to go next. One camp says its models prove the world is headed toward a dramatic economic collapse as energy scarcity takes hold, while another camp believes there is still time to turn the ship around. Still, all biophysical economists see only very bleak prospects for the future of modern civilization, putting a whole new spin on the phrase "the dismal science."

Last week, about 50 scholars in economics, ecology, engineering and other fields met at the State University of New York's College of Environmental Science and Forestry for their second annual conference on biophysical economics. The new field shares features with ecological economics, a much more established discipline with conferences boasting hundreds of attendees, but the relatively smaller number of practitioners of biophysical economics believe theirs is a much more fundamental and truer form of economic reasoning.

"Real economics is the study of how people transform nature to meet their needs," said Charles Hall, professor of systems ecology at SUNY-ESF and organizer of both gatherings in Syracuse. "Neoclassical economics is inconsistent with the laws of thermodynamics."

Like Hall, many biophysical economic thinkers are trained in ecology and evolutionary biology, fields that do well at breaking down the natural world into a few fundamental laws and rules, just like physicists do. Though not all proponents of the new energy-centric academic study have been formally trained in economics, scholars coming in from other fields, especially ecology, say their skills allow them to see the

global economy in a way that mainstream economists ignore.

Central to their argument is an understanding that the survival of all living creatures is limited by the concept of energy return on investment (EROI): that any living thing or living societies can survive only so long as they are capable of getting more net energy from any activity than they expend during the performance of that activity.

For instance, if a squirrel burns energy eating nuts, those nuts had better give the squirrel more energy back then it expended, or the squirrel will inevitably die. It is a rule that lies at the core of studying animal and plant behavior, and human society should be looked at no differently, as even technologically complex societies are still governed by EROI.

"The basic issue is very fundamental: Why should economics be a social science, because it's about stuff?" Hall said.

'Peak oil' embraced

The modern biophysical economics movement may be relatively young, but the ideas at its roots are not.

In 1926, Frederick Soddy, a chemist who was awarded the Nobel Prize just a few weeks before, published "Wealth, Virtual Wealth and Debt," one of the first books to argue that energy should lie at the heart of economics and not supply-demand curves.

Soddy also criticized traditional monetary policy theories for seemingly ignoring the fact that "real wealth" is derived from using energy to transform physical objects, and that these physical objects are inescapably subject to the laws of entropy, or inevitable decline and disintegration.

The sharpest difference between biophysical economics and the more widely held "Chicago School" approach is that biophysical economists readily accept the peak oil hypothesis: that society is fast approaching the point where global oil production will peak and then steadily decline.

The United States is held as the prime example. Though the United States is still the world's third-largest producer of oil, its oil production stopped growing more than a decade ago and has flatlined or steadily fallen ever since. Other once-robust oil-producing countries have experienced similar production curves.

But the more important indicator, biophysical economists say, is the fact that the U.S. oil industry's energy return on investment has been steadily sliding since the beginning of the century.

Through analyzing historical production data, experts say the petroleum sector's EROI in this country was about 100-to-1 in 1930, meaning one had to burn approximately 1 barrel of oil's worth of energy to get 100 barrels out of the ground. By the 1990s, it is thought, that number slid to less than 36-to-1, and further down to 19-to-1 by 2006.

"If you go from using a 20-to-1 energy return fuel down to a 3-to-1 fuel, economic collapse is guaranteed," as nothing is left for other economic activity, said Nate Hagens, editor of the popular peak oil blog "The Oil Drum."

"The main problem with neoclassical economics is that it treats energy as the same as any other commodity input into the production function," Hagens said. "They parse it into dollar terms and treat it the same as they would mittens or earmuffs or eggs ... but without energy, you can't have any of that other stuff."

Nor is conservation or energy efficiency the answer. In his presentation, Henshaw noted that the International Energy Agency's own data show that energy use is doubling every 37 years or so, while energy productivity takes about 56 years to double.

In fact, the small world of biophysical economists seems to agree that energy and resource conservation is pointless in the economic system as it is now construed, contrary to what one might expect. Such efforts are noteworthy as it buys the world a bit more time, but the destination is inevitably the same -- a gallon of gasoline not burned by an American will be burned by someone else anyway.

Other peaks?

Though not as closely studied, biophysical economists theorize that the peak oil phenomenon holds true for all non-renewable resources, especially energy commodities. Proponents of the field say they are moving closer to understanding "peak gas" and "peak coal." Consumption of many of the world's most valuable minerals could likewise see those resources nearing exhaustion, as well, they say.

And no amount of technology can fix the problem. Hagens points out that oil extraction has evolved by leaps and bounds since the early 1900s, and yet companies must expend much more energy to get less and less oil than they did back then.

"It isn't that there's no technology," Hall said. "The question is, technology is in a race with depletion, and that's a whole different concept. And we think that we can show empirically that depletion is winning, because the energy return on investment keeps dropping for gas and oil."

The most pessimistic of the biophysical economics camp sees the oil-fueled world economy grinding to a halt soon, possibly within 10 years. They are all working to get the message out, but not all of them believe their peers in other professions will listen.

"Of course I'm trying to send a message," said Joseph Tainter, chairman of Utah State University's Department of Environment and Society. "I just don't expect there's anyone out there to receive it."

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