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Nobelists talk energy

Twenty-five Nobel laureates convened early this month on the island of Lindau, Germany, to meet with 567 talented young physicists from universities and laboratories around the world. After several lectures on Bose-Einstein condensates, high-energy particle physics, and carbon nanotubes, as well as presentations on biophysics from the winners of the 1988 Nobel prize in chemistry, seven laureates got on stage for a panel discussion of climate change and energy challenges.

Though they were all admittedly speaking beyond their fields of expertise, the scientists offered unfiltered political and social advice.

Five of the panellists had signed the 1997 declaration calling for political action in Kyoto against global warming. Those included Douglas Osheroff and Johann Deisenhofer of the United States, Klaus von Klitzing and Hartmut Michel of Germany, and Jack Steinberger of Switzerland. Ivar Giaever of Norway and Carlo Rubbia of Italy also joined the panel, which was moderated by Hans Joachim Schellnhuber, director of the Institute for Climate Impact Research in Potsdam, Germany. When asked for a winning set of strategic solutions, the laureates strongly supported the increased use of nuclear power, as well as solar energy and photovoltaic cells, while criticizing the focus on biofuels. The consensus was that solutions had to come from technology available now, not in 50 years. They added, however, that implementing the technology in a way that would make a difference would take global commitment from governments, scientists, engineers, and society at large.

Giaever, the panel's self-proclaimed "skeptic" in regard to the importance of global warming, questioned the likelihood of obtaining such a feat. Since the Kyoto agreement, "I don't see much change in these years when we were supposed to have done something about this already," he said. "If we are really worried about this thing why don't we talk about nuclear power?"

In response, Rubbia suggested the use of thorium high-energy nuclear reactors. "If we want to have nuclear energy available we need to solve the issue of waste — either by reactions based on thorium or depleted uranium or burning with an incinerator." With thorium, he said, 1 ton can do the job of 200 tons of uranium to run a standard power plant for a year. It has the added benefit of producing less waste, and it addresses the fear factor - the opposition from the public and some governments to further development of nuclear energy because of its connection with the nuclear bomb. Using thorium for nuclear energy is a "safe use of a tool that cannot be diverted in the wrong way, and it would be available for many years to come," said Rubbia. "There's no reason not to call it renewable energy."

Rubbia also proposed establishing thermal solar energy storage and distribution systems on 200 kilometres by 200 kilometres of land across the world's deserts. "The amount of energy delivered across 1 kilometre is equivalent to 1.5 barrels of oil," he said. Harnessing this energy that comes for free from the sun doesn't require a complicated system, he added. "It can be done with a bicycle-type approach."

Steinberger, who during the panel urged governments to tax carbon, lectured the next day on the future of energy and climate. He focused his talk on the importance of reducing population growth and the current use of overnight storage and on-demand distribution of thermal solar energy.

Between 1985 and 1991, eight solar parabolic trough power plants were built in the Mojave Desert with a reflector surface of 2.3 square kilometres. They heat oil to 390 degrees Celsius to store the solar energy overnight. The plants generate 450 megawatts of power. In Spain, the Andasol power station and the 17-megawatt Solar Tres Power Tower are both building thermal storage based on heating molten salt. The Solar Tres tower costs €200 million, will stand 120 metres tall and will have a temperature range of 300 to 560 degrees Celsius.

The technology, Steinberger said, will make it possible to produce renewable energy at an acceptable cost, but "The necessary political will and collaboration which would be required is a much more difficult challenge."

Michel, who shared the Nobel prize in chemistry in 1988 with Deisenhofer and Robert Huber for their work on photosynthesis, argued that farmers should install photovoltaic cells to obtain energy rather than try to press the energy from biomass such as corn.

Nature, he argued, has been trying to improve on energy conversion using photosynthesis throughout evolutionary history and has succeeded in storing only 0.7 to 0.8 percent of the Sun's energy – any more than that and the plant gets sunburned.

When a farmer converts biomass to energy, he gets 0.03 percent of that solar energy back. "That is why we should be against producing biofuels," Michel explained. When it comes to converting rainforests to farms for biofuels, "We are killing the forest in order to produce biodiesel for Europe, so we should stop this immediately," he said, receiving strong applause.

One of the researchers in the audience, physicist Michael Sentef of the University of Augsburg, Germany, was not surprised when Giaever asked, "Who knows what the right temperature for the Earth is?" Though Giaever was against pollution, he considered the issue of global warming over-hyped.

"I could already guess from yesterday evening's dinner conversation that Ivar Giaever would say something politically rather incorrect at the panel discussion — he's a real skeptic," Sentef said. "In his lecture on Monday, he told us the story of the young mechanical engineer coming from Norway to join General Electric with a good mixture of luck and verve. He was kind of an outsider, and this he still remains."

But Sentef admitted Giaever had a point: "As a take-home message, the climate issue, controversial as it is, is not the most pressing problem. Rather it's the energy issue, which is, however, more of a socio-economical problem than a scientific one. Science already provides the necessary technical solutions to solve it, but there is a lack of political will to implement them."

What should his generation of scientists do to solve the problem? "We have to take political discussions more seriously and try to influence the people in charge to make the right decisions," Sentef said. "It is our responsibility to act together as a strong scientific community across disciplinary and political borders."

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