The Jus Semper Global Alliance

In Pursuit of the People and Planet Paradigm

Sustainable Human Development

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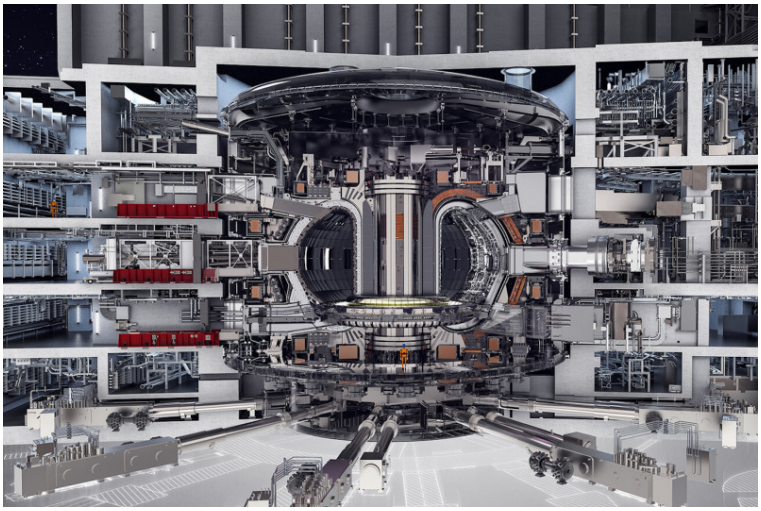
Nuclear Fusion, Icarus and Techno-Magical Thinking

The unbridled enthusiasm with which the recent experiment has been received in the media shows the obsession with the search for an unlimited source of energy

Antonio Turiel – Juan Bordera

I am sure you have heard or read about the new technological promise set to save everything: nuclear fusion. A historic milestone. Unlimited energy within reach in just a few years; energy created out of nothing (screw yourself, thermodynamics!). These are just a few niceties with which the breakthrough is garnished in most media.



Depiction of Tokamak ITER. OAK RIDGE NATIONAL LABORATORY

But has there really been such a spectacular breakthrough? Short answer: no. It was a progression in the long-running experiments at the National Ignition Facility (NIF) in the United States. For the first time, the energy produced by the nuclear fusion of pinhead-sized deuterium and tritium pellets was greater than the energy carried by the emitted laser beams.

They fired 192 laser devices in unison to compress the material and fuse the nuclei of the two hydrogen isotopes. Specifically, the small nuclear explosion produced an energy of 3 megajoules (MJ), while the laser beams carried an energy of 2.1 MJ, a gain of almost 50%. This breakthrough shows that inertial confinement fusion (as this method is called) can work because if fusion generates a net gain, a chain reaction could occur in a larger sample

size and achieve more significant amounts of energy. The data from this experiment will improve our understanding of these kinds of processes, and in that sense, it is an important milestone for science. So much for the good news. Now for the bad news.

The first objection that could be raised is that the amount of energy generated, 3 MJ, is enough to boil the water in a 9-litre pot, which would require an installation the size of a football stadium. In addition, the lasers get so hot that they can only fire one shot per day, making it challenging to do this process sustainably.

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Most importantly, there was no real net energy gain. To charge the laser devices, 300 MJ were spent, i.e. 100 times more than what was produced in the tiny fusion reaction. A laser device is very inefficient, and it is completely normal that so much energy is lost in it: performance is sacrificed for precision, which is essential in this kind of experiment. So energy has not been gained: it has been lost. Now go back to the headlines.

The design of the experiment also does not allow for a reactor to be easily constructed. You would need some material to absorb the energy produced to harness it, but you can't put anything between the laser and its target. Moreover, to produce energy continuously, it would be necessary to ignite pellets like this one at a continuous rate. In this case, the reaction lasted 0.0004 seconds. It would take 2,500 pellets per second or 150,000 per minute at that rate—a real manufacturing and logistical nightmare.

One might ask why this design is like this if it does not help the construction of a fusion reactor (unlike ITER, which will have unresolved technical problems but is at least a real reactor design). The answer is that the US NIF is a laboratory whose purpose is experimentation to improve the design of atomic bombs. The facility is not intended to create something like a reactor but to emulate a small-scale hydrogen nuclear bomb to obtain information to improve the design of the current US nuclear arsenal. And the only reason the "discovery" has been made at this time is that a possible budget cut had been announced. The government will now have a much harder time cutting the NIF allocation—a US domestic political move.

Knowing all this, what is not understandable is the unbridled enthusiasm with which this news has been received in Spain - in contrast to the rest of Europe, where it has been given much more marginal coverage and with better technical explanations of what has been achieved and in what context. Apart from the ridicule of many of the media, this case illustrates something very significant: the obsession in the public discourse - and therefore, more dangerously, in the imaginations that can be assumed - that the only acceptable solution to all the problems we have is the search for a new source of unlimited energy / techno-magical miracle that will allow us not only to do the same as we do now but even more of the same. And that is the really interesting question here.

Let us conscientiously ask ourselves, what would happen to a range of other problems, such as resource limits, soil degradation, and the biodiversity crisis, if we were to produce the holy grail of unlimited energy? The answer is obvious: they would get worse. Energy resources are just one of the biophysical limits imposed on us by life on this rock suspended in the middle of cold space.

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A few years ago, Tom Murphy, an astrophysicist at the University of California, wondered what would happen if we suddenly found a magical source of infinite energy. Assuming we maintained historical rates of growth in energy consumption, and bearing in mind that energy, after use, does not disappear but is converted to heat (First Law of that stubborn Thermodynamics), as human energy consumption grew, the heat dissipated by our machines would cease to be negligible as it is now. In just 400 years, we would boil the water in the oceans! The logic of growth would lead us to burn ourselves with the torch of infinite energy if a malevolent god were to offer us this cursed gift.

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These and many other contradictions can only be avoided by acknowledging that perpetual growth is impossible, harmful, and the main self-destructive obsession of our civilisation. Technology should be our ally, but it cannot be our ally if growth is imperative because then the conditions are created so that you always need to run a little faster to stay in the same place: the Red Queen effect. And that effect, unfailingly, exhausts. Finite essential resources and time to react, in our case.

At a time when there was no shortage of energy, the discovery of the Higgs boson dominated discussions of high-energy physics. This elementary particle explains the properties of mass in our observable universe. The God particle, they called it. I'm sure you remember that recent breakthrough. Beyond the consequences of the breakthrough, its cultural implications are again much more interesting. That name has a lot of subtexts, specifically of the crucial relationship our society has established between technology, magic, and religion.

The great religions had this function of cohesion, of generating expectations for a better future, even in the afterlife. Much of the space that religion has lost in this respect has been won by techno-magical thinking. The true religion of our age. The one that makes the wealthiest men on the planet into technology tycoons, and their self-destructive fantasies, the bane of many.

Paradoxically, in this mad race to try to overcome the biophysical limits of the planet, the number of technological miracles on which "sustaining growth" would depend is the only thing that continues to grow: recycling materials to limits that defy thermodynamics; huge percentages of carbon capture and sequestration as assumed in all climate models, although to this day it is an energy fiasco and an economic boondoggle; hydrogen of all colours - but above all that looks green - and without assuming its limitations; 100% renewable energy, as if it were possible to do so with the current level of consumption when renewable energy capture sources do not yet produce even 15%, and all this supported by the mantra we will hear most: net zero emissions. It is making perpetual growth and techno-magical thinking more and more a dangerous matter of faith, like Daedalus' faith in those wings that killed Icarus, his son, for wanting to get too close to the sun.

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The only solution is to get rid of this kind of blind faith in technology that dominates our societies as soon as possible. And fast. The higher the faith in the power to fix problems with the same cultural frameworks we have generated grows, the more the distance to the ground will also increase. We must realise that many of the stories we regularly read in the media are more about hope than experience, faith than reason, and despair than poise.

This situation is reminiscent of the nuclear (fission) energy furore of the 1950s when everything was to be powered by small reactors when it was said that electricity would become too cheap to charge for. Nuclear fission is the energy that has led us - after Hiroshima, Nagasaki, Chernobyl and Fukushima - to this winter, in which France, the biggest nuclear reactor powerhouse, has warned of rolling blackouts to its population mainly because a good part of its power plants are shut down. What surprises will there be when we open this new Pandora's box of technology if we ever manage to do so?

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