
The Mini-Sun

In lecture, Guest speaker Thanassis Psaltis talked about stars. They're formation, properties, types, end-of-life, and more. One of the things that really caught my attention was the energy output of stars. Our sun uses hydrogen fusion (pp-chain) to create energy. And, every second it burns 4.3 million tons of hydrogen into helium. As a result, our sun generates 3.8×10^{26} Joules of energy, which is roughly equivalent to one million times the amount of energy humans consume in one year! To say that this is amazing is a huge understatement of all kind of proportions. If we can create a mini-sun on earth and replicate the hydrogen fusion reaction, not only can we solve the energy crisis, but also climate change. Looking to nature for solutions for complex problems is both effective and sustainable. Interestingly, this is referred to as Biomimicry, which is often referred to as Bionics. We've turned to nature to solve a plethora of problems, including, but not limited to: locomotion, architecture, optics, agriculture, etc. Everyday items such as the Velcro was inspired by the tiny hooks on bur fruits. Several scientists believe that almost all of humanity's problems can be solved by turning to nature. After all, it is the oldest and most well developed system on planet Earth and in the entire universe; and space is no exception. Looking to stars to solve the energy crisis is the best solution.

Stars, like our sun, create energy through the process of nuclear fusion; where lighter elements collide to form heavier elements. Our sun creates helium atoms from hydrogen atoms. In the process, a huge amount of energy is released, which can be calculated by Einstein's famous equation, $E = mc^2$. The closest we've gotten to harnessing energy from colliding atoms is through nuclear fission, which has a whole host of problems. On the other hand, nuclear fusion is

miles better than nuclear fission. It produces more energy, is safe, hydrogen is abundant, and does not produce any harmful byproduct (Cohen, 2019). The only byproduct is helium, which has a wide array of applications such as cooling, aerostatics, welding, semi-conductor and fiber optics manufacturing, lasers, hard drives, telescopes, and more (Hammoutene, 2018). There isn't a better source of energy than nuclear fusion. Thankfully, the prospects of developing nuclear fusion into a source of energy has significantly improved, according to experts (McGrath, 2019). Private companies, like General Fusion, and governments are working hard to produce a prototype within a decade. Each company has a different approach. First Light wants to fire projectiles at hydrogen atoms to create a shockwave that will produce plasma that is hotter than the sun (McGrath, 2019). On the other hand, TAE Technologies, backed by Google, is using a cylindrical colliding beam reactor to heat hydrogen gas to form two rings of plasma (McGrath, 2019). Either way, the future holds exciting possibilities. Unlimited energy can solve 95% of the world's problems! Food and water will no longer be scarce, and power outs will be a thing of the past. Nuclear fusion is very promising; even Bill Gates and Jeff Bezos are interested in it.

References

- Cohen, A. (2019, January 14). Is Fusion Power Within Our Grasp? Retrieved November 7, 2019, from <https://www.forbes.com/sites/arielcohen/2019/01/14/is-fusion-power-within-our-grasp/#7fc5fa219bb4>.
- Hammoutene, G. (2018, December 26). Applications | Helium. Retrieved November 7, 2019, from http://www.heliumscarcity.com/?page_id=28.
- McGrath, M. (2019, November 6). Nuclear fusion is 'a question of when, not if'. Retrieved November 7, 2019, from <https://www.bbc.com/news/science-environment-50267017>.