

OCKHAM'S RAZOR

12 YEARS: NOW OR NEVER?

Climate change according to Leon Smook

A MATTER OF TASTE: PIZZA

Ranking delivery pizzas

MOVIE REVIEW

Jurassic Park



ALUMNUS:
FERNON EIJKHOUDT

THE ETHICS OF
AUTONOMOUS CARS

UT SCIENCE NEWS:
PRINTABLE GOLD?



CONTENTS

- 3 From the Board/From the Editor
in Chief
- 4 UT Science News
- 6 Interview: the 10th Board of H.V.
Ockham
- 10 Alumnus: Fernon Eijkhoudt
- 12 The Ethics of Autonomous Cars
- 16 12 Years: Now or Never?
- 17 Movie Review: Jurassic Park
- 18 Past Activities
- 20 Ockham's Pizza Taste Test
- 22 10⁴⁶ Watts and Invisible Bacteria:
Speculation in Science



Colophon

Editor in Chief
Leon Smook

Layout Editor
Eline Uiterweerd

Editorial Board
Saumitra Athlekar
Saskia Helmich
Guido Ritsema van Eck
Marie-Laure Snijders
Eline Uiterweerd

Special thanks to
Feron Eijkhoudt

Ockham's Razor
Volume 4 Issue 1

© 2019 H.V. Ockham

 **OCKHAM** Honoursvereniging



From the Board

Dear members,

First, I would like to wish everybody a good and productive 2019. Yes, I know Epiphany (Driekoningen) – the official (Dutch) end date for New Year wishes – has long passed. But should there be a final date for wishing everybody the best, am I not always permitted to wish someone the best? It should however never be an empty wish, so for this year I therefore have the resolution to mean everything I say. So, know that when I say the following, I mean it! I hope you will always be as motivated as you are in the first week of the module, as happy as Stephen Hawking when he detected Hawking Radiation and as inspiring as Stan Lee.

There is one group who I would like to wish something more; the people who hold a Razor for the first time and do not yet know Ockham. To these first-year honours students I wish the best of luck in the honours lectures to come. But remember that the honours programme is not the only thing you are getting; you have been given the opportunity to join a quite unique community, a community of honours students. We – the board of Ockham – will try to add as much value to this community as possible, but we cannot do this alone. Committees are a vital part of Ockham and get a lot of freedom – if you would like help make Ockham Great, feel free to join a committee or come to the committee market on the 13th of March.

The 13th of March seems far away; however, we have a filled schedule until that moment. All our committees will organise an activity; there will be two drinks, a fun activity and a dinner colloquium, all bundled in a period we like to call the Honours Kick-In. I urge all of you to come, both the new, existing and former honours students. Go to at least one activity, there is no harm in trying, you may find that Ockham is the perfect association for you.

Best regards,

Sander Oosterveld

Chairman of the 10th Board of H.V. Ockham

On behalf of the 10th Board of H.V. Ockham



From the Editor in Chief

Dear reader,

Sometimes, it is difficult to find information to write the first paragraph of a letter or article. Ideally, you would like to prevent using clichés and boring openings. At other times, inspiration flows readily and your hands fly over your keyboard, words jump onto your screen, and your text is written in no time. Writing this letter, I found myself in the first situation, so I followed advice I have gotten somewhere - 'just start' - and slowly but surely words started appearing.

This slow start is very relatable. Who has not had a project that started off slow and needed a final sprint to make the deadline in time? Who has not woken up early, only able to get work done after a first cup of coffee? This edition of the Razor has undergone a similar process, with increasing intensity as the deadline neared. Therefore, I am proud to present to you the first edition of the Razor of 2019.

For some of you, this may be the first time you have ever read or even seen the Razor. Others may have given earlier editions a quick once-over or even an in-depth read. This edition of the Razor is again chock-full of interesting articles and information about our association. You can read about the activities that have been organized by the various committees of Ockham; learn about the experience of an alumnus member in Japan; enjoy several columns; get acquainted with the members of the board of our association; and read a letter from one of the people involved in the Honours programme.

On behalf of me, thanks for actually taking the time to read this letter from the editor. And on behalf of the whole of the editorial board, I wish you a pleasant read of this first edition of the Razor of this (academic) year.

Kind regards,

Leon Smook
Editor in Chief



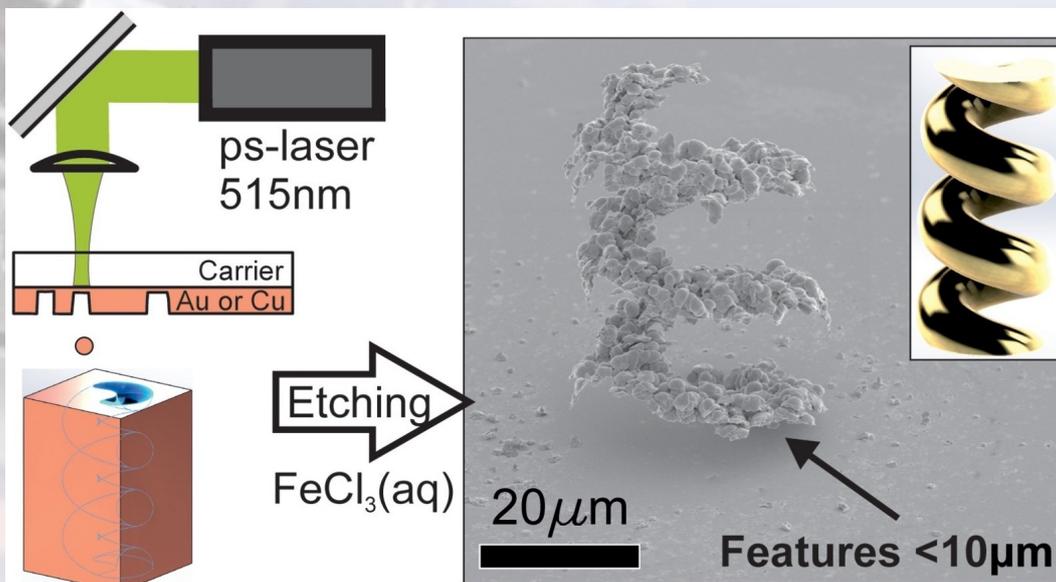
UT Science News

By Marie-Laure Snijders

Amazing research is being done everywhere, but definitely also here in Enschede. Here are some breakthroughs made in science at our university over the last couple of months.

Printable Gold (December 2018)

3D printing is rapidly becoming a commonly used techniques to create precise and complex models, but it can also be used to print certain elements. At our university, researchers have developed a way to 3D print free-standing and three-dimensional microscopic gold structures. The technique used first uses Laser-induced Forward Transfer (LIFT), which creates a small droplet of both copper and gold, after which chemical etching is used to remove the copper. The free-standing gold structure that remains is smaller than 10 micrometres. The fabrication of these metallic microstructures plays an important role in fields such as electronics, photonics and biomedical technology, where precise electronics need to be developed (Feinaeugle, Pohl, Bor, Vaneker, & Römer, 2018)



The technique behind 3D printing gold.

Superconductor makes a lighter wind turbine (November 2018)

A new type of superconductor is being developed that can make powerful magnets which are lighter, more compact and use less rare metals than the current ones do. Superconducting materials are able to conduct electricity without resistance when they are cooled down beneath a critical temperature. These materials are therefore useful to create strong magnetic fields and a lot of electricity at a lower price than what is currently being done. The research group Energy, Materials and Systems at our university helped developing a very powerful cooling system for these superconductors, which was modelled after the coolers used in MRI ma-



chines. The cooling system is able to reach a minimum temperature of minus 240 degrees Celsius. The new generator that the cooling system is a part of is four meters in diameter, making it 1.5 meters smaller than a conventional one, despite being able to generate the same amount of power. The magnets are made from a magnetic tape with a ceramic superconducting layer sitting on a steel ribbon. The entire system is able to induce more Watts per kilogram of generator weight than ever before and it is currently placed inside a 88 meter high wind turbine in Thyborøn, Denmark and produces 3.6MW (Leysen, 2018) (King, 2018) (Cohen, 2018).



Wind turbines in Denmark.

Zero-error tumour removal (May 2018)

The Biomedical Photonic Imaging group (BMPI) is working to develop minimally invasive needles for photoacoustic medical imaging. The project, which started last August, will last four years and involves partners from both the Netherlands and India, such as the TU Delft, the *Indian Institute of Science* and the Indian *National Institute of Mental Health and Neuro Sciences*. When developed, the needles can be used to shine a laser beam made of ultrasound into a tumour to generate a detailed image of the areas inside the tissue. A biopsy of the tissue can then be taken to see whether the tumour is cancerous or not. Furthermore, the needles can be used to check whether all of the cancerous parts of the tumour have been successfully removed. The technology will eventually be able to be implemented into virtually any medical procedure in which needles are used, according to the BMPI group. ■

Bibliography

Mudur, N. (2018, May 19). City, Dutch researchers to make tumour removal error-free. Retrieved January 18, 2019, from <http://www.newindianexpress.com/cities/bengaluru/2018/may/19/city-dutch-researchers-to-make-tumour-removal-error-free-1816554.html>

Cohen, N. (2018, November 28). Wind turbine swap in Denmark turns focus on superconductors. Retrieved January 18, 2019, from <https://techxplre.com/news/2018-11-turbine-swap-denmark-focus-superconductors.html>

Feinaeugle, M., Pohl, R., Bor, T., Vaneker, T., & Römer, G. (2018). Printing of complex free-standing microstructures via laser-induced forward transfer (LIFT) of pure metal thin films. *Additive Manufacturing*, 24, 391–399. <https://doi.org/10.1016/j.addma.2018.09.028>

King, A. (2018, November 22). World first as wind turbine upgraded with high temperature superconductor. Retrieved January 18, 2019, from <https://www.chemistryworld.com/news/world-first-as-wind-turbine-upgraded-with-high-temperature-superconductor/3009780.article>

Leysen, G. (2018, November 20). Wereldprimeur: supergeleider zorgt voor lichtere windturbine. Retrieved January 18, 2019, from http://www.engineeringnet.be/belgie/detail_belgie.asp?Id=21211&category=research



Interview: the 10th Board of H.V. Ockham

By Saumitra Athlekar, Leon Smook and Marie-Laure Snijders

On September 18th, the 10th board of H.V. Ockham was charged. Some of you might still remember the not-so-lengthy GMM that preceded the board change; others still cherish their vivid memories of the Constitution Drink that followed on September 21st. Whether you are a brand new Ockhammer or an ancient one, you will get to know the board better by reading the interviews on the next four pages!

Sander Oosterveld, Chairman and Commissioner for External Affairs

Could you introduce yourself?

I am Sander Oosterveld and I am 21 years old. I would be in the 3rd year of Advanced Technology, however, I have chosen to go a different road and spend this year building a boat on solar power at Solar Boat Twente, besides doing a part-time board year for Ockham. I am a proud Mathematics track graduate. One board position is too easy, therefore I am both the Chairman and Commissioner for External Affairs (abbreviated the President of Ockham).

Why did you choose to become a board member for H.V. Ockham?

I have been active at Ockham since I started Honours. Thijs, the Chairman of the 8th board, “tricked” me into joining the ACCIE [Activities Committee, red.], I have been stuck ever since. In 2017 I was not quite ready to do a board year, so I decided to do a few committees and join the board the year after. The following year, many things went well—the number of new members was higher than ever—but limited effort was put into long term improvements. I wanted to change that and to do that I become a board member of H.V. Ockham.

When was H.V. Ockham founded?

Since we had our 9th Dies this November I guess it must have been in November 2009.

What was your biggest mistake and your biggest success as a board member so far?

My biggest success is finding a new drinks location for Ockham. We are currently in the process of being part of the “Stichting Borrelruimtes Zilverling”. This will result in Ockham being able to have drinks at the MBase-ment and Abscint. Since we are now in the trial period, we can already have our drinks in the MBase-ment every Second Monday Of The Month.



Sander Oosterveld, Chairman and Commissioner for External Affairs.



The 10th Board of H.V. Ockham From left to right: Eline Uiterweerd, Remco Abraham, Sander Oosterveld, Bilge Tekeş.

The biggest mistake would be my contact with our own members. I have been busy supporting Ockham from the back office, but I am the Chairman and therefore I should also put myself more in the spotlight. Talking more to our members and getting feedback on our work. This will also be my focus for the remainder of the year: getting in contact with more members.

What is the most challenging aspect of being on the board?

You are trying hard to do the best you can, but only a little is visible for your members. Meanwhile if something goes bad you get blamed because it is your responsibility. It is easier to see the bad than the good, that is something we see often as a board. You have dedicated a large part of your life without many rewards in return. The challenge then is to cherish the rewards and not get stuck in complaints. This might seem easy but is harder than it sounds.

What year would you like to travel to if time travel were possible?

I actually quite like the time we are living in, but if I had to choose, I would move 50 years into the future. I expect that by that time it is scientifically possible to ensure eternal youth and happiness and I like the sound of that!

Remco Abraham, Secretary

Could you introduce yourself?

I am Remco Abraham and I am currently 20 years old. I am in my third year of technical computer science. I have finished the Mathematics track last Summer (in the same year as Sander) and I am the Secretary of H.V. Ockham.

When was H.V. Ockham founded?

H.V. Ockham was founded in 2009 by a few honours students. The first Chairman was Remco Bloemen. Apparently sharing the same first name creates some confusion and I have therefore been confused with Mr. Bloemen a few times, so I would like to clarify once more that although much of my time is devoted to H.V. Ockham, I am not the founding father of H.V. Ockham. ▶▶



Remco Abraham, Secretary.



What do you think you are going to learn during your board year?

I have already learned a lot. As a board member, you will work with a lot of people, some of them will share your opinion, and some will not. I am slowly learning that I cannot please everyone with my actions as a board member. As a board member you do what you think is best, and sometimes you have to accept that your decisions were not the best in hindsight. Similarly, you cannot really blame others for making wrong decisions since also they just did what they thought was the best thing to do.

Would you recommend anyone to do a board year?

Yes! It is such a great opportunity to learn many different professional skills in a short amount of time, and while you're at it, you're also improving your favourite association!

What was your biggest mistake and your biggest success as a board member so far?

Luckily, I have not yet made any horrible mistakes (let's hope it will stay this way). About successes, I think our board has already achieved a lot with major successes like our trial membership at the "Stichting Borrelruimtes Zilverling", good progress in the discussion on relocating the Ockham Room and the launch of the new website. I, however, do not believe in claiming any of these successes as my personal achievement since anything we achieve as a board, we achieve it together and together with the many great people in our committees.

What year would you like to travel to if time travel were possible?

Although a lot of old people will probably disagree with me, I do not think things were better in the past, and since I don't know whether the world will still exist after Trump finds the big red button, I think I will just stay right here where the world has not gone up in flames just yet :)

Bilge Tekeş, Treasurer

Could you introduce yourself?

My name is Bilge Tekeş. I come from Turkey and I am 21 years old. I study Business and IT for my regular study programme (2nd year). In Honours, I do the Science track because it rules! I am also the Treasurer of the current board.

What would you like to achieve this board year?

Make Ockham great again.

What do you think you are going to learn during your board year?

I would like to improve my skills on handling conflicts between members. I would also like to learn managing groups and improve my planning skills. After all, a board year requires a lot of work.

What was your biggest mistake and your biggest success as a board member so far?

My biggest mistake is that I accidentally took the mac adaptor and forgot about it. I don't even have a mac. The owner please contact me...
My biggest success is that everything goes smoothly. Which it does.

What is the most challenging aspect of being on the board?

Definitely, planning. With a part-time board planning, this is sometimes very difficult.

What does your life look like in 10 years?

I really hope I have a nice job that somehow leaves me time to travel. I would also have a big house that I can fill with many dogs and cats. The rest I don't want to decide just yet, I hope life surprises me in a good way!



Bilge Tekeş, Treasurer.

Honoursvereniging

Eline Uiterweerd, Commissioner for Internal Affairs

Could you introduce yourself?

My name is Eline Uiterweerd and since I am 19, I am the youngest board member and only teenager on the board. I study Industrial Design (2nd year) and I'm in the Design track in Honours. My position on the board is Internal Affairs! Obviously the best position ever.

When was H.V. Ockham founded?

Well, we're the 10th board, so that would mean that the first board (and thus the association) was established in 2009. Our 2nd lustrum year will be next academic year, after all.

What would you like to achieve this board year?

As the Honours Programme has been growing quickly, we as a board want to make sure that Ockham can keep up with this growth. That means that we want to make the association accessible for all honours students through organising a wide range of activities. There are already some important goals we have accomplished, such as launching the new website and finding a new 'borrelruimte' (drink space).

What does your life look like in 10 years?

In 10 years, I'll be 29 years old. Who knows what has happened to me by then? I'll probably already be working for some years, and my guess is that I will not live in Enschede or Twente anymore. I hope that I still have the time to travel a lot. Also, I'll hopefully have some pets (cats or dogs, or both!), and a favourite human being with whom I share my hopes and dreams (preferably in the 'boyfriend' category). Nicely settled down, but hopefully not too boring!

What year would you like to travel to if time travel were possible?

To 2029, to see if my predictions from the previous question are right. Or maybe to somewhere around the year 2200, to see if we have been able to save the planet! Or to 14.000.000.000 BC, to become the first human being to see the Big Bang and the creation of everything taking place. Wait, but in that case, I have to travel to before the start of time itself... Would that be possible? ■



Eline Uiterweerd, Commissioner for Internal Affairs.

Do you want to know more about us and our functions? Don't hesitate to come to the Ockham Room in Citadel H209, or visit our website at hv-ockham.nl!

Cheers,
The 10th Board of H.V. Ockham
Sander, Remco, Bilge and Eline





A Different Japan: an Internship in Okinawa

By Fernon Eijkhoudt

お久しぶりです (*Ohisashiburi desu - Long time no see*) H.V. Ockham, my name is Fernon. Since the start of my university life, I've wanted to go abroad on an adventure! Till the end of my bachelor I still haven't done anything remotely close. The warmth of the university was too comforting and the unknown scared me. However, when I started my master this needed to change.

An internship abroad has to be arranged months in advance, so halfway through the first year it was time to start looking for places to go. I went to a few professors and asked if they knew anything in their field on a university **far** away from home. Their responses were in the line of: 'Of course, where do you want to go?'. My preferred location was somewhere in Asia, since the culture is different and for some reason I was attracted by that. One of the professors came up with a university which was described as the perfect university. I did some research on this university and found a group which was working in my field of interest. Through a mailing conversation I got advised to participate in their internship programme. This is comparable with a scholarship. The programme included the flight, housing, and internship allowance.



Japanese cuisine!

After arriving, my journey quickly began and as always the beginnings are difficult, but nonetheless very interesting. In my case I had to go for grocery shopping directly after arriving. The first

time someone joined to help me out. However, even then it is not clear what the supermarket has and how it should be cooked. It doesn't make it easier that it is impossible to read and that the Japanese cuisine is different from the Dutch cuisine. The supermarket has for example way more vegetables, different kinds of fish (fresh and frozen), differently prepared meat, and different kinds of desserts. I'm not bad at cooking, however I found myself struggling to deliver delicious meals in the first two weeks. Over time, I learned more and more Japanese meals like: gyudon, omu rice, sashimi, and freshly prepared octopus pasta. I also got a lot of questions like: 'How much rice did you eat' and 'Are you sick of rice now'. I can happily reply to these questions with: I love rice. I've eaten it at least daily and most of the time twice a day. In general I really liked the dishes in Japan.

Working in a completely different environment was an incredible experience. My research topic was different compared to my usual biomedical engineering study. But since this article is more about my experience, I won't bother you with all these details. What however is interesting, is that I worked on a university with an infinite amount of budget, or so it seemed. The labs did not only look top notch, but they also had a lot of equipment which was shared with everyone. They also have a small cleanroom, which is where I worked most of the time. The positive side of this cleanroom was that it only took a 30 min introduction training to gain access to the cleanroom. My co-



workers were amazing and were always happy to help and open for discussions. We also had a weekly lunch in a nearby restaurant. The working ethos around this university is completely different from what I was expecting from Japan. Everyone has heard of Japanese people working overtime/nightshifts, but Okinawa is more laidback. I worked 8 hours a day, had a lot of spare time and weekends off as well. No-one expected me to reply to any e-mails outside working hours. There were still people who did work long hours, but no one actually expected you to do so. I think this is thus the perfect place to start experiencing Japan. It's a bit different, more relaxed, but still Japan. This difference might be caused by the fact that Okinawa was originally not part of Japan, but its own separate kingdom: Ryukyu. The kingdom was taken over by Japan and the original culture slowly disappeared and was replaced by the Japanese culture. It might also be because it has the same weather as Hawaii.

Together with the group members we also did activities like snorkelling, visiting the aquarium, going to sports and game-arcade halls, and going bowling. In the Netherlands we do not really have arcade halls, but in Japan they are everywhere. People come there to play video-games alone or together to show off their insane skills. These types of games are also really different than what we play behind our computers. For example they have an advanced Dance Dance Revolution, which is amazing. I would recommend you to look it up on YouTube (dance rush stardom).

I also went exploring Okinawa, alone and with some friends. I first rented a bike, but quickly realised that the island was bigger than expected. Therefore, I rented a car in the last month. The island is very beautiful and has an amazing scenery. There are ruins from old cas-



The beautiful nature of Okinawa.

ties, never ending sand beaches with blue water, mountains, jungles and much more. I would say that this island is so versatile that you can never actually say that you've seen everything Okinawa has to offer. Nevertheless I tried.

The architecture on Okinawa has a lot of concrete. One of the reasons is the rough weather during the typhoon season. There are still however buildings in somewhat more old style: the Ryukyu style. This is different than the Japanese style, but looks very similar. One thing that is really stood out is that they have their power lines above the ground.



A Ryukyu-style building..

One of the sports originating from Okinawa is karate. As a practitioner of a martial arts, I definitely wanted to try this out. The cool thing is that the original karate was meant to fight, not for attacking, but for self-defence. This aligns with my idea about a martial art. While training under Kevin Chaplin, I learned that karate is a hard sport. The use of blocks, punches and kicks are designed to not waste any energy. This makes it also faster and if performed correctly very powerful. ■

Fernon Eijkhoudt

Commissioner for External Affairs of the 7th board of H.V. Ockham (2015/2016).

MSc. Biomedical Engineering, advanced bionanotechnology and manufacturing.





The Ethics of Autonomous Cars: Philosophy vs Reality

By Saumitra Athlekar

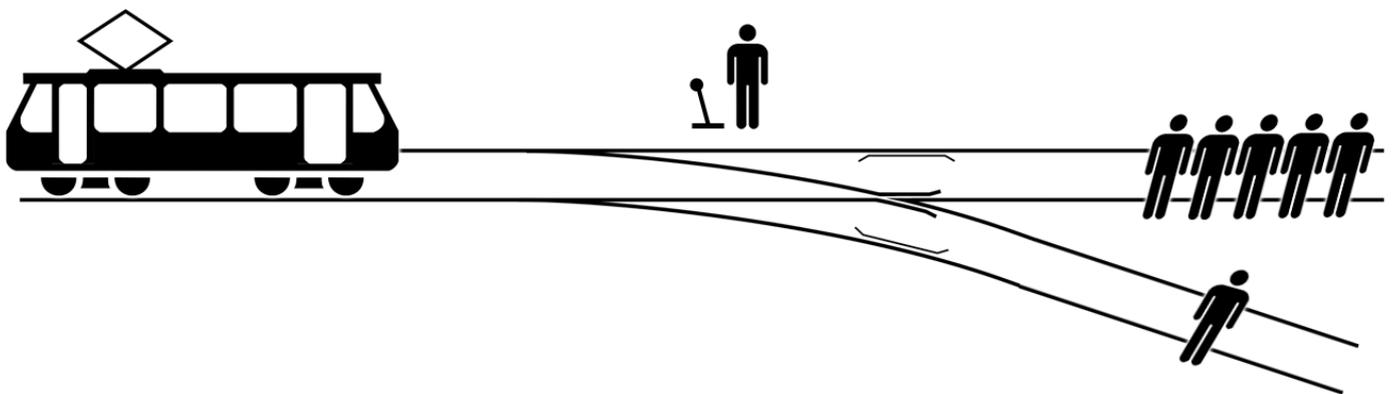
Until recently, it was believed that technology itself does not possess moral or ethical qualities, as they are merely tools in the hands of humans, who give them a moral or immoral use. In the last few decades, philosophers of technology have assessed certain hypothetical as well as real-life scenarios and have come to believe that technological artefacts do, in fact, possess ethical elements that are ingrained in them and are radiated by them, designated to them by their makers or designers, and utilised by the ones who use them. As such, the ethics of technology has become a relevant topic, especially in this age of rapid technological development, internet and automation.

One of the technologies that have garnered some attention in this regard is the self-driving car, the ethics of which has been the object a lot of debate, amongst experts as well as amongst the general public. As with any new technology, these discussions revolve around two main topics. The first one is the morality of inventing and implementing the technology itself, and the second one is the possible effect of the technology on the power of individuals, and the consequences of these effects on existing ethical questions. Both of these approaches culminate into one issue that is given the limelight: the problem of choosing whom to kill, which is often compared to the age-old 'Trolley Problem'.

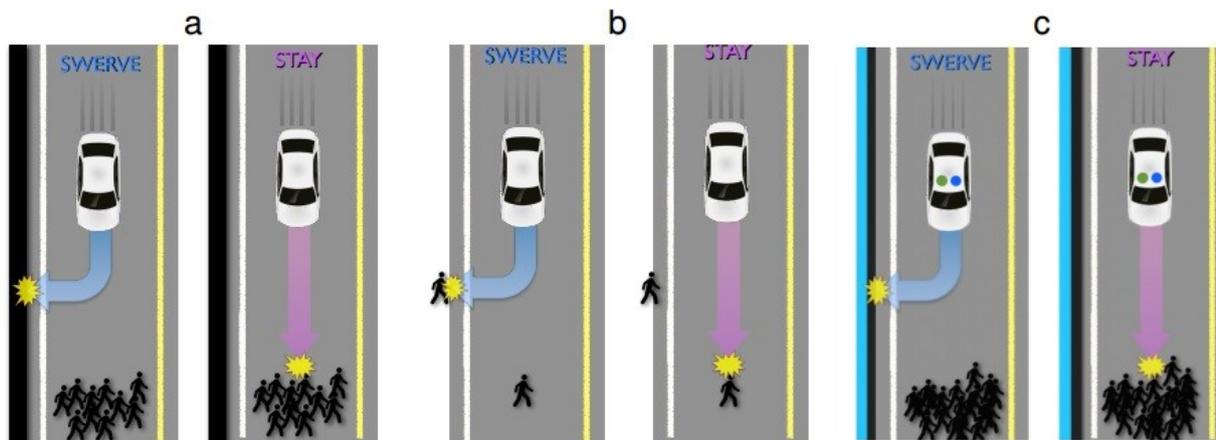
The 'Trolley Problem', as many readers might know, is a series of extreme hypothetical situations proposed by British philosopher Philippa Foot, and its variants have been used extensively

in research and studies related to moral psychology. The situations are usually some variations of a trolley speeding down a railway track, heading straight for five people working on the track. The person is given the possibility of switching the train onto a different set of tracks which has only one person on it, or to do nothing. The ethical dilemma is connected to the consequence of in/action, where inaction would lead to the death of five people while pulling the lever would lead to the death of one. The hesitation to pull the lever can occur from the realisation that by acting, the person is deliberately causing the death of that one person on the track, while the alternative, despite causing more deaths, is not brought on by one's own actions.

This is also similar to a situation in which the pilot of an aircraft is forced to choose between redirecting a malfunctioning aeroplane away from a



A classic representation of the Trolley Problem.



The Trolley Problem applied to self-driving cars.

heavily-populated region to a less-populated area to save as many lives as possible. Such an act is, in fact, likely to be considered noble, and the morality of it would tend to go undiscussed. In the programming of driverless cars, this problem exists in defining the action that the car would perform when faced with a situation in which avoiding death is impossible, and the AI of the car must choose between saving the owner of the car, or a child in the road, or any number of other possible victims.

Various solutions falling under different ethical ideals have been proposed for such 'Trolley' problems. Opponents of action usually argue about the moral responsibility of participation in the death of a person by virtue of that action, while proponents emphasise the immorality of inaction in the face of obvious evil, when it could be prevented or mitigated in some way. There can also be also religious influences on the choice, while the incommensurability of life is often asserted, calling into question the weighing of one human life against five. This can lead to more complex considerations such as five elderly people against one youthful person, or five incurably diseased people against one healthy person, and the effect of such descriptions on the choice to act.

The utilitarian view, which holds consequences as superior to actions, seems the most rational to me, as it chooses the option that does the greatest good for the most number of people. In the case of the hypothetical trolley or the real-life autonomous car, this would simply mean saving as many people as possible while accepting the inevitable deaths of others as being, well, inevitable. A utilitarian philosophy would, in fact, claim that it is obligatory to steer the car as to maim fewer people, rather than be a passive observer

to the harm to many. This is also an application of the doctrine of double effect whereby certain actions leading to undesirable or harmful consequences are allowed to be considered moral as long as the agent has good intentions, the bad effect leads to good, and the good outweighs the bad. This is clearly the case for autonomous cars, where harming someone is only the side-effect of saving others, not



Tesla is known for its self-driving, electric cars.

the intended effect itself. There various arguments against this too, and perspectives are highly dependent on one's own definitions and boundaries of morality, rationality, religion, and so on. In the end, the fact remains that there is no clear-cut straightforward solution that would be acceptable to everyone, and that cannot be challenged on a moral basis. ►►



In my opinion, while discussions about the Trolley Problem are a good exercise in moral philosophy and the application of this dilemma to self-driving vehicles can lead to stimulating conversations, it is not a necessary consideration in practice, and the emphasis on it can only lead to alarm in the public's mind, especially when scientific journalism treats it as a harbinger of disregard for life. Without going into details of the problems in 'clickbait' journalism, this is similar to what has led to fear of AI in general, as well as that of nuclear power, genetic modification, vaccines, etc. in the minds of the general public. There is an undeniable difference between thought experiments and reality that is never emphasised while bringing this problem to the forefront.

In reality, the occurrence of something even close to the situation we considered has incredibly low probability. Besides, the idea that there is a hypothetical incident where there is absolutely no way to save everyone but that we need to think about a way to save everyone is self-contradictory. And yet, for the programmers who write the instructions, this can pose a problem when they have to define which persons the car would consider a priority while in action. However, the cars aren't coded with every possible scenario under the sun, even not accounting for the specific hypothetical one under discussion here, and there will be hitherto unprecedented incidents at some point. As such minimising death and damage is the best way to go in the code, and if a trolley-problem-like event occurs, it may either lead to an arbitrary outcome or malfunctioning, either of which can be considered as acceptable, if only because it is similar to what would happen if there were an actual person driving and faced with an impossible situation.

While there is still the concern that someone might eventually die as a direct result of this technology, that risk exists with any technology, and currently, the known, projected advantages of autonomous cars outweigh this theoretical disadvantage by a landslide.

Studies have shown that over 90% of accidents are caused by driver error, compounded by alcohol or texting, etcetera. these will be mitigated to a large extent through the introduction of self-driving cars on the roads.

Minimising risks with driverless cars, will require changes in infrastructure and regulations, which is not a new concept, as the same was required when cars replaced horse-driven carriages. Signs, paint, signals, will have to be adapted to be recognisable to the cars, and other human drivers will need to be trained better than they are today, to equip them to react to autonomous car behaviour. Speed limits and road designs, along with facilities for pedestrians and cyclists, will have to be made stricter and safer. These are actual problems that technicians and law-makers will have to tackle if such cars are to be brought into widespread. My issue with the whole ethical discussion is that the only thing that the conflation on the thought experiment and actuality achieves is take attention away from these very real concerns and to push them to the side. We need to reconsider our tendency to exaggerate morbid scenarios with vivid imagination, and try to bring the real issues back into focus. ■

Bibliography

Griffin, J. (2016, June 23). People want self-driving cars to value passenger safety over pedestrians, study says. Retrieved January 18, 2019, from <https://www.pbs.org/newshour/science/people-want-self-driving-cars-to-value-passenger-safety-over-pedestrians-study-says>

Trolley problem. (2019). In *Wikipedia*. Retrieved from https://en.wikipedia.org/w/index.php?title=Trolley_problem&oldid=878238897

SPONSORED

“More Than a Tech Job”

Meet Pieter Smorenberg, a 2017 Delft University of Technology graduate who recently found himself back at university, this time explaining to students how technologically fascinating his job is. Originally from Amsterdam, Pieter couldn't have guessed that he would find so many technical and social opportunities in Veldhoven at ASML, the fast-growing tech giant.

Pieter studied precision and microsystem engineering, and now works as an applications engineer in customer support at ASML. He also spends some of his time as one of over 400 'ASML Ambassadors', giving guest lectures at his alma mater university or promoting STEM among school-aged children in the region.

“The more I tell people about working here, the more things I realize I appreciate about the company,” he says. “A lot of people don't realize just how big ASML is in the semiconductor industry. You realize it when you visit the campus in Veldhoven. You see the big tower, the cleanrooms, the huge gardens and parking lots; it's impressive. And then at the complete other end of the scale, almost all of the metrics we work with here are practically at an atom level – no other company is producing such advanced chip-making equipment.” ASML is the world's leading provider of semiconductor lithography equipment, in an industry worth \$438 billion. All of the world's top chipmakers are our customers, including Samsung, Intel, and TSMC.

Pieter has certainly found more than he expected in Eindhoven. “Coming from Amsterdam and Delft, I was a bit uncomfortable about moving to Eindhoven. But actually it seems like everyone is moving here. A lot of my friends from university are here, and there's a lot going on that you only discover after you get here. It's not a 'small city'. It's a melting pot – people come from all over the world to live here.”

Pieter has also found more than a career at ASML. “There's so much going on in our company, technically as well as socially. We have annual technology conferences where you can learn about what's going on in your department, and across the company. This is really unique to ASML. You can develop your network, and learn a lot about what other people are working on, and get ideas for yourself. I'm like a kid in a candy store at these conferences.”

Celebrating our technology isn't the only way we have fun at ASML. “I sometimes go for drinks with the 'Young ASML' group for young ASML professionals,” Pieter says. “You get to meet colleagues from all kinds of different departments. It's a really open-minded atmosphere, because everybody is there for the same reason: to share a good evening with each other.” The ASML campuses are like small cities – more than 12,000 people work just at the Veldhoven campus alone. Young, old, male, female, LGBTI+, living abroad, you name it – it's easy to feel at home at ASML.

As a customer support engineer, Pieter also gets to travel a lot, listening to ASML's customers and helping them to achieve their technology roadmaps. During his travels he experiences other cultures first-hand. “You learn a lot – socially and culturally as well as technically. It's been an eye-opener for me. We're diverse, in terms of education, background, and nationality, but we're all working together as one team because we all have the same goal: make this incredibly complicated technology a reality.” ■

*Want to help us make our technology a reality?
Find out more at [www.workingatasmil.com/
students](http://www.workingatasmil.com/students)*

About ASML

ASML provides chipmakers with everything they need—hardware, software and services—to mass produce patterns on silicon, helping to increase the value and lower the cost of a chip. Our key technology is the lithography system, which brings together high-tech hardware and advanced software to control the chip manufacturing process down to the picometer. All of the world's top chipmakers like Samsung, Intel and TSMC use our technology, enabling the waves of innovation that help tackle the world's toughest challenges. ASML has 19,000 employees worldwide. We are headquartered in Veldhoven (The Netherlands) and have over 60 offices in 16 countries.



Movie Review: Jurassic Park

By Marie-Laure Snijders

After having a module on evolution in the Science Track, I was dying to watch the Spielberg classic Jurassic Park (1993), and now I really want to pet a real life dinosaur. Let's just say that this film is not exactly encouraging making a park filled with dinosaurs that could literally kill you just out of clumsiness let alone bloodlust, but honestly even though you would probably get eaten within seconds, it still sounds like a fun vacation idea. Anyone wants to sponsor my research?

I have got to say, I thought that the special effects from a film made 25 years ago would be cringy at best, but they are actually not bad all things considered. The only time it really hits you that this film is a bit old is when the cars display their location in the park and the kids lose their minds over this type of "futuristic technology". And despite the fact that most of the second half is just different dinosaurs trying to eat the humans, it doesn't get boring at all. When you work in a park full of dinosaurs, at least every day is different than the ones before.

If there really ends up being a park in which you can see dinosaurs just roaming around, this film gives some nice tips to make sure no one gets eaten when the dinosaurs inevitably break out.

- First of all, make sure that all the dinosaurs in the park are female, even though they apparently change to male on their own after a while (which is obviously when the problems start to happen).
- Also, make sure to pay your son/the only IT guy in the entire park enough so he doesn't steal you dinosaur embryo eggs and crashes your entire security system.
- Only hug a triceratops when it is ill and shot with a tranquilizer. Don't try to help her, hugs are enough to get her through being poisoned. After which, just leave her, who cares?
- A T-rex' favourite meal is goat. Except for the leg, which it will obviously rather use to scare little kids.
- Those same two kids holding a broken windshield are stronger than the T-rex trying to eat them as a late night snack. Ian Malcom almost grabs some popcorn for this (and so did I).



Jurassic Park is essentially just a petting zoo.

- A T-rex cannot see you if you don't move. Ian Malcom ignores this and grabs a flare light to play fetch with the T-rex.
- Surprisingly, the T-rex also wants to play fetch with the flare light. It does not appear to be good at returning the light though. Room for improvement on the dino's part.
- Sitting on a toilet is highly offensive to the T-rex and she will eat you for it.
- A brachiosaur is like a long-necked teddy bear: you can pet it while it eats the tree your sitting on.
- It was honestly a missed opportunity from Dr. Grant to not ride the brachiosaur out of the park instead of walking, but maybe that's just me.

Finally, this will now forever be my favourite dinosaur joke:

Kid: "How do you call a blind dinosaur?"

Dr. Grant: "What?"

Kid: "A do-you-think-he-saurus?" ■



12 Years: Now or Never?

By Leon Smook

All of us have our own lifestyles and habits. Some people like to take long hot showers, others use their driers each time they do their laundry. Some have a large and tasty piece of meat for each meal, others enjoy flying regularly to their holiday destination. Some people drive their car everywhere they have to go, others get the newest iPhone each year. But almost none of us regularly thinks about the impact these habits have on the climate and our environment.

Now, don't misunderstand me, I am no sustainability god – not at all. And I definitely don't always make the best decisions regarding their impact on the environment. It is difficult to always take the environment into account with every decision you take, especially since there is no direct visible reward. Living a life that has a net-zero impact on the climate and environment is virtually impossible to achieve in this day and age. However, that does not mean that we should not try.

In October 2018, some of the world's leading climate change scientists published a report that showed that we (that is, the entire world population including you and I) only have twelve years left to reduce our impact on the environment and keep the global temperature increase to at most 1.5 degrees Celsius. Twelve years may seem like a lot, but for most of us that is over half our lives. On the other hand, twelve years from now most of us will be only a few years into their working careers.

Twelve years seems even shorter if you realize that some of the most influential people value their own gain over the fate of our planet. Some leaders of large countries have openly stated that they do not see climate change as a priority, and as a result they try to minimize any effort to reduce their environmental footprint, especially if it increases their popularity. Even worse, many of these

influencers have been elected only a short while ago and may remain in power for the coming six years. Imagine the damage that then may have to be reverted in six years from now!

However, there are reasons to be hopeful. The Chinese government has passed legislation that will motivate industry to reduce their environmental impact. With about one sixth of the world



population living in this country earning about 20% of the world GDP (source: Statista 2018), this can be considered a significant step in the right direction. Moreover, the topic of sustainability has gained some traction due to for instance the zero-waste movement. Consumers are finding topic increasingly more important as well, giving the need for large companies to start doing better, so as not to fall behind the competition.

With only 12 years left, there is no time to lose to make changes. Therefore, I would like to implore you to consider your options, keeping the environment in mind. Is it really necessary to have a big chunk of meat for dinner? Do you really need the latest iPhone even though your current phone is performing fine? Do you really need to take a 30 minute shower? Do you really want to eat that delicious mango when you can have an apple instead? If everyone would just ask themselves these questions before making a decision, then maybe, maybe, we can collectively change our habits before it is too late. ■



Past Activities

By Eline Uiterweerd

In the past few months, quite some activities have been organised by H.V. Ockham's several committees! Here follows an overview of what our members have been doing, or what you might have missed.

Constitution Drink 10th Board

On Friday, September 21st, the new board was celebrated in the Stek (Bastille). Despite the fact that there were no fridges to cool the beer and we had to improvise by putting the beers in to buckets of ice water, we had a festive afternoon. Not only were we visited and congratulated by some fellow study associations from the UT, but even our sister association NSHV (Nijmeegse Studenten Honours Vereniging) joined the party! What some people probably remember is that some happy little mistakes were made by our (slightly drunk) pedellen. Both our chairman and our pedelstaf were stolen and we might just have slightly damaged one of the walls of the Stek. Nevertheless, it was a great afternoon!

Second Monday of the Month Drinks

Speaking of drinks: our SMOTM Drinks organised by the DriCie were once again a great success! Something worth mentioning is that, after a few months of uncertainty, we finally found a new location for our drinks: MBasement (behind Educafé). In November, we had our very first drink in MBasement, which was celebrated by unlimited free beers and soda for all members. People were very enthusiastic, and we saw many new faces. If you're a new member of H.V. Ockham, then definitely come join us during our drink in the bachelor intro weeks to get an impression of what these SMOTM Drinks are like!



Dies of H.V. Ockham

On November 21st, we celebrated our Dies Natalis with a fun activity: Ocktoberfest! (mind the pun). The ACCIE had prepared an awesome scenario: imagine waking up from a coma, three weeks after you went to the Ok-

toberfest. The police tells you that, in the night that you passed out, a crime was committed. You are one of the suspects and have to come up with a solid alibi to prove that you are innocent. The problem: you have no clue what happened that night! Throughout the Citadel, teams of 4 people could find all kinds of hints in the form of minigames and thus reconstruct what happened. Of course, we ended the night with a drink and a chat in the Ockham Room.

Miko's lunch lecture

Miko Elwenspoek, our honorary member and retired dean and founder of Honours at the UT gave a very intriguing lecture about "How We Think the World Is, and How We May Be Wrong" on the 29th of November. Through a short quiz, followed by descriptions of general trends in the world, he exemplified that even here at the uni, and amongst Honours students and teachers, most people were unaware of the situation in the world, regarding things like women's rights, poverty, crime, terrorism, literacy, climate change and so on. In the end, Miko showed that most of us got a lower score on the quiz than a chimpanzee!! (Note: our cousin relied on pure guesswork)



Ice skating

Just before the holidays on December 18th, the ACCIE organised their traditional December activity: ice skating! With a small though enthusiastic group, we went to the IJsbaan Twente at Kennispark. Although some people skated better than others, it is safe to say that everybody had a great night on the slippery ice! ■

Do you want to join our upcoming activities, or perhaps even help organise some? Take a look at the back of this magazine or ask one of the board members!



Ockham's Pizza Taste Test

By Saumitra Athlekar, Saskia Helmich, Leon Smook, Marie-Laure Snijders and Eline Uiterweerd

Every student has been in the situation that they are hungry, in need of food, and not willing to cook. One common solution is then to order pizza. However, the pizza quality varies significantly depending on where you get your pizza. Therefore, the taste test team of Ockham's Razor as saved you the time, money, and disappointments of finding the perfect pizza. In this test, a team of culinary (not!) experts reviewed seven pizzas from six different locations. The pizzas reviewed are the "Margarita" from the Coop (brand: oké); "Peperoni" from Mario's; "TVOH pepperoni pizza" from New York Pizza; "Perfect Pepperoni" from Dominos; "Salami" from Elat Roma; "Pepperoni" and "Margarita" from Turtles. All pizzas were evaluated on price, delivery time, presentation, and taste.

Without further ado, let's get to the scores. On the **seventh place**: "Margarita" from the Coop. This cheap, tomato-y pizza is the perfect match for students without any sense of taste or on a very tight budget. Paying less than €1 for an entire 'pizza' gets you exactly what you pay for. It takes only 13 minutes to prepare, but you do have to buy it yourself before the Coop closes. All in all, this food contraption will definitely provide you with some nutrients (we hope), but is definitely not worthy to be called pizza.

Coop (oké) Margarita	
Price: €0.94	
Delivery cost: -	
Preparation time: 13 minutes	
Delivery time	4.7
Presentation	1.7
Taste	1.6
Overall score	2.1/5



Coop, how dare you call this pizza?!

Marios pepperoni pizza placed **sixth**. This "green and ugly" pizza came with surprise toppings of jalapeño peppers. The excessive use of vegetables on this pizza made this pizza not very appetizing to look at. Some people in our panel were even to scared to taste it. In summary, this pizza was a little bit more spicy than the others, but horrendous as a whole. Combined with a delivery time of almost one hour, this pizza is definitely not worth the wait.

Marios Pepperoni	
Price: €8.50	
Delivery cost: €2.00	
Delivery time: 59 minutes	
Delivery time	1.0
Presentation	1.6
Taste	3.0
Overall score	2.2/5



Yuck, vegetables.

On the **fifth place**, we find the New York Pizza TVOH pepperoni. This pizza is perfect for gamers that do not need to share as this pizza falls apart when someone tries to share. Moreover, this pizza has a weird sweet, slightly burnt and anis-seedy taste. With its sweet dough and impeccable presentation, this pizza is the first in line to score a sufficient mark.

New York Pizza TVOH Pepperoni	
Price: €7.99	
Delivery cost: -	
Preparation time: 34 minutes	
Delivery time	3.6
Presentation	3.4
Taste	2.0
Overall score	2.8/5



Sooo sweet and greasy...

Dominos Perfect Pepperoni comes in on the **fourth place**. This pizza may as well have been delivered by drone, as it arrived only fifteen minutes after ordering. Despite its greasiness and not so crunchy crust, this pizza showed an excellent balance between cost, taste and delivery time. Overall, this pizza scored a more than sufficient mark.

Dominos Perfect Pepperoni	
<i>Price: €8.95</i>	
<i>Delivery cost: -</i>	
<i>Preparation time: 16 minutes</i>	
Delivery time	5.0
Presentation	3.4
Taste	3.9
Overall score	3.6/5



Well, at least the delivery was fast.

In **third place**, we find the Salami pizza from Elat Roma. This pizza arrived within a reasonable time after ordering. It is very sharable and has a great value-to-cost ratio. Despite it having a little too much cheese and slightly burnt edges, its overall taste is pleasant and the well-cut slices make it a perfect pizza to share.

Elat Roma Salami	
<i>Price: €7.00</i>	
<i>Delivery cost: -</i>	
<i>Preparation time: 34 minutes</i>	
Delivery time	3.5
Presentation	2.8
Taste	4.0
Overall score	3.7/5



CHEEEEEEESE!!!

In **second and first place**, we find pizzas from Turtles. These pizzas were delivered in a reasonable thirty minutes. It is properly boxed and was the largest pizza during this test. The pizzas were rather salty and relatively cheap, although it needs to be mentioned that Turtles has a minimum order of €10, which makes that it is not possible to buy one single medium-sized pizza. In the end, the cost-to-value ratio makes that the margarita comes out on top compared to the pepperoni.

Turtles Pepperoni	
<i>Price: €6.99</i>	
<i>Delivery cost: -</i>	
<i>Preparation time: 33 minutes</i>	
Delivery time	3.5
Presentation	3.5
Taste	4.0
Overall score	4.1/5



Omnomnom.

With these pizzas, we come to the end of this taste test. It is important to mention that none of the pizzas were sponsored and all companies were unaware that their pizzas were ordered for a taste test. All scores were the result of the opinions of our test panel, and the final scores were based on the entire pizza experience from ordering to eating the pizza. With this taste test in mind, you should never be disappointed by a pizza again. ■

Turtles Margarita	
<i>Price: €6.49</i>	
<i>Delivery cost: -</i>	
<i>Preparation time: 33 minutes</i>	
Delivery time	3.5
Presentation	3.5
Taste	4.0
Overall score	4.3/5



The winner of the test!

10^{46} Watts and Invisible Bacteria: Speculation in Science

By Guido Ritsema van Eck

In 1963, Russian astrophysicist Nikolai Kardashev was assigned to study several quasars (a type of black hole which emits various kinds of radiation due to the collapse of surrounding gas clouds) in the Soviet search for extra-terrestrial intelligence. Based on cosmic background noise and the relation between transmitter power and the rate of information transfer, Kardashev tried to estimate what the frequency spectrum of extraterrestrial radio messages might look like. Kardashev's conclusion was that the emission spectra of his quasars strongly resembled the optimal interstellar broadcasting spectrum. Remarkable as that was, however, one of the by-products of his research was just as interesting: in order to estimate the power available for broadcasting, he developed a categorisation system for hypothetical extraterrestrial civilisations.

His system, often called the Kardashev scale, divided advanced civilisations into three categories, based primarily on their energy consumption. A type-1 civilisation, or planetary civilization, would be one that harnessed most of the energy available on its planet – primarily, the incoming radiation from its parent star. A type-2 civilisation would be able to capture most of the total energy output of its local star – Kardashev himself gives the example of a “Dyson sphere”, a megastructure built around the star for the purpose of energy capture. Finally, a type-3 civilisation would be one that has scaled type-2 technologies up to large parts of the galaxy (Kardashev, 1964).

Although its only intended use was to estimate available power, the Kardashev scale has sparked much discussion about proposed extensions and alternative metrics of technological advancement. For instance, Carl Sagan has proposed extending and interpolating the scale, with each level representing 10 orders of magnitude. Although neither Kardashev nor Sagan explicitly acknowledged it, this allows for the idea of a Kardashev-4 civilisation, which would have roughly 10^{46} W of power at its disposal. Now, while a survey based on the expected relation between radio emissions and waste heat (detected as infrared radiation) concluded that

Kardashev-3 civilisations are extremely rare or completely non-existent in our local universe (Garrett, 2015), a Kardashev-4 civilisation might be almost impossible to detect even if it was right under our nose. Why is this? The total energy output of the observable universe is estimated to be within a few orders of magnitude from 10^{45} W. In other words, a Kardashev-4 civilisation would have mastered an appreciable fraction of all energy in the observable universe; if such a civilisation existed, it is conceivable that their works would be indistinguishable from the laws of nature to us (Galatai, 2004).

Closer to home, and on a much smaller scale, we find another interesting piece of speculation: the shadow biosphere. Since microbiology mostly detects organisms based on certain biochemical elements, it is argued, complete kingdoms of micro-organisms could remain unnoticed if their chemical make-up differs sufficiently from that of other life. It is generally assumed that a shadow biosphere would consist of ‘living fossils’ from an early stage of the history of DNA-based life, or even from a different evolutionary origin. For instance, RNA-based life-forms could exist without ribosomes, the molecular machines responsible for the replication of DNA, which are commonly used to detect and identify micro-organism. Additionally, the idea of RNA-based

life as a precursor to DNA-based biochemistries is fairly well established in evolutionary history, lending further credibility to this specific example.

An example of the shadow biosphere came to relative prominence in 2010, when NASA-associated biologists reported isolating a strain of bacteria, named GFAJ-1, capable of incorporating arsenic in its DNA in the absence of the phosphorus used by other lifeforms (Wolfe-Simon, 2010). A news conference was subsequently announced by NASA, claiming a discovery that would impact the search for extraterrestrial life. Admittedly, the possibility of alternative biochemistries would expand the range of conditions under which life might exist. However, the NASA conference itself was met with backlash for the sensationalistic announcement, and the biological study itself quickly came under intense scrutiny. Later studies on the GFAJ-1 strain revealed that arsenic-based DNA was, in fact, chemically unstable, and the bacteria could survive in arsenic-rich environments because its biochemistry was fine-tuned to prefer phosphorus over arsenic even at very low concentrations (Elias & Tawfik, 2012).

Although they are hypothetical, both the Kardashev scale and the shadow biosphere illustrate what blind spots in our knowledge may look like: a Kardashev-4 civilisation might be indistinguishable from the background of the universe, because it would operate on the same scale as that background. On the other hand, the idea of a shadow biosphere shows us how the methods and definitions we use may limit us: if we look for life based on specific chemistries, all life we find will conform to those chemical structures. This is the value of speculation: when used properly, it can show us the outlines of what we cannot know. However, it is important to remember that it is not a puzzle piece to be inserted wherever it fits a gap. ■

Humanity on the Kardashev Scale

So where does all of this leave humanity on the Kardashev scale? Based on Sagan's extension of the scale, humanity currently ranks at about 0.72 (compared to 0.7 in the 1970's). Note that this makes the scale logarithmic, so a revolution in energy production would be needed to attain a Kardashev-1 rating within the foreseeable future. Additionally, sustaining Kardashev-1 levels of energy consumption requires the development of advanced solar technology almost by definition.

Bibliography

- Elias, M., & Tawfik, D. (2012). The molecular basis of phosphate discrimination in arsenate-rich environments. *Nature*, 134–137.
- Galatai, Z. (2004). Long Futures and Type IV Civilizations. *Periodica Polytechnica Social and Management Sciences*, 83-89.
- Garrett, M. (2015). The application of the Mid-IR radio correlation to the G^A sample and the search for advanced extraterrestrial civilisations. *Astrophysics of Galaxies*.
- Kardashev, N. S. (1964). Transmission of Information by Extraterrestrial Civilizations. *Soviet Astronomy (transl.)*, 218-221.
- Wolfe-Simon, F., Blum, J. S., Kulp, T. R., Gordon, G. W., & Hoefl, S. E. (2010). A Bacterium That Can Grow by Using Arsenic Instead of Phosphorus. *Science*, 1163-1166.

JOIN H.V. OCKHAM IN THE

HONOURS KICK-IN

JOIN AND MEET YOUR FELLOW STUDENTS!

MON 11/02: SMOTM Drink and Pubquiz

20.30 - 00.00 | Borrelruimte MBasement (behind Educafé) | Free entrance

THU 28/02: Pooling with ACCIE

20.30 - 23.00 | Snooker- en Poolcentrum Enschede | €2,-

TUE 05/03: SympCie Dinner: To Learn or Not To Learn?

17.45 - 21.00 | Citadel T300 | €3,- (including dinner)

MON 11/03: Committee Market

18.45 - 19.45 | Ravelijn Atrium | Free drinks and snacks!

MON 11/03: SMOTM Drink

20.30 - 00.00 | Borrelruimte MBasement (behind Educafé) | Free entrance