Francken abroad
Moving to Paris

Mystery Piece
Big brother

Inside view
Marcos & Antonija

Francken Vrij

28.1 Pressure

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Editorial
Francken Vrij has reached a new high this year by being the biggest Francken Vrij committee ever. With ten motivated editors we were able to divide the pressure, keeping more space for our creativity resulting in a unique magazine. With the next edition already starting to take form we will work on expanding the magazine even more. A sneak peek into the next edition: you'll gain insights into the potential financial advantages you could receive by maximizing your Francken membership and even rumors of the return of our committee mascot Bob. We hope you are excited for next editions and have fun reading about cutting edge research and entertainment!

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Chair's Preface

By Ciska van Elsberg

Why would I be writing this piece while spending my weekend at Francken, you may ask? Well, it is all because of our beloved almanac, and as the new chair, I feel the weight of expectations pressing on me to ensure it is completed. Luckily, being at Francken has provided me with some inspiration, especially when I look at the static tile with the words 'Oost West, Asbest,' which has taken on a whole new meaning for me. You see, we have had our fair share of encounters with asbestos, including the unexpected freefalling beamer incident which got me saying, hè what?! But it's all part of the unique Francken experience. In addition to that, it's also about the incredible bond we share as Francken members, whether we are gathering in the Franckenroom, University Library, Duisenberg building, or any other study spot. With the absence of klaverjas and affordable beer due to the room closures, perhaps people will now focus more on their studies and pass all their exams with flying colors.

Now, this is the first piece I am writing as the President of our association, so there is a bit of pressure to do it justice. The theme of this edition is pressure, and it is something we all experience, albeit in various forms. There is the physical pressure, like when a beamer falls from the ceiling, and then there is the peer pressure, urging us to make the most of our time at Francken. But perhaps the most common type of pressure is the academic kind, where we are expected to excel in our studies while balancing all the other aspects of our lives, even when everything seems unclear. Striking that perfect balance is a challenge we all face, much like the feeling of being half-alive in the whirlwind of activities.

So, as we navigate this year, let's keep embracing charming moments, and finding our own unique experiences that make us love Francken, even amidst the pressure and occasional confusion that life brings.

News of the Association

By Hannelys Posthumus

The time has come for me to write the first 'News of the association', meaning this will also be the first Francken Vrij released during the board year of Freefall. I must say, I am under some pressure when writing this because just like my predecessor, I started to write this during the Francken Vrij layout weekend. Anyways, the committees and the board organised some fun activities under some healthy pressure during the first five months of my board year, so hopefully you'll enjoy this summary of fun!

Pientercamp

Before starting with the pressuring academic life of making homework, handing in assignments and studying for exams, there was the beloved Pientercamp with all three associations Sirius A, FMF and T.F.V. 'Professor Francken'. Here the Pienter committee organized some activities for the first years with the help of the parents, general crew and the cooking crew. This included a treasure hunt (which turned out to not be a treasure hunt), a sports tournament which included frisbeeing and hula hooping, and, of course, there were a few games of the infamous game Vlaby, where the first years as well as the crew were very excited to get covered in vla.

Introduction week
During the first week of the academic year board Freefall organized various activities for first years for them to get to know the beauty of Francken. The first Monday started with the traditional free toasties during lunch, and this is also how the introduction week ended on Friday. In between those days, a Pub quiz was held on Monday in the ACLO bar together with Sirius A and FMF for first years to get to know Groningen, student life, academic life and of course, the three study associations. On Tuesday Francken organised a Crazy 39, where first years had to do challenges to win amazing prizes. I can say that some people within the Francken board are now engaged with first years because of those challenges. The last introduction activity was a free lunch by the pond on campus with Applied Physics students and their mentors. All in all, it was a fun week and the first years felt a little bit more at home by the end of the week.

Start of the year BBQ
Following up on this, there was the start of the year BBQ, where people showed up in large numbers. This was expected because next to the delicious (vegetarian/vegan) meat, there was great company and ice cream from the Ijscowboys. Board Freefall took a lot of time to set up party tents because sadly the weather forecast was not very promising. However, it started raining only after all the food was finished and we migrated to the Francken room for a little drink. It was as if the pressure of the clouds wasn't big enough for it to start raining so we could have a rain-free barbecue!

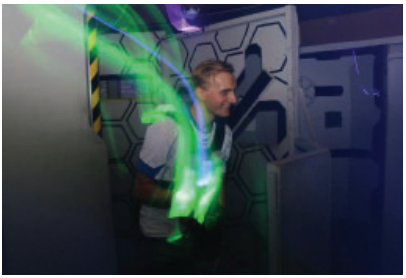
Francken Friday Lecture
The first Francken Friday lecture of the academic year. Here Vasista Adupa introduced us to how they used molecular dynamics simulations to determine how a certain protein can be used as a shield against neurodegenerative diseases.

Karakterborrel
During the first Karakterborrel of the year, we experienced some good old fun with some drinking and dancing, and outside of

the Brouwerij, games were played. We also sang our Chair Ciska a happy birthday song, because it was her birthday!

Bingo night
Fraccie organized their first event, which was a nostalgic bingo night. Not only bingo was played, but also some sideline games. There were some false bingo's. Luckily peer pressure took care of the false bingo'ers that had to endure the consequences.

Target laser gaming
Sportcie organized their first event, which was the successful laser gaming. Everyone was highly enthusiastic and competitive. This caused a heat flow and therefore the air pressure got higher, meaning everyone came out of the lasergame room really sweaty. Thanks to the Fotocie, some cool artsy pictures became available showcasing the great vibes during laser gaming.



Karaoke borrel
On the 10th of October Borrelcie organized their first event where people screamed their lungs out while singing their favourite songs. As you know we are an international association, and this showed since there were a lot of songs in different languages and even different accents, including Dutch, English, Slovakian, Hindi, German and my personal favourite, Frisian. A lot of bonding between members also occurred when singing 'Het Gras van het Noorderplantsoen'. It was heartwarming to see people sing their favourite songs and definitely worth it to organise again.

Dies Natalis
The Dies Natalis started the day before the actual birthday of T.F.V. 'Professor Francken' when the Fraccie initiated making a video continuing the legacy of the lustrum committee from nine years ago. The video turned out to be very successful as well as the Dies Natalis, which started in the the morning with a cake that had a picture of Jan Carel Francken on it. In the evening a Dies party was held in café Dorst?! There was a spooky vibe as the theme was Franckenstein. Everyone dressed up accordingly and the Dies Natalis of the association was definitely well celebrated.

Intermediate GMA
On the 17th of October, the I-GMA took place and the board discussed some important matters concerning the progress of the association. The GMA had some useful input for the board to work on. Importantly, Christian presented his final settlement,

Fusion presented their Annual Report, and both of them were approved by the GMA. Lastly, all members of Fusion were discharged as board members and the GMA voted in favour for them to become permanent members.

Teqram excursion

On the 19th of October, a group of 26 Francken members headed to Zwolle for an introduction to TME, which is a company that designs and builds equipment for the offshore, bulk, asphalt and concrete industry. After that, we got an introduction to Teqram, which is a vision-guided robotics company, used for processing steel, and a tour through their working space. Some attendees also exchanged contact information with the company so I think it's safe to say that it was a success. After the excursion, we headed back to Groningen and enjoyed dinner together at Italia.

Confusion at the Intermediate General Members Assembly

Inside view

By Antonija Grubisic-Cabo & Marcos H. D. Guimarães

Under (No) Pressure

Pressure plays an important role in many parts of our daily life, even if we don't often think about it - of course, here we refer to the physical concept of pressure. From the simple act of breathing, to regions of high and low pressure (bringing all that wind to the Netherlands), car tires and engines, vacuum cleaners, the delicious beer Gebouw 13… Examples of pressure are all around us - and we are also always under (the atmospheric) pressure. Clearly pressure plays an important role in our life, but so does no pressure, or vacuum.

Low pressure (vacuum) systems play an integral role in the study and fabrication of new materials and devices. Without them, we would not have computers, smartphones, or any electronic device. Our society would certainly be much different.

But what is vacuum and how do we produce it?

If you go to Wikipedia and search for "vacuum", it will tell you that vacuum is a space devoid of matter [1]. In reality, it is not possible to create a perfect vacuum with absolutely no matter in it, and what we encounter most of the time is a partial vacuum - a region of space where pressure is significantly lower than the atmospheric pressure. We distinguish between different levels of vacuum, where, the higher the vacuum is, the lower the pressure. Vacuum is usually measured in millibar, and for comparison, atmospheric pressure is 1013.25 mbar.

Vacuum Level	Pressure [mbar]
Rough or Low	1000^{-1}
Medium	$1 - 10^{-3}$
High	$10^{-3} - 10^{-8}$
Ultra-high	$10^{-8} - 10^{-11}$
Extreme-high	$<10^{-11}$

Table 1. *Different levels of vacuum and corresponding pressure ranges.*

Different vacuum levels are important for different applications, and the way we achieve them differs significantly. For each level of vacuum we need a different type of vacuum pump, with different working mechanisms, Figure 1. Before discussing different pumps, we will do some general introduction to the theory of vacuum and gas flow.

As we said earlier, vacuum is a region of empty space (or region where pressure is significantly lower than the atmospheric pressure). While it is simple to remove solid and liquid objects from a vessel, which we will call a vacuum chamber, we also need to remove all of the gas molecules - and that is the main role of vacuum pumps. In order to know pumping efficiency, we will first define the flow of gas - because the faster we remove the gas, the faster we will achieve the vacuum we desire. The gas flow rate Q can be defined as $Q = \frac{d(pV)}{dt}$, where p is pressure, V is volume and t is time.

Using the ideal gas equation $Q = k_B T \frac{dN}{dt}$, where k_B is Boltzmann constant, T is the temperature, and N is the number of gas molecules. From this, we can see that the flow rate corresponds to the flow of particles. Therefore, we can use flow rate to describe removal of molecules from the system: $-\frac{dp}{dt} = p\frac{S}{V_c} - Q_0$, where Q_0 is the incoming flow of particles, V_C is the volume of the vacuum chamber we are trying to empty of gas, and S is the pumping speed (usually measured in m^3s^{-1} or litres per second). In the limit where incoming particle flow can be neglected, the pumping-down of the system can be described from: $p(t) = p_0 exp(-\frac{S}{V_c}t)$, where p_0 is the starting pressure. This exponential behaviour is found in the initial stages of pumping down, but as the pumping efficiency of a vacuum pump depends on the pressure, it usually decreases when pressure goes down. Pumps are defined by not only the pumping speed, but also the lowest achievable pressure, and different types of pumps perform well in different gas flow regimes (laminar vs molecular), so in order to achieve very low pressures, we will need to use a combination of several different pumps, Figure 1.

How do we know when we have different flow regimes? From the kinetic gas theory: $\lambda = \frac{k_B T}{\sqrt{2}\pi\xi^2 p}$, where lambda is the mean-free path of the gas molecules and xi is the molecular diameter. Knowing this, different flow regimes can be defined by the ratio of the vacuum chamber diameter, d, and the

mean-free path. In the case of lambda<<d we are in the viscous flow, and lambda >>d we are in the molecular flow.

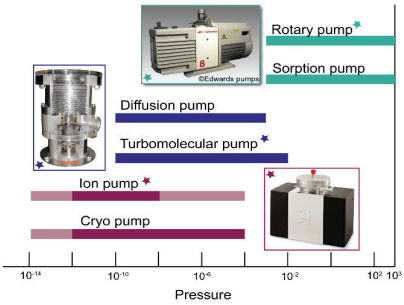


Figure 1: Means of achieving different vacuum levels.

The simplest type of a pump is a rotary pump, used to create rough to medium vacuum. This pump does not actively "suck" the gas out of a vacuum chamber, instead it relies on the fact that the gas tends to distribute uniformly within the space it occupies, and due to this some gas will enter the pump, and get removed. Then the rest of the remaining gas distributes again, and slowly, lower pressure is achieved. As this pump relies on the distribution of gas in the chamber, it will work well in viscous flow regime where the chances are high for the gas molecules to enter the inlet of the pump, but will not work well in the molecular flow regime. This is the factor limiting the vacuum level (10^{-3} mbar) which can be achieved with a pump like this. In order to achieve lower pressures, we need to use other pumps, in combination with the rotary pump.

High and ultra-high vacuum (UHV) is typically achieved by combining a rotary pump with a turbomolecular pump (or turbo pump). This vacuum pump works in a similar way to the pump in turbocharger engines in cars and turboprops in planes. The turbomolecular pump has a large, short inlet connected directly to the vacuum chamber, which increases chances of gas molecules entering the pump. Once inside the turbo pump, gas molecules encounter fast rotating blades that kick them and provide them with additional kinetic energy. The blades are angled towards the exhaust of the pump, effectively pushing the gas out. Using this combination of pumps, one can reach pressures in the low 10^{-10} mbar to mid 10^{-11} mbar range. These are pressures comparable to the pressures in outer space! Even lower pressures are achieved by adding additional pumps, such as ion and cryo pumps. These pumps are both "passive", in a sense that they do not remove the gas molecules outside of the chamber, but rather bind it onto their surface.

Beyond just the type of pumps, we also need to take care that we use the correct materials for our vacuum system. For high and ultrahigh vacuum regions, one should only use materials that have low vapor pressure (low probability of mate-

rial evaporating) such as stainless steel and special ceramics. Extreme-high vacuum is even more demanding, and you need extra pumps and special ways of preparing materials. But why do we try so hard to achieve such low pressures?

Why is vacuum important for research?

During lectures we usually treat isolated systems. We study an electron trapped in a quantum well, a metal rod which has one side hotter than the other, or maybe a pendulum going back and forth (with no friction, of course). That's sometimes the reason why engineers make fun of physicists: "When will you ever encounter such a situation?!" Lo and behold! We put the pendulum inside a vacuum chamber!

The fact that we can isolate the system we are studying from the interaction with the environment makes the problems much easier to solve, and highlight the important physical phenomena at play. It allows us to understand the Hamiltonian of the system, for example, and write it down in a simple way. Imagine if we had to add 10^{23} other molecules to the Hamiltonian of our poor electron in the quantum well. It would be impossible to work with!

In fact, there are whole research fields that would not be possible without vacuum. A branch of physics that studies surfaces of materials and processes happening on it - surface science [2], depends strongly on the possibility of creating ultrahigh vacuum. It would be very difficult to study the surface of a system with a lot of water and gas molecules constantly being deposited on top of it, and with so many things on top, would it even be a surface still?

The study of new "quantum materials" also strongly depends on our ability to make vacuum. The pesky water and gas molecules tend to interact with the materials and destroy any kind of quantum effect we are trying to study. Additionally, we also need to cool down the systems to temperatures close to absolute zero, sometimes around 4 Kelvin, sometimes even lower, down to 0.01 K. At such low temperatures, all gasses will condense or solidify on top of our system and we would really prefer that this wouldn't happen. Think about the interaction between our quantum system and a layer of liquid nitrogen or oxygen deposited on top of it. Not really ideal!

Vacuum for growth of materials and electronic device fabrication

Vacuum technology is paramount for our modern lifestyle. Electronic components rely on the deposition of thin metallic and insulating films on top of surfaces, and our techniques to do that need a good vacuum.

On your way to the Francken room, in building 13 of Nijenborgh 4, you might pass by a clean room in the corridor of building 12. This is the room with big glass windows and some people inside dressed funny, almost like they are preparing to go to outer space. Looking through the windows you can see many vacuum chambers used for deposition of metallic thin films. These are machines very similar to the ones used in industry for the fabrication of electronic chips. One machine uses an electron beam to heat up metals which evaporate (or sublimate) and deposit on a sample held nearby, this machine is known as an e-beam evaporator. There you can also find a sputtering machine, which uses low-pressure argon ions to sputter a metal target, creating a thin metallic layer on top of the sample. All these machines are big stainless steel chambers in which we pump to (high) vacuum so we only deposit the materials we want, and keep their high purity.

Vacuum is also needed for growing materials. Two-dimensional materials, like graphene and molybdenum disulphide, can be grown using techniques like chemical vapor deposition (CVD) or molecular beam epitaxy (MBE). These techniques are capable of growing large crystals or even a single atomically-thin layer on top of substrates which are several centimeters in diameter [3]. Well, a key thing is that vacuum allows us to grow very clean, pure materials – after all, vacuum is (mostly) empty space, so there are no impurities that could end up incorporated in the material you are growing. For this reason, the growth chambers are usually in ultrahigh vacuum or at least low vacuum, with a residual pressure given by an inert noble gas, like argon.

In the world of applied physics, we've learned that where there's a vacuum, there's innovation. From high-tech labs making and studying new materials, to the humble vacuum cleaner. So, here's to the unsung hero of science and technology – the vacuum, proving that in science, sometimes the coolest things happen in the emptiest spaces. Who knew that the key to progress was in the art of sucking?

References
[1] https://en.wikipedia.org/wiki/Vacuum
[2] Philip Hofmann, Surface Physics: An introduction, version 1.4 (2016)
[3] X Xu, et al., Advanced Materials 34, 2108258 (2022)

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We participate in programs of Bachelor and Master levels in the field of Physics and Chemistry. But, since it is our mission to train a new generation of researchers in cross-disciplinary approaches to research and equip them with the diverse skills required by modern science, we have initialized programs breaking the traditional boundaries between disciplines like e.g. the interdisciplinary Top Master program Nanoscience and the High Tech Systems and Materials Honours Master, which tackles real-life product development challenges in the same interdisciplinary fashion.

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Life after Francken

By Jeanne van Zuilen

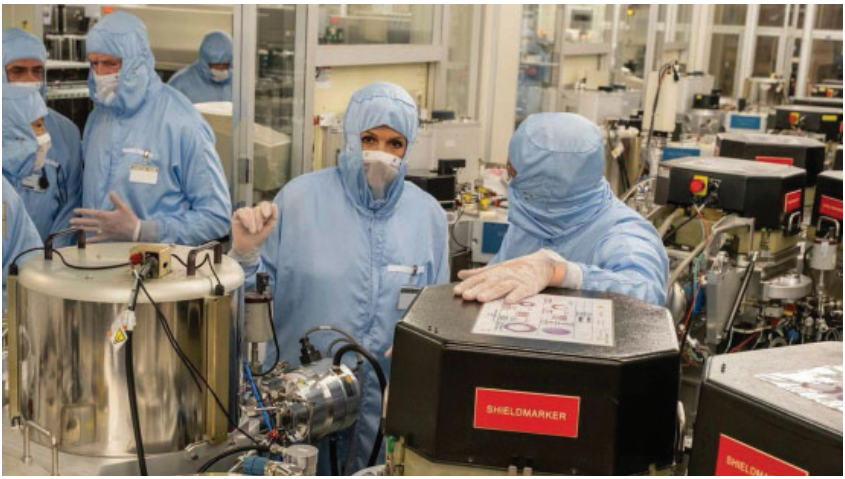
I am writing this from my couch in Doetinchem, where I did not expect to be after my studies. In 2016, I barely passed my exams and moved from Doetinchem to Groningen to study Physics. I quickly came in touch with Francken because of the free toasties. Before I tell you about my job as a process engineer metallisation for NXP Semiconductors, I will tell you a bit about my life while I was active at Francken.

While eating a toastie, I signed up for the Sjaarscie and from there completely rolled into the "Francken life". I was part of several committees before I became a board member in 2018 as the Commissioner of Internal Relations of board "Statisch". After my board year, I moved in with the Braumeister and Lars. The brouwcie set up the brewery in my home and we produced about 500 liters of amazing beer that year. The committee even starred in a video which has, at the moment of writing, 694 views on YouTube!

Next to brewing all that beer I continued my studies in Applied Physics. The observant reader has noticed that I started with Physics. However I switched to Applied Physics at the end of my first year, partly as a joke (Grolschie tegenbestuur 'Vo), partly because many VrijMiBo lectures showed me it is the more interesting side of Physics. In 2020, for my bachelor thesis, I investigated the host-guest interaction of trimesic acid in a porous network. This was done by analysing a pre-existing data set (measurements were not possible because of Covid) of scanning tunnelling microscope data. Even though I did not take any measurements myself, I did fall in love with the technique of the STM. For my master thesis I again joined the surfaces and thin films group of Meike Stöhr, this time to take my own measurements on a low temperature (78K) STM called Bertha.

I did not succeed in producing graphene nanoribbons from 6,12-dibromochrysene on an Ag(111) surface but did accumulate so much (atomic-resolution) data that Koen (my supervisor during the project) is currently trying to publish my thesis. While taking the measurements I gained experience in vacuum technologies and sputtering. Which brings me to my job, where I sputter about eight different kinds of metal on wafers to produce chips. I started working at NXP Semiconductors in October 2022. The deposition of all those metal flavours is done by about 27 machines which are running 24 hours a day, seven days a week. It is hard to image the size of the fab without having been there. I remember during my interview I was speechless after seeing the clean room, which has two levels and currently contains about 500 production machines. One of the great parts about my job is that I can walk into the fab every moment, to either talk to technicians or to run some tests on wafers. The fab is located in Nijmegen and is called "The cathedral" by locals because of its shape. There are about 1500 employees in Nijmegen and we also have a stray cat called Fabricia.

NXP Semiconductors mostly makes chips that are used in cars. For example, our chips are used in airbags, brakes, battery management but also in a car radio. Because these components should never fail in a car, quality is very important in our lab. In order to guarantee the quality of our chips I work together with three other process engineers to monitor the processes on the metal deposition machines. We do this by constantly monitoring several parameters, like the temperature and pressure of the machine chamber, and the resistance and layer thickness of the deposited layers. Part of the wafers we process go to the section defectivity where they lay the wafers under a microscope. When the amount of particles is above the control limit, I get a notification from that



section to check my tool. From the shape and amount of the particles, I determine where (or if) the particles are released in my tool. Depending on the answer we either do a burn-in or open the chambers. Besides monitoring the current processes, I work on releasing new tools for production. Because quality is so crucial we cannot simply start producing wafers on a machine but first have to prove that the chips from that machine are within specifications.

Besides metal deposition, I am also a back-up process engineer on rapid thermal annealing furnaces. These furnaces heat the wafers from room temperature to above 1000 degree Celcius in mere seconds. It is mind boggling to see how much a wafer can actually handle (I have dropped a monitor wafer to the floor and it did not break).

In some processes the wafers starts warping during annealing, meaning the wafer bends and due to stresses released it starts dancing in the chamber. After processing the wafer goes back to its flat shape like it did not just almost break. Very rarely a wafer does break, meaning I get more data for a project in which I am trying to find out if a wafer handling issue somewhere in the fab can be detected from the shape of the breakage.

One of the highlights of the last year was the visit of Queen Máxima, who also went into the cleanroom and even posed with one my tools. The queen visited because NXP Semiconductors won the Koning Willem I price in 2022. Although I did not meet the queen myself, my office had the greatest view on her entry.

You can imagine it was hard to follow the meeting I was in at the moment she arrived…

What makes my job so interesting is that even though this fab has been running for longer than I live, and some of my colleagues have worked here for longer than I am alive, we all learn something new every day. Producing chips is utterly complex and when you think you understand everything about metal deposition, some problem occurs and gives us new insights. If I ever feel like I am finished learning (I do not think that is possible) in the metal section, then there are still many other steps in producing chips that I can learn. There are many more machines than the ones from ASML in a chip fab! As the need for chips is ever growing, especially now that there is a shift to electrical cars, I think I can keep learning the art of sputtering for a long time here. I hope you enjoyed reading about my journey from Doetinchem to Doetinchem. Please do not hesitate to contact me if you have any questions about my job or living in the Achterhoek, I can enthusiastically talk about both for hours.

Members input

By Malo Blömker

Pressure - there sure is a lot of that as a first year. And yes, the first thing that comes to mind is always academic pressure: quickly getting used to the new learning format, attending as many lectures as possible and of course avoiding the infamous negative BSA.

Sure, all that should rightfully be on your mind, but coming into Groningen, it was not academic pressure that was weighing me down but rather the uncertainty in my social life that was building up pressure. The need for friends at any stage in your life can not be stressed enough and coming here to Groningen meant a complete restart.

Now there are many ways in which the university helps first years in this regard, including things such as the mentor group, but I very quickly found that associations such as Francken were brilliant places to meet new people. My first experience was at the introduction camp - PIENTER camp - which Francken helps organise and run with FMF and Sirius A. This along with the pub quiz and the crazy 39 were great opportunities to meet fellow first years and make many friends. It is hard to articulate how important these events were in shaping my life here in Groningen. Furthermore I have now joined the one and only amazing Franken Vrij committee run by the greatest of people. I am very glad to have settled in as well as I have and doing so has taken a lot of pressure off of me.

True or False?

Test your knowledge about ASML

From chipmaking to EUV and from the number of employees globally to next generation machines, discover the most important facts about our fascinating tech company.

The name 'ASML' is an acronym.
FALSE. ASML isn't an abbreviation of anything anymore, though it used to stand for 'Advanced Semiconductor Materials Lithography'. ASML was founded in 1984 as a joint venture between Philips and ASM International, so a name was chosen to reflect the partners in the venture. Over time, this name has become simply 'ASML'.

ASML makes microchips.
FALSE. ASML does not make microchips – we make the machines that other companies use to make microchips. We also don't make the silicon wafers that form the cradle of the chip. Customers such as Intel, Samsung and TSMC use ASML's DUV and EUV lithography systems to print tiny patterns on silicon that has been treated with 'photoresist' chemicals. They also rely on our metrology and inspection systems, together with our computational lithography and patterning control software solutions, to achieve the highest yield and best performance in mass production.

ASML is the only company that makes EUV (extreme ultraviolet) lithography technology.
TRUE. Unlike in the DUV (deep ultraviolet) lithography market, where ASML competes with other top-notch suppliers, ASML is currently the only lithography equipment supplier capable of producing EUV technology. Chipmakers use these EUV systems to manufacture the world's most advanced microchips. In fact, if you own a relatively new smartphone, gaming console or smart watch, chances are you've benefited directly from EUV lithography technology. We spent 20 years developing EUV with our partners and suppliers, resulting in a machine that contains around 100,000 parts. To ship just one of these huge machines to customers requires 40 freight containers, three cargo planes and 20 trucks.

An ASML machine is all you need to make microchips.

FALSE. Making chips is a complex, long and expensive process. Our customers have spent years and invested billions building 'fabs' (fabrication plants), buying equipment and training employees to become experts in the complex field of semiconductor manufacturing. ASML's lithography machines form an important part of a chipmaker's production line, but they are not all that's required to produce microchips. Lithography – printing patterns on silicon wafers – is certainly a critical step in the chipmaking process, but it's just one of many!

ASML is building a new kind of EUV lithography machine.

TRUE. In the semiconductor industry, innovation never stops. That's why we're already developing a next-generation EUV platform that increases the numerical aperture (NA) from 0.33 to 0.55. This means that the optics systems in the new machines will allow light with larger angles of incidence to hit the wafer, giving the system a higher resolution. The EUV 0.55 NA

platform, called EXE, is well on its way to production – we're planning the first shipments of these machines to customers for R&D purposes by the end of 2023, and we expect them to be used in high-volume manufacturing by 2025.

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Francken abroad

By Jelle Bor

La vie à Paris

So far I have spent a year in Paris, and I have another year ahead of me. I am pursuing a, so-called cotutelle, PhD in theoretical physics, meaning that I am jointly supervised. During the first two years, I conducted my research at the Van Swinderen Institute at the University of Groningen, and I am now spending two years at IJCLab at Université Paris-Saclay.

Vous ne parlez pas français? - Pourquoi? To be honest, I was expecting such passive-aggressive remarks from the local bakery personnel when I moved to Paris. This would likely have been the case if I not made an effort to speak their language (meanwhile I have completed a Duolingo streak of over a thousand days). They tend to be quite kind when you make an attempt, but it is no surprise if they correct your pronunciation or give you an intense stare when your message is not entirely clear. I got used to it and it is better to persist in trying, or my French will never improve.

Fortunately, at work, we communicate in English among our immediate colleagues, but when you need assistance from the human resources department for example, one should prepare some French sentences in advance. Another common situation is when someone asks you for directions on the street, such as the entrance to the park. If they notice that you need some time to respond, they often just walk away without an answer and ask someone else. Parisians, in general, are quite impatient, especially in the metro. They will squeeze themselves

into the crowded trains, even when there is clearly no space left and another train will arrive in two minutes. When it comes to food, though, they suddenly have all the time in the world. Everywhere in Paris, you will find long lines at excellent restaurants or Instagram-famous spots, and people patiently wait their turn. One must give them credit; they do have one of the finest cuisines in the world. The best baguettes and the most delightful pastries can already be found just 20 meters from my front door.

Life in a bustling metropolis like Paris is undoubtedly a world apart. Beyond the main tourist attractions, Paris is composed of numerous smaller hubs, often situated near metro stations. Compared to the Netherlands I think its unique that I now have everything available in my street that one might need on a daily basis: five bakeries (where you can also pick up online orders), three supermarkets, two night shops, two barbers, a pharmacy, and much more. Even more essential, there is a fromagerie, a butcher, a wine shop, and three excellent, budget-friendly restaurants to remind me that I am in Paris. A word of advice based on my experience regarding outdoor dining: I recommend avoiding the andouillette. While it may sound like a delightful dish with meat, French fries, salad, and mustard sauce, it is actually a sausage made from various intestines. I gave it a try and regretted it instantly. I had an awful taste in my mouth for three days afterward.

Since then, I have been more cautious about my orders. My favorite go-to French dishes include oeuf mayonnaise, escargots, confit de canard, steak (tartare), and boeuf bourguignon. Additionally, the pizzas here are notably better than in the Netherlands, perhaps due to Paris's proximity to Italy. Another noteworthy detail is that French butter is on a different level compared to what you find in the Netherlands. Part of living in Paris, of course, is becoming a snob. However, once I clearly crossed the line. I asked the baker for a more crunchy baguette, as after paying I noticed that the baguette she gave me was quite white in my opinion. Instead of receiving a replacement, she raised her voice, claiming it was

too late to make such a request, which made me hesitant to return to this bakery for two weeks.

To be honest, in the beginning, I experienced a fair amount of loneliness, but I believe that is common when you relocate to a new city. I directly found a salsa school, which, as some of you may know, I have been practicing for years. This not only provided me with a weekly activity but also helped me improve my French as well. So, my weekdays were occupied with work, and I engaged in some small talk with colleagues during lunch, ensuring that I had my daily social interactions.

However, the weekends were an entirely different story, and I had to keep myself entertained. I began taking long walks to explore the many sights in Paris. Given my interest in art and history, I made it a personal mission to visit a museum every weekend. I captured hundreds of photographs with my camera. In essence, I was playing the role of a tourist in my own city. Nothing wrong with that, but luckily things have changed in the meantime.

While I still occasionally visit museums, I prefer drinking a beer and chatting away with some friends of course. Making French friends proved to be challenging, as I did make an effort but found that they tend to be quite reserved and may not necessarily be seeking new friendships. Dutch people, on the other hand, are more approachable as I discovered. I found out that there is a large community of them, and every first Wednesday of the month, they get together for a drink. It was at these gatherings that I made my first connections outside of work, and I am quite content with the way things have turned out. Moreover, thanks to these new connections, my to-do list in Paris, either alone or with them, has expanded even more rapidly than my weekends can accommodate.

One of the challenges I encountered is the extensive bureaucracy in France. For instance, it took the university three months to prepare my contract, despite them being aware of my stay in France two years in advance. Even then, not everything was sorted out as initially agreed. Another example is the health insurance system. In contrast to the Netherlands, where you can choose

your insurance based on your preferences from various companies, in France, only supplementary insurances operate that way. Everyone has the same basic insurance regulated by the government. If you are born in France or paying taxes, you are entitled to enjoy the sécurité sociale. In practice, this entails sending an extensive number of document copies by mail and waiting for months to receive your so-called carte vitale. It took six months for mine to arrive, but I have heard of even longer waiting periods. During this time, if anything had happened, I would have had to cover the costs myself.

Renting an apartment, opening a bank account, and getting internet set up in your flat gives one nightmares. The sheer volume of French paperwork that needs to be read and signed in both scenarios is overwhelming (no English version available), not to mention the agonizingly slow process to get everything arranged. Furthermore, all these requirements are interconnected, which essentially means you need to hack the system: having one thing often facilitates the arrangement of another.

I began with obtaining a French phone number, as apparently they do not call you back on a Dutch number (I learned that the hard way). As a wise, albeit drunk Frenchman once told me in Teddy's bar (highly recommended to visit when you are tipsy): "It is the charm of France - it keeps life exciting." Somewhere there is a wisdom in that statement, as eventually, everything fell into place. Hopefully, the same holds true for my first tax return next year.

Work in France also presents several notable distinctions. Forget about having your sandwich at your desk; it is forbidden in France. Lunch is typically enjoyed with all your colleagues and takes at least an hour, preferably over a warm meal. Despite the generally high costs in Paris, a notable advantage is that the student canteen offers a lunch for only €2.30. Paris-Saclay is actually quite far from the city. I travel 40 minutes back and forth every day, during which I listen to a lot of podcasts. Four out of five times I need to stand in the metro in the morning, while in the evening I can take a seat but need to fight my way out of the metro as everybody is standing around me. You might think that I should wake up early to begin work at nine, but if you arrive at ten, you will be the first one at the institute. On the other hand, people here typically work until at least seven to make up for it.

The campus is much larger than Zernike and is nestled among woods and hills, creating a stunning environment. The building where I work reminds me a lot of building 13, but it requires even more renovation to make it fully functional. Asbestos, inadequate lighting, a malfunctioning coffee machine, broken toilets, and the like are common occurrences. Once, I had to move my entire office (by myself) to another room due to

a floor restoration, but I doubt I will ever return to my original office. I now work between stacks of tea, wine, soft drinks, and other leftover items from conferences as it appears they have assigned a secondary role to my office as a storage room. One box of jus d'orange is already months past its expiration date, which surprised me, as I thought that drink to be sacred in France. I suppose it is all part of the PhD adventure.

The research group here is larger than in Groningen, which is advantageous for discussions and expertise. However, the most significant difference lies in my supervisor. While my supervisor in Groningen is clear, helpful, and constructive, my supervisor in Paris is a man of action with creative, grand ideas. Both have their advantages, but I sometimes struggle with the chaos that often accompanies the latter. Additionally, bosses in France tend to be more assertive. One particular project progresses more slowly than I would prefer due to all his ideas, but I am confident that in the end it will pay off.

One of the enjoyable aspects of living abroad is that I have had many friends visiting, seeking a free hotel in Paris. It is always delightful, but it should not happen more than once a month; otherwise it becomes too costly on a French PhD salary. I will conclude with a humorous anecdote. Recently, I found myself standing in the metro to work for three days, afraid of touching anything, due to a massive outbreak of punaises de lit (Rosa can confirm). Later the news announced it was fake. Bed bugs have always been a common presence in big cities (not necessarily in public transport); it was some unjustified panic on social media that made even reputable newspapers to amplify the story in the end. Hopefully, this article has offered you some insight into my life as a PhD student in Paris.

C'est tout.

Puzzle

By Prakhar Agarwal:

The theme of this edition is pressure, and so today I decided to talk about one of the most pressured committees in Francken: the illustrious Borrelcie. Every week, this committee fills the fridge (in theory!) but is constantly under pressure from members. For this puzzle, I decided to write a rather short logic teaser exploring the pressure the Borrelcie routinely finds itself under.

An acknowledgement: the format of this puzzle is heavily inspired by Steven Groen's puzzle for the issue 'Intelligence', thank you for making such a fun puzzle Steven!

Introduction

In a parallel universe, the Francken room is separated from the borrelkast by a canal, and for some reason, we have only one boat to cross it. We follow the saga of a Borrelcie member named David.
David is not so lucky, today it is his turn to fill the fridge in the Francken room, but his partner has mysteriously disappeared (for context, there was a borrel last night). Now, David is under great pressure to fill the fridge right, otherwise the members will not be happy! Fortunately, the Francken fridge in this universe only contains 3 things - beer, candy, and Fristis.

The board

When David enters the Francken room, he encounters (the rest of) the board: Ciska, Hannelys, Siem, Liz and Lilly-Anne. David has obtained one piece of important information from the borrel last night, the day after a borrel, the board's behaviour becomes very strange: some of them only tell the truth, and some of them always lie.

To fill the fridge up, David first needs the key to the borrelkast. However, one of the board members has this key, and they refuse to give it up. David must find out which board member has the key in order to proceed to the kast.

David asks questions to his fellow board members:

David: Ciska, are there more liars than honest people?
Ciska: No.

David: Hannelys, is the person with the key a liar?
Hannelys: Yes.

David: Siem, is Ciska being honest?
Siem: Yes.

David: Liz, is Hannelys being honest?
Liz: No.

David: Lilly-Anne, does Liz have the key?
Lilly-Anne: Yes.

David manages to figure out which board member has the key, and now proceeds to the borrelkast.

The boat

David has managed to secure the help of 3 members for his trip across the canal: Bradley, Sibren, and Puck. However, there is a catch: due to the rain last night, David can only bring one item and one other person on the boat at a time.

There is another problem - Francken members cannot be trusted, and in particular David knows that on either side, Bradley cannot be left alone with the beer, Puck cannot be left alone with the candy, and Sibren cannot be left alone with the Fristis. How many trips does David need to make in order to get all 3 items back to the Francken side safely?

The fridge

Last night, an unknown Francken member has decided it would be a great idea to lock up the door to the fridge using a bike combination lock. Since David does not want to disturb the board any further, he figures out the code and enters it. Finally, the fridge is filled!

The code is a 5 digit number: the number of this issue of the Francken Vrij, the number in constitutional order of the board member who had the key followed by the number of trips David needed to get all the items back safely. What code did David enter?

0	0	0	0	0

Note from the editor:

If you want to get a chance to win a prize valued at €20, send your answer to this email: **franckenvrij@gmail.com before the 22nd of December.**

ONTDEK DE TECHNISCHE KRACHT ACHTER LUCHTVAART

Werken bij ***Luchtverkeersleiding Nederland*** *is werken in één van de meest complexe luchtruimen van de wereld. Je vervult een unieke rol en levert elke dag een topprestatie. Van een veilig en verantwoord gebruik van ons luchtruim, tot het verduurzamen en toekomstbestendig maken van luchtvaart. Of je nou luchtverkeersleider wordt, systeemspecialist of maintenance engineer -* ***samen maken we luchtvaart mogelijk****.*

Check het verhaal van lead engineer Floortje

Vind jouw stageplek, nieuwe werkomgeving of meld je aan voor een voorlichting via

www.komwerkenbijlvnl.nl

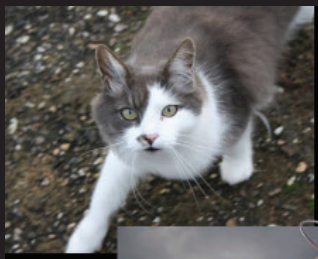
Picture Collage

By Hannelys Posthumus

When thinking about an idea for this column I realised pressure is quite an abstract concept. It is hard to concretize especially when one is not very experienced with art. This is mostly because it has so many different definitions but they are somehow all related. They have a sort of abstract main definition that cannot be easily described by words, art, music, or anything else that has a somewhat descriptive character. That is why I thought: Let's just grab my camera (my mom's camera) and try to photograph everything that slightly reminds me of pressure, or no pressure (meaning: to take a break from all the pressure around us).

In the background, there is a photo of the night sky, taking into account the concept that the difference in physical pressure in certain areas in the universe is quite astonishing. It contains interstellar regions with a pressure with a factor 10^{22} smaller than the air pressure that we are used to on Earth. On the contrary, the pressure within a neutron star is a factor 10^{27} greater than the air pressure on Earth. The pressure within a proton is even higher.

Back to some other forms of pressure. The committee members experienced a lot of pressure during the Francken Vrij lay-out weekend, because every piece had to be layouted. Charlotte also points out (literally) that Hamza takes a break from all the pressure. The rest of the pictures and the illustrations look unrelated, but when you start to think about it they can all be linked to one overarching theme, which is pressure. There are ducks that unconsciously experience group pressure, a train where we had to sit on the ground because it was so overcrowded, a clock, because lots experience time pressure and most importantly a pressure cooker.















gossip rubric

By Charlotte & Marc

Before we get into the latest Francken gossip, we would like to inform you about some devastating events that happened lately. **The passing away of Bob**, our beloved mascott, sent shockwaves through the Francken community. Simultaneously, Building 13 was forced to shut its doors for a week due to asbestos. **Were these two events related in any way?**

Its a long way until Valentines day, but love and attraction is already a hot topic in Francken. A certain older board member is not only good at chess but also with the ladies. When it comes to wining and dining, this old board member is not just adept at budget discussions but also at creating an atmosphere of romance. **Forget about pi; love is the real constant in this equation.**

It seems that first year mathematicians are not only integrating for their homework but also forming romantic integrals with their fellow Francken members. **Who knew math could be this romantic?**

Already passed Thermal Physics? Two of our beloved physicists are putting thermodynamics into action beyond the lecture hall. Move over dating experts, because a certain board member has cracked the code. Word on the street is that she's a maestro at the dating game. Teach us your ways, oh wise one!

What have Francken members been up to? Not only have they been swimming in pools on Tuesdays in the early morning but also **frolicking in lit fountains after dark.**

The **klaverjas addiction** is striking again, and the newbies are falling victim to the irresistible charm. Somebody save them!

Francken Huisje 1 is turning into the headquarters of the treasurers with the third treasurer having moved in. Maybe they can make pie charts together while enjoying a beer or 12. Our previous treasurer also moved lately and threw a door out of the window of his old home! Talk about making a grand exit.

A little birdie told us that PIENTER, once a mere committee within the association, is spreading its wings and daring to go solo! Yes, you heard it right, **PIENTER is breaking free**, evolving, and paving its own path to become a foundation in its own right. Other whispers in Building 13 suggest that Buixie is dropping subtle hints, cryptic messages, and coded clues about the destination. Place your bets now before it's too late!

The Borrelcie went on a wild weekend to Denmark, seeking beer but found themselves beer-less on a Sunday. **And where did that pumpkin for Halloween disappear to?** It's like they missed the memo that borrels require refreshments! The calendar may be packed with social events, but the fridge? Not so much.

Talking about events, hold on to your scarves, dear members, because the temperature might be dropping, but **the heat is definitely rising during this autumn's Members Weekend!**

Short pants may not be the warmest choice, but they will certainly ignite flames of passion among our members. So pack your short pants, brace yourselves for the autumn chill, and let **the seduction games** begin. Members Weekend just got a whole lot cozier and a touch more scandalous.

Tour de Francken might not be free this year, but that sure won't stop members from running around half naked in the outskirts of Groningen. **Who will win and who will return home safe and clothed?** Win or lose, one thing is for certain—the post-tour celebrations are going to be legendary. The Tours aftermath is a time for dancing, laughter, and perhaps a few raised eyebrows. Camiel, were you jogging or running from the chaos?

You know you love this rubric, so see you next time!

XOXO Gossip Girlies

PS: Hannelys and Gerrit are cute

Comic

By Tetiana Ovramenko

Riding the Wave: Francken Dives into the Pressure

Hey Francken fam!

Guess who's back with the scoop on everything T.F.V. 'Professor Francken'? It's your go-to column, and this time we're diving deep into the pressure cooker that is the beginning of the academic year.

First off, have you met the rockstars running the show? Say hello to the Freefall board, the 39th in line and making history with six members. Yeah, you heard it right. Six brains, one mission: to make this year epic. Who said change wasn't a good thing? These guys are shaking things up, and we're here for it!

Now, let's talk about Francken Vrij. The theme this time? You guessed it - 'Pressure.' It's not just about squeezing through exams; it's about the vibe that keeps us going. The pressure cooker of student life, if you will. From tackling assignments to surviving labs, it's the kind of stuff we can all relate to. Professors, we know you're reading this, and trust us, we've got our game faces on.

First-years, listen up! BSA is the name of the game. Forty-five out of sixty ECTs, that's the golden ticket. The pressure is real, but so is the support. We're all in this together, whether we're nerding out over equations or hyperventilating in the library. Let's crush it, guys!

But that's not all. Big news: Francken is on the move! New room, new vibes. Change is in the air, and we're ready to roll with it. Who knows, the new space might just inspire some groundbreaking physics discoveries or, you know, at least a killer study playlist.

As the first block wraps up, it's all about that Francken fam love. Whether you're a seasoned senior or a fresh-faced first-year, we're all in this together. Study groups, parties, and everything in between. This community is the glue that keeps us sane.

So, buckle up, Franckenites! With the Freefall board steering the ship, Francken Vrij dropping truth bombs, and a

new room on the horizon, we're in for a wild ride. Who said physics was boring? We're living proof that it's anything but.

In the realm of applied physics, where pressure isn't just a force but a way of life, T.F.V. 'Professor Francken' is where the magic happens. Here's to a year of discoveries, challenges, and the kind of memories that make us say, "Yeah, we did that!"

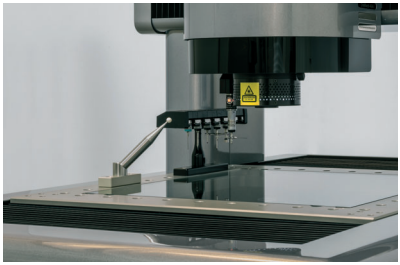
Stay epic, Francken fam. The best is yet to come!

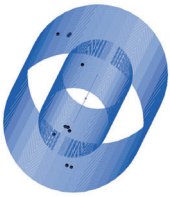
This piece was written by the one and only ChatGPT, with the prompt:

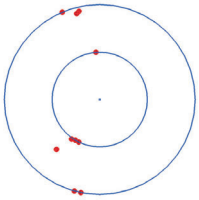
"We are a student association in university of groningen for applied physics and our name is T.F.V 'Professor Francken'. We release a yearly magazine called Francken Vrij and the first edition this year is themed 'Pressure'. We would like you to write a 600-800 word article to be put as a column. Some intresting facts about the associations are: The board is the 39th board and its called 'freefall' they are 6 people which is the first time in thew association history (usually 5 people). Right now is the beginning of the year, we are in the end of the first block out of 4. first years have to get their BSA so 45/60 ECTs. The association is getting a room in a new building and we should move this year."

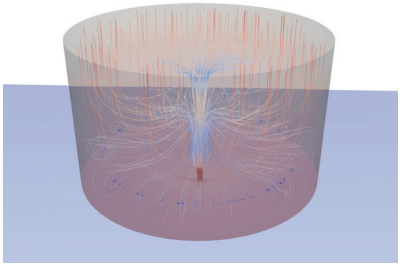
So what does ChatGPT say about students using it under pressure, considering ethical implications?

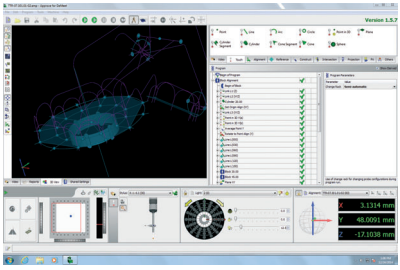
Using ChatGPT for applied physics assignments can be a huge help when you're feeling the pressure of tight deadlines. But, it's important to be ethical about it. Remember, ChatGPT is there to support your learning, not to replace it. Don't use it as a shortcut; instead, see it as a tool to understand better. Always give credit where it's due, and be honest about the assistance you get. Teachers are there to guide you, so follow any guidelines they provide. As technology becomes a bigger part of education, let's make sure we use it responsibly, especially when time is tight.











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