

Diamond miner
Find all the diamonds
hidden in the puzzle

Life after Francken
Tom's changeover: from
Nijenburg to Duisenberg

Prediction time
What will the next
25 years bring us?

Francken Vrij Diamond



25.3 Diamond

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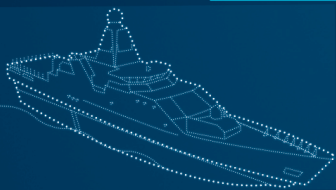


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Jelle Bor MSc, Tom Boot, Arjen Kramer, Melav
Salih, and Bradley Spronk

Editorial

This edition already concludes another academic year. As a committee we've also had quite a busy year; we managed to get back on schedule by sending out 5 editions. I'd like to take this opportunity to thank the entire committee for their hard work. In addition I'd like to thank Emma and Tabitha who'll be leaving the committee after having worked on it for three years.

The theme of this edition is Diamond. You can read all about the new board, we'll be looking forward to the next 25 years of Francken Vrij, and much more. Enjoy reading!

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6 Chair's Preface

Melav Salih

It's already the last preface that will be written by Melav. Here you can read what happened to her foot, but also how she looks back on the last year.



7 News of the Association

Tabitha Minett

There have been quite some activities since last edition; the ASML lecture, Crash & Compile, Symposium, Tour de Francken, and many more! Read all about the latest activities [here](#).



10 Meet the new board: 'Half-life'

Their name suggests they'll be in combat with the Nihilanth, but in reality they are the new board of Francken. Read more about Ian, Sjoukje, Melvin, and Charlotte!

12 Diamonds are Forever

Jelle Bor

In this edition, Jelle discusses the recently proposed method of using diamonds in an interferometer to explore gravity.

15 Diamond

Bradley Spronk

As is usual, Bradley has drawn us a lovely comic. This comic concerns the problems of rocks.

16 Life after Francken

Tom Boot

Even though he left the Nijenborgh eleven years ago, Tom still looks at the Francken room every day from his office in the Duisenberg building. If you wonder how a once Theoretical Physics student ended up as an Associate Professor in the Faculty of Economics and Business, then this is your opportunity to find out!



19 Diamond miner

Arjen Kramer

For this edition we told Arjen he could go all out, and I have the feeling he did. In this puzzle you'll be digging for diamonds, but first you'll have to construct some walls. Can you figure it out?

22 Predicting the future

Francken Vrij

For a very long time we've thought about what we can do to celebrate 25 years of Francken Vrij. Eventually we figured everyone can read the old editions (professorfrancken.nl/association/francken-vrij), and instead of reiterating them, we are going to be predicting what life, the universe, and Francken will look like in 25 years.





Chair's Preface

By Melav Salih

At the time of writing this, I thought the hardest pressure of my year was over as our transfer had officially been held and everything is opening up. Little did I know that my broken foot would give me this much pain and distress with my final tasks. While everybody is out enjoying the sun, here I am with my foot held high once again at my mother's, just like when I wrote my first piece for the Francken Vrij.

What a turbulent year it has been! We started out hopeful, thinking that everything would go back to normal by October, only to end with another online GMA. Yet, we persevered and shaped ourselves under high pressure into a charming board to build up our beloved study association. Just like every other board, we grew and learned a lot throughout the year. It's incredible



how much can happen with four amazing friends by your side.

As this is my final piece, I would like to thank all our lovely members for simply still being a part of Francken. Especially those who helped organise events or attended them! The association would not have continued without you.

Looking back at my board year, I can confidently say that we did a good job in a stressful time. In the end of the day, Charm shined bright like a diamond!





News of the Association

By Tabitha Minett

Fraccie: The Movie!

This year, the fraccie has constantly surprised me with their events, and this was no different. Instead of hosting a typical movie night, they decided to make a whole movie. Following on seamlessly from their previous events, the movie saw a bullied HBO student hatch a plan to take revenge on a more fortunate student. I shan't spoil any more, but if you haven't seen it, I strongly recommend you check it out!



Symposium: Cognitive Matters

The long-awaited symposium on Cognitive Matters was a huge success. Some lucky attendees were able to watch the event live and join the speakers, and it was equally as enjoyable viewing from home! Several speakers from the Netherlands joined us in person, while the rest joined online, giving talks ranging from developing new materials and algorithms to improve smart and environmentally friendly chips, to neuro-morphic computing. To top it all off, participants were treated to lunch delivered to their door and a lovely borrelbox, including an exclusive *Gebouw 13* beer from the Brouwcie.

Candidate board announcement

Everyone assembled excitedly on Gather-Town to find out who'd make up the 37th candidate board. Ready with a goodie bag full of clues as to who the candidates were, members watched the announcement video and had the opportunity to congratulate them afterwards. You can learn more about them on pages 10 and 11 and hopefully meet them in person in the near future!

Sustainable dinner

The Wiecksie were unable to arrange a membersweekend for us this year, so they instead decided to feed us at home with a lovely sustainable dinner. With some tapas, loempia, and beers delivered to our door, we met online to eat together and play some games.

ASML Lecture Talk: Mirrors in the ASML machine

In a collaborative event with FMF, we heard Rick Meijerink and Robbert Jan Voogd tell us what it's like to work at ASML and about their research so far. Rick is a former Francken member, so it was lovely to hear about his time at Francken and his career

since then. Robbert talked about the operation of mirrors in the ASML machine, and welcomed a discussion on the technical aspects.

Flunkyball tournament

Unfortunately, our annual excursion once again couldn't take place in April, but instead the S.L.E.F. organised a great flunkyball tournament in Stadspark! On a slightly soggy day, we gathered in a carpark and played through several rounds, snacking in between rounds to keep us focussed. During the event, the S.L.E.F. looked for their successors to organise the excursion for April 2022!

Francken Masterchef

In an opportunity to meet the candidate board and compete to be crowned Francken's best chef, members had to cook a meal with the provided ingredients and the kandis judged each meal. With the random ingredients, groups cooked extravagant meals like Mexican dumplings, fried pear, and stuffed courgettes. Although all meals were very tasty, the sjaars were ultimately crowned the winner.





Crash & Compile

The annual Crash & Compile, while still online, did not disappoint! This year's game was Monopoly themed, and teams of two used their programming skills to earn Monopoly money by solving puzzles or doing challenges. With this money, teams could buy properties, build houses, pay taxes, and unlock more puzzles. Some of us may have done more *crashing* than *compiling*, but we could all agree it was a fantastic event.



Figure 2: Tour de Francken at Bernoulliplein

Tour de Francken

Although a little later than usual, the Borrelcie and Fraccie were determined to make the Tour de Francken go ahead before the end of the year! In groups of four, teams cycled around the city and consumed their adts.



Games in Stadspark

For one of the final events of the year, the Sjaarscie organised their first in-person event: games at Stadspark! Attendees joined beerball, parkour, koekhappen and spijkerpoeppen (I'm not actually sure what the last two are called in English, and "spijkerpoeppen" was totally new to me). The beautiful weather meant we had to try to avoid getting sunburnt, and the snackbag was a lovely addition.





Meet board 'Half-life'

Ian Soede

Dear Mooie Gekken, my name is Ian Soede and I am the new president of T.F.V. 'Professor Francken'. I have to admit, I have not been here for a very long time, and I only got to experience Francken during these unusual times, but I have enjoyed every single event and interaction. So much so that I have come up with the most ingenious plan to enjoy it even more: do a board year.

Now because you might not know a lot about me I thought I would take this chance to give you some slightly useful but mostly useless facts about myself. I come from a town called Drachten, which is in the undeniably beautiful Friesland. I like to play music; currently, I am trying to have go at the harmonica. So if you need someone to play '*Piano Man*', I am your guy. I also used to keep a colony of ants in my bedroom, but unfortunately, they all escaped.

In the coming year the room might open up. If I have not met you yet I hope to meet you then, after 4, with a beer in our hands. See you then!



Sjoukje de Jong

Dear lovely people that are reading this, my name is Sjoukje de Jong and at the time of writing this I am candidate Secretary for T.F.V. 'Professor Francken'. I am in the second year of the Bachelor of Applied Physics and I am from a tiny village in Fryslân. Gliding is one of my favourite past times, this entails flying in a single-person aircraft that does not have an engine. When the weather does not permit this wonderful activity I enjoy painting or traveling, when it is possible. Another hobby of mine is playing various instruments, however, to be completely honest with you I have not done this in a pretty long time. What I am most looking forward to from our upcoming board year is to have loads of amazing on-site events and to have an open members room for you, where I hope to see you all in person. I am confident that I and my candidate board will take good care of the association, we will put all of our time and effort in for you!



Melvin Mijnlief

Hello everyone! I really don't like writing about myself, but here I am doing exactly that. I was born and raised in the most beautiful city of the north: Groningen. I thought I knew every nice place in Groningen until I started studying Applied Physics



and got to know the couches in the members' room. I only had about half a year to enjoy them, but they impressed me and I miss them. I joined the Sjaarscie, but we could only organise the dinner. Organising only one event was not enough for me, so I became the treasurer of the Fraccie. Finances seemed interesting, so I decided to apply for treasurer of the whole association. I like to play football and tennis, but I haven't really done any sports in the last months, so I'm knackered after a few sprints. For some reason, I also like to play poker, even though I almost always lose my buy-ins. I'm excited for next year and hope to talk to you soon in the members' room. You would probably find me on the couches.

Charlotte Broekmeulen

Hi, my name is Charlotte and I am the extern and intern as you probably already know. I am originally from the sunny South where they speak with the oh so soft g, but I have become accustomed to the hard "gr-rh" and sometimes even use it myself. In high school, I either wanted to study law, enter politics and promote nuclear energy or become a nuclear engineer. I only decided upon which one like two days before the deadline, but I figured that I would enjoy applying physics way more than reading outdated laws. I like debating and heated discussions, travelling and those disposable cameras. If you know that one TikTok



"At first, I was like... as a joke, but I don't think it's a joke anymore", that was basically me during this year about applying for the board. I am really happy that I applied and I am looking forward to the upcoming year with my board! I hope you are ready for lots of plants and fun.





Diamonds are Forever

By Jelle Bor, MSc.

On 14 September 2015 the LIGO and Virgo collaborations measured the first signal of a gravitational wave. This direct observation was reported around the world as a remarkable accomplishment for many reasons, as efforts to directly prove the existence of such waves had been ongoing for over fifty years. Moreover, Albert Einstein himself doubted that mankind could ever detect them, as the waves were predicted to be minuscule. This observation confirmed again his theory of general relativity in the context of large scale cosmic events generating space-time distortions. To detect these waves one has to use an interferometer: it superimposes beams of light to generate an interference pattern. To recap, you add the heights of the separate waves together as they interact, and the resulting wave is the interference pat-

tern. In general there are two specific kinds of interference: constructive interference and destructive interference. The basic configuration of a laser interferometer is shown in Fig. 1. It consists of a laser, a beam splitter, two mirrors, and a photodetector that records the pattern. Of course this is highly simplified, but one can set up such system to construct maximum destructive interference, and when the mirrors start to wobble you see the signal.

Now, six years later, physicists in Israel have created an interferometer on an atom chip, a so-called Stern Gerlach interferometer. This device is very small and can be used to explore the fundamentals of quantum theory by studying the interference pattern between two beams of atoms, in contrast to the huge gravitational wave experiments

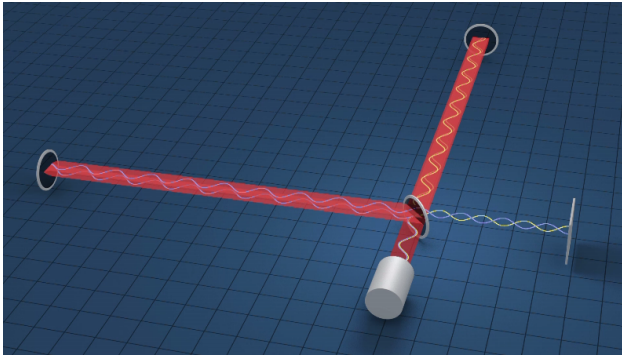


Figure 1: Layout of a basic laser interferometer.

which probe macroscopic physics using light. The device was proposed by the German physicists Stern and Gerlach, after they demonstrated that the spatial orientation of angular momentum is quantized. Their original aim of creating an interferometer with freely propagating atoms exposed to gradients from macroscopic magnets has not been practically realized until now. A beam of rubidium atoms is levitated over the chip using magnets, and magnetic gradients are used to split the beam according to the spin values of the individual atoms, like in the original Stern Gerlach experiment. Subsequently, the two divergent beams are brought together again and recombined. The interference pattern is then formed (schematically shown in Fig. 2) and the spin values are measured. Since the opposing spins are entangled, the interferometer is sensitive to other quantum phenomena.

Three of the four fundamental forces of physics are described within the framework of quantum mechanics and quantum field theory. The current understanding of the fourth force, gravity, is formulated within the framework of classical physics instead. General relativity models gravity as curvature of spacetime, but quantum field theory is typically formulated in the flat spacetime. The description is incomplete (e.g. describing the gravitational field of a black hole in the general theory of relativity, physical quantities such as the spacetime curvature diverge at the center of a black hole). The study of combining these two disciplines, gravity with quantum physics, is called quantum gravity. No such theory has yet proven successful in describing the general situation where the dynamics of quantum matter, affect the curvature of spacetime. If one attempts to treat gravity as simply another quantum



field, the resulting theory is not renormalizable. Even in the simpler case where the curvature of spacetime is fixed, developing quantum field theory becomes more mathematically challenging, and many ideas physicists use in quantum field theory on flat spacetime are no longer applicable.

Recently, theorists have proposed an experiment to determine whether gravity is in fact a quantum phenomenon (Y. Margalit et al., Realization of a complete Stern-Gerlach interferometer: Toward a test of quantum gravity, ScienceAdvances, 2021). They want to use entangled mesoscopic objects, namely tiny diamonds that can be brought in a state of quantum superposition. It would be possible to use these diamonds

instead of the rubidium atoms on this interferometer. However, this process would be highly complex as the device, which is currently operated at room temperature, would need to be cooled down to around 1 Kelvin for the mesoscopic experiment. If this is realized, two of these atom chips could free fall together (to neutralize external gravity), so that any interaction occurring between them would depend on the gravitational pull between the two chips. Then, the aim is to determine whether quantum entanglement of the pair occurs during free fall, which would mean that the force of the gravity between the diamonds is indeed a quantum phenomenon. Time will tell.

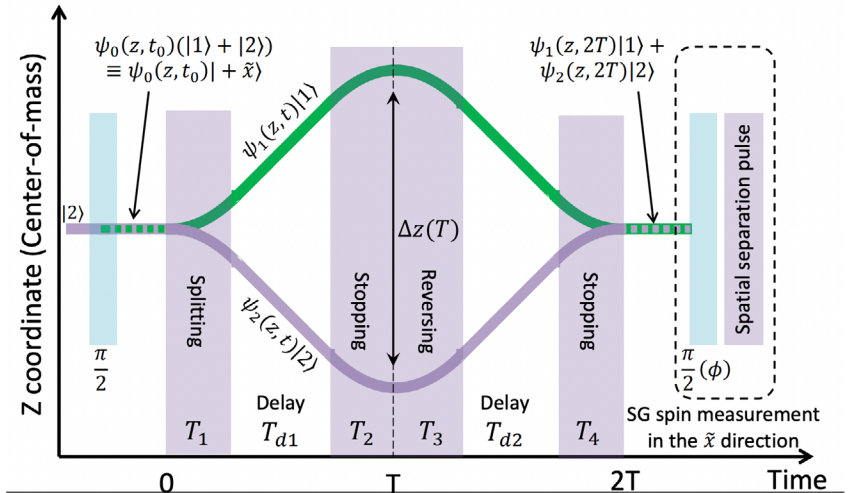


Figure 2: Schematic overview of the Stern Gerlach interferometer.



Diamond

By Bradley Spronk





Life After Francken

By Tom Boot

Life after Francken', some say it exists... I don't buy it. Once you're in, you're in. I'm sitting in my room on the 7th floor of the Duisenberg building, with a clear view of the Franckenkamer across the pond. Two doors next to me is the office of my fellow 2005-2006 Francken board member Christiaan van der Kwaak. A significant part of my current social life is the WhatsApp group of the unofficial but widely recognized Technisch Fysisch Heeren Dispuut Dum Spiro Bibo, and I just discovered I forgot to bring lunch. So did anything change since I left Nijenborgh 4 eleven years ago?

First, I must admit that I have never studied Applied Physics. I mean, I have nothing against Applied Physics. Some of my best friends are applied physicists. But I had fun-

damental problems understanding anything that went on in a laboratory. I couldn't wrap my head around the second year course in Electronics. Parallel circuits, series circuits... terribly confusing. I owe all my lab partners for putting up with me.



Not surprisingly, I gravitated towards Theoretical Physics. The courses were great, learning these magical theories that the legends of the 20th century have invented.

The thesis however was a different story. In hindsight, at the time I probably did not have the discipline it takes to write a thesis (although I was quite dedicated in playing TrackMania) and what was somewhat demotivating was that I never gained intuition for all the calculations that I was doing. Despite the best efforts of my supervisor, I must add! Anyway, it was long, it was painful, but at one point it fortunately was done.

What then? I traveled a bit (this was before flight shame) and on a high mountain in the Himalaya I had an epiphany. Well, two actually. The first one was that I should definitely not have eaten this cheap bag of, what were they anyway, nut like things? And second, I had a sudden urge to go to Rotterdam to study Econometrics. Yes, there was a girl.

So, on to Rotterdam. I had to follow a Pre-Master program, but apparently they were

not used to Pre-Master students. They came up with a 'program' of 4 courses that I had to complete before I could enter the Master's (I checked, now it's 13). First block: no courses. I took an accounting course just to have something to do. It was unexpectedly great. There was a professor who had no problem entertaining 500 students talking about a balance sheet. Second block: one course, but the exam was scheduled when I was skiing (the only time in my life), so I had to take the resit. I have never been more nervous for an exam. I could see myself failing a Pre-Master of four courses because I went skiing...

Let's fast forward a bit. Everything turned out fine, made some friends, entered the Master program that I very much enjoyed, oriented on the econometrics job market, and decided I would like to pursue a PhD. Conventional wisdom is that "1 in 3 econometricians becomes a millionaire" so





the statistics require 2 out of 3 to pursue an academic career. The PhD, we're now talking 2012-2016, had ups (yes, I have this amazing proof!) and downs (ah, lost a minus sign on the second line!), and by the time it was almost over, I suddenly had the urge to move back to Groningen. Yes, same girl.



Figure 3: Tom 15 years ago

In Econometrics, it's possible to move into a tenure track position directly after completing the PhD (unlike in Physics, where I think you have to pursue about a million postdocs), and I was very lucky to find a professor that believed in me and convinced the faculty board to give me such a position.

So what do I actually do now, you may wonder? In case you do: research and teaching. One of the things I study are techniques that can be used to obtain more accurate macroeconomic forecasts. This includes

combining information from many economic indicators, from different countries, or different time periods. Challenge 1: not enough data. We have too few countries in the world, and we measure economic activity at a low frequency (monthly/quarterly). Challenge 2: too much data. There are about 793,000 economic indicators (<https://fred.stlouisfed.org/>) that you can use to figure out what will happen next... This all brings up very nice statistical problems that I enjoy working on. I also teach courses on Probability Theory (there's a lot of probability and statistics in the econometrics curriculum) and Dynamic Econometrics (where I jump around a lot). The coming three years will mainly be research however, as I was recently awarded a Veni grant. Just like my fellow Francken board member whose office is two doors down the hall. See, I told you, you can never get out. Now I got to go play with my kids: J.C. and Jeff...

I hope to meet/see you all soon when the world, the Franckenkamer that is, reopens.

Cheers,

Tom





Diamond miner

By Arjen Kramer

In this puzzle you'll be digging some very specific caves to look for diamonds!

On both floors, the cave forms one connected region and the cavewalls all connect to some edge of the puzzle (interestingly enough, this is equivalent to saying that you can draw a single non-intersecting loop around the cave, think about it). Additionally, no 2 by 2 cell diamond can be completely filled by cave or completely filled by wall.

On the first floor, the clues indicate the number of cave-cells that can be 'seen' along the diagonals from the clued cell including the cell itself.

On the second floor, the clues indicate the number of 'wall' cells that are in the 3 by 3 cell diamond around the clued cell, think minesweeper.

All clued cells are part of the cave.

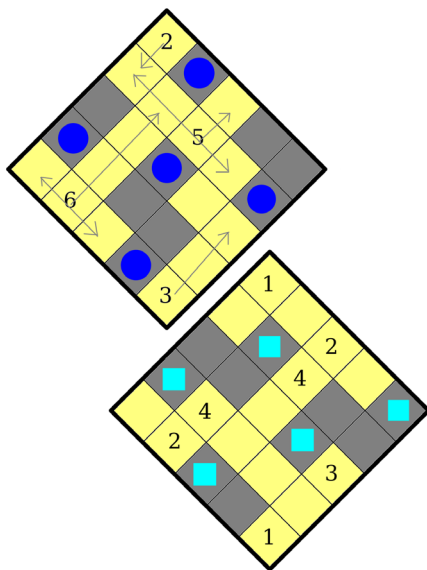
To support the cave on the second floor, some supports must be placed. These supports must be in the same cells on both floors and both of these cells must be wall.

To keep the digging safe, two of these supports are to be placed on each diagonal for a total of 24, and the supports can't be directly next to each other, neither orthogonally nor diagonally.

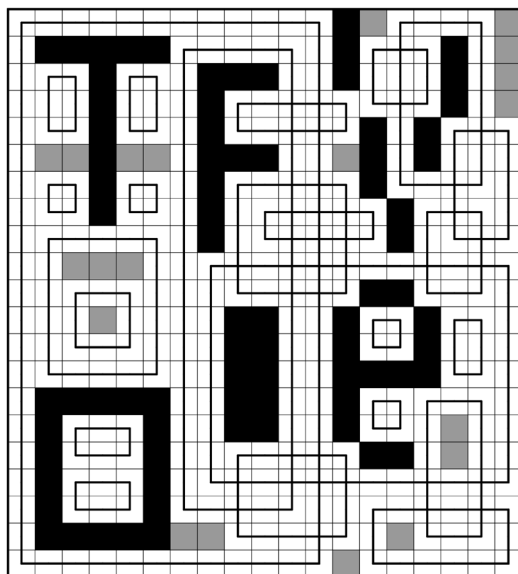
When both caves are constructed, the search for diamonds can begin, they are hidden inside the walls of the second floor, whose first floor equivalents are not wall. There is exactly one diamond in each diagonal, and just like the supports, none of the diamonds can be directly next to each other.

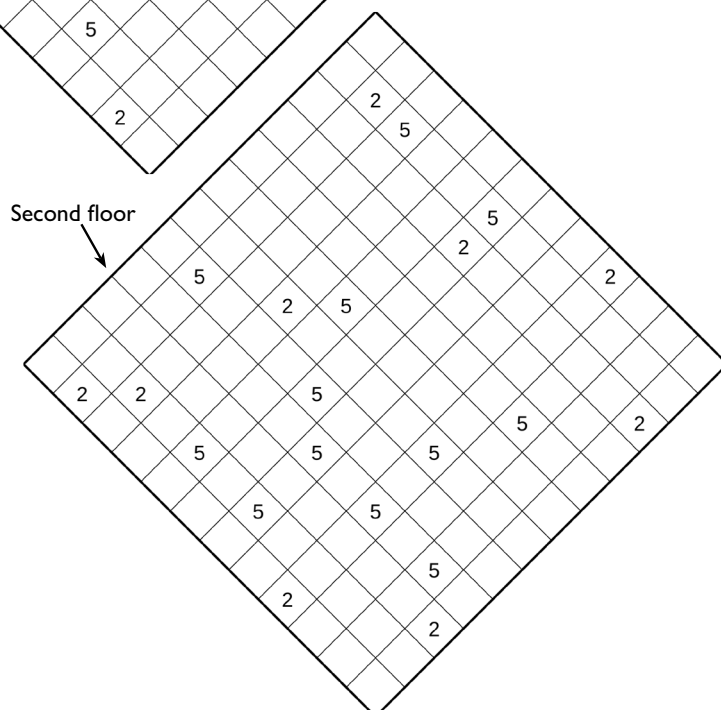
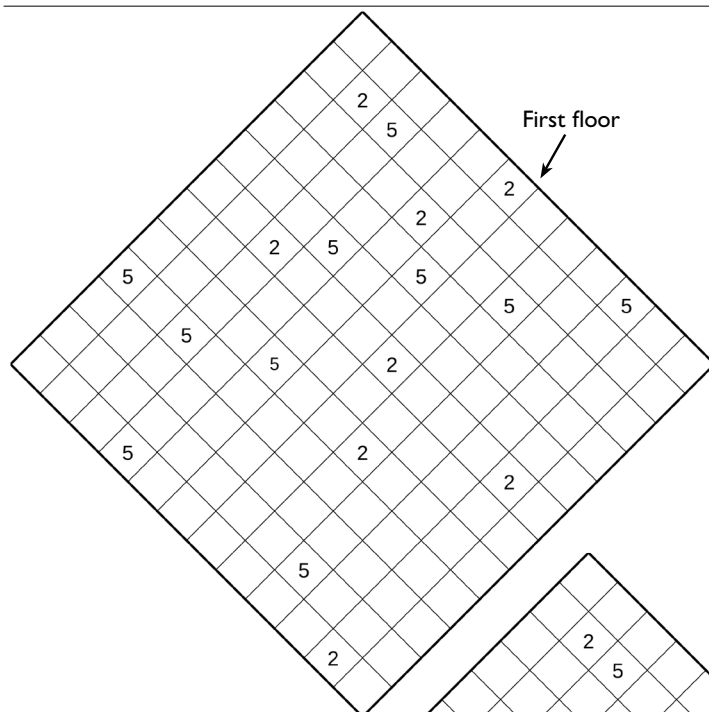
See the small example for clarification of the rules, it turned out to be impossible to get the complete set of rules to work for a small grid, so the floors are not connected. In floor one, pillars are placed, though only 1 per diagonal. And in floor 2 diamonds are placed, though if the floors were connected, this arrangement wouldn't work, as the corresponding cells in floor one aren't all cave

The first submission of the correct location of these diamonds will receive an actual diamond!



Solution to the previous edition's puzzle:







Predicting the future

As you might have noticed before, this year we are celebrating 25 years of Francken Vrij. We've been thinking what to do for a very long time. In the end we decided not to put too much effort into the past, but instead it might be more fun to look forward. What will be the technologies of the future? What will the association look like in 25 years? And how many times will Kathinka end up dying? This column attempts to provide you with the answers to these questions, but if you want the true answers to these questions we'll have to reference you to edition 50.3. But without further ado, Francken Vrij presents, '*Predicting the future*'.

What will fashion look like in 2046?

In general we're quite divided on this topic, though the general trend seems to suggest that in the future we'll be wearing an exaggerated version of today's fashion: Gradu-

ally there will be more and more holes in clothes until they reach a state where tiny bits of clothing only covering our private areas will be the newest trend. Additionally, jorts will certainly become a trend at somewhere in this process.

How many times will Kathinka die?

The exact amount is uncertain, but we've agreed that the answer is at least many. However, in order to die, Kathinka needs to at least be revived once in that period of time. Which brings us to:

Will internet at Francken finally be working in 25 years?

At the moment of writing this, the internet has been broken for at least a year. Since the Francken Vrij is probably the most dependent on the internet working, the answer is easily determined to be a *no*. Hopefully Mark will build us our own network.



What new feature will the iPhone 36 have?

At this point in time Apple, Google, and Microsoft have probably implanted a chip in everyone's brain anyways. If phones are still around we hope to see that they come with a disposable tool set for the Fikscie to use. Additionally the phone will probably be bulletproof (like a mini bible from WWI), though the screen will still break once you let it fall, forcing you to buy the new iPhone 37 the year after.

Which beer brand will be the most popular?

On July first 2021 a law went into effect making it illegal to have more than 25% discount on alcoholic beverages. We can therefore predict that in the next couple of years *pauper* beer (like Dors, Brouwers, and Pitt) will rise in popularity. The Dutch government shall realise that their entire population looks like trash and will hopefully return to the status quo (like we can see in figure 1).

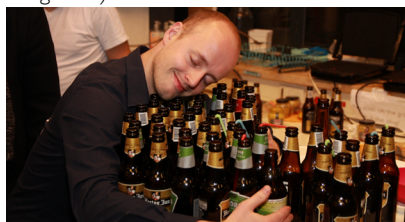


Figure 1: Leon liking his beer, as a proper citizen should.

Which major breakthrough in (Applied) Physics can we expect in the next 25 years?

This is probably the most important question. Science always has been moving in two directions: up and down. In the coming years interplanetary travel will become possible. Elon Musk will put the first people on Mars. After some years a colony will be established and not long after the first Mars-baby will be born. On Earth nano technology has taken over, making self ironing clothes available for everyone. A Theoretical Physicists (who's currently only a teenager) has provided the theory of everything: It turns out that atoms are not real, they just seem that way.

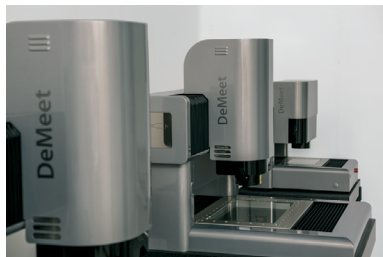
Will we finally have flying cars?

Though the technology is possible, it doesn't seem viable on a big scale. If possible they would need cooled for superconductors, and the hypothermia rate in LN2-powered cars is concerningly high. The probability of cars being outlawed is higher than cars having the ability to fly.

Gaat 'ie nog een beetje lekker?

A very difficult question to answer. If we must believe the Francken Vrij we'll be living in a dystopian world where climate change has swallowed the Earth and computers weren't even able to take over, because we nuked ourselves... We have to make sure we're not right together, and we hope to see you all in 2046.





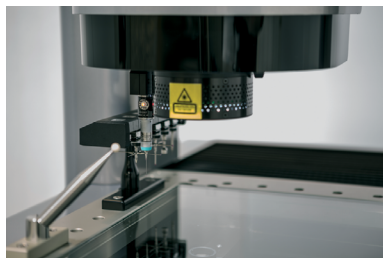
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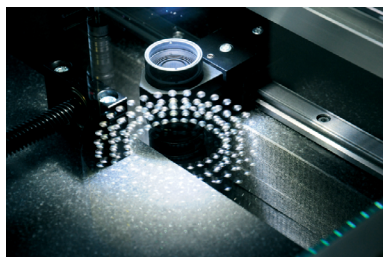
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