Volume 52
Edition 1

ACiD

The Chemistry of Autumnal Colours

Why Leaves Change Colour When the Seasons Change

Amsterdams Chemisch Dispuut

Meet the Board
Our refurbished and new board members introduce each other

Bachelor Thesis Project: Jesper Ruiter
Retention modelling on SPAM-traps for two-dimensional liquid chromatography

Studenten Zoeken Huisvesting

Colophon

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From the Editor

Dear reader,

If there is one thing you can count on during these ever changing times, it is the ACiD reaching your (digital) doorstep with wonderful pieces from an excited committee full of inspiration. However, some changes with sending you the ACiD will take place as well, as mentioned later in this periodical. With this edition, you can hopefully take a quick break from the busy online university life and get a chance to meet the (new) board and the first year bachelor's and master's students. Traditionally, we also give you a look behind the scenes of the OC, a wonderful recipe, a Chemistry vs .. and Jesper will tell you about his bachelor project in Analytical Chemistry. Since we also have not escaped the debate around wearing mouth masks, we decided to write down for you how they work and with autumn all around us, there is also a piece included that tells you what exactly makes these leaves turn into their wonderful colours. To all our old and new readers: enjoy!

On behalf of our entire editing team,

Kind regards,
Michelle van Dongen

Content

New Presser
What does this mean for you?

After this first edition, the ACD will change from presser for its ACiD and will also start distributing its periodical differently: only members who gave notice of wanting to receive a physical copy will be sent one. Otherwise, members will automatically receive the digital version. Last year, every member had the opportunity to state whether he/she wanted to receive the digital or physical copy by filling in a Google Form. If you are unsure whether you have done this or want to change something, you can still fill in this form by going to http://bit.ly/distributionACiD . The deadline for giving notice is 30-11-2020. For the new members of the ACD: you don't have to fill in the form, as it was part of your registration.

If you want to change from physical to digital or vice versa after the deadline of 30-11-2020 or have any questions, please send an email to bestuur@acdweb.nl.

Het wel en wee van de OC part 1

Sverre Overdijk

Some of you might not know what the OC is, so we will start off by introducing ourselves. The OC stands for program committee ('opleidingscommissie' in Dutch) and is a committee that ensures that the quality of the education programme is up to par. This is accomplished by giving solicited and unsolicited advice and having a veto on the OER (Teaching and Examination Regulations or 'Onderwijs En Examenregeling'). This means that the OC evaluates the OER by taking into account the information that you provide us in the course evaluations. Furthermore, we have contact with the lecturers regarding this information as well. For the OC, it is of great importance that you fill in these course evaluations, since it is our best way to improve on the education programme regarding your feedback. Also, the OC is a listening ear for all suggestions and more pressing matters.

To make sure everyone has a say in these matters, the OC consists half of student members and half of lecturers. This year the student members are Casper van Eijden and me for the bachelor, and Anna Butter and Alexandra Polyakova for the master. The emails of these students can be found at the dedicated DataNose page of the OC, which is also available via the UvA website. Feel free to send any of them an email or approach them in person.

So, after the introduction, what has the OC been up to as of late? We looked at the first draft for the new curriculum provided by the curriculum committee. As of now, the broad outlines are there, but it's still at an early stage. There are some interesting plans laid out by the committee and we will, of course, let you know when we know more.

OC mail: ocs-science@uva.nl
OC page: student.uva.nl/sck/content/az/opleidingscommissie/opleidingscommissie

The Old Chair Says Goodbye

Dear ACD'ers,

Over the past year, I wrote the 'From the chairman'-piece with great pleasure. While I started the year by looking back at activities that were held in the months between the publication of this magazine and the one before, in the period of corona I mostly wrote encouraging pieces. After all, there weren't that many activities to look back on and I thought there was a great need for my words of encouragement to all of you. Fortunately, I had a lot of positive reactions to these words and I hope that I helped everyone who read it a little bit through the period. And now it is time for the very last 'From the charman'-piece that I'll write for the ACiD. I am no longer chairman, but Commissioner of Education. I think this is the first time this has ever happened: that the piece from the chairman is written by a current board member, but still a former chairman. :)

Enough talk about me. Last year was a very special year. The year started fairly normally with great events such as the oh so cosy 'borrels', sports activities and several educational excursions. The trips such as the AJW and the ski trip were also great successes. We enjoyed attending these activities, not knowing that in the following months it would not be so obvious that these activities could just take place. From March it all went a little different, but still very cool things have been achieved. All those online activities have helped us to still have a connection with each other while we could not physically hang out with each other. I have said it before, but I am really very proud of what has been organized in the past year, especially in the period from March. I would like to thank everyone who has worked hard to make the activities of our association so successful; my sincerest appreciation for this effort. All committee members who had to adapt to online activities: a big thumbs up for how you have handled this. Without you, the past year wouldn't have been the same. I want to give thanks to all members, donors and VOLA members who showed attendance at activities or contributed in any other way to make sure the year was a great year. Finally, my fellow board members: Bart, Bente, Floris, Jari and Nadav. I am so happy that my board year was with you guys. How we, as a group, picked up on everything and did things, I still think is remarkable. So, thank you guys!

For now, it is time to hand over the baton. Finding the new board didn't go smoothly though, and you'll see the seventy-fourth board as board again this year, along with Michelle. Some in different positions, some in the same. So, I will be the Commissioner of Education, as mentioned earlier. In the coming year we are going to enjoy the pieces of Floris and I am confident that these pieces will become masterpieces.

This is it, the last piece. Thank you all very much for reading and enjoy reading the rest of this magazine.

With kind regards,
Your former chairman
Sam Hulscher

The New Chair Says Hello

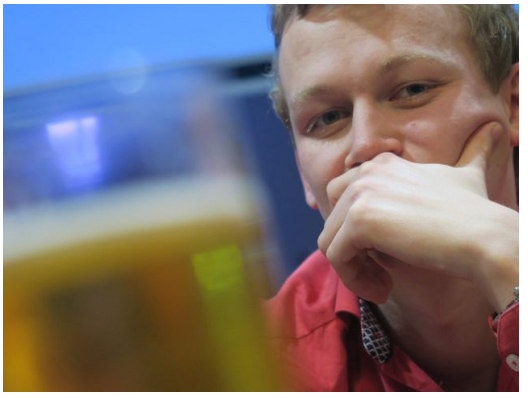
Dear ACD'ers,

First of all, I would like to thank Sam for his kind words. Also, I would like to thank the 74th board for all their work and effort last year; we would not have been here without you. Furthermore, I would like to thank my fellow board members for sticking by me for another year to keep the spirits up at the ACD.

These past couple of months have been some of the strangest in recent ACD history. As Sam mentioned, everyone had to adapt to the online environment, in both studying and socializing. This is an ongoing process which all of us together will have to make the best out of. After a rough but warm summer, we still have to deal with mostly online lectures. For all of those who are starting their bachelors or masters studies this is a difficult period to deal with. But luckily we were able to have some physical educational activities at the start of the year. The Faculty Introduction was one of the first moments for the first-year bachelor students to physically meet each other, hats off to all the organizing parties for handling this day very well regarding the short-notice changes in planning as well as following the social distancing measurements.

Besides the educational activities we were also glad to follow through with some more social activities. The KOESt has done a tremendous job of switching over from the planned introduction activities for the freshmen to some other activities throughout August and September. Such as an online pubquiz, a sport and game afternoon at Flevopark and a scavenger hunt through the city centre. We also played some football at Flevopark during the late summer week in September and the ABC was also able to host two 'borrels' at the start of the year. One at 'Maslow' and the other one at 'de Oerknal'. These were both very successful and might show signs of more to come in the coming months.

At the end of September, it was time to welcome the 'new' board at the General Assembly, which was held



via Zoom. Those of you that were there saw me struggle with some of the rules and regulations as chairman of the final part of the General Assembly after staring at a computer screen for a few hours. However, this also showed some perspective; I found out that even after a full board year there is still a lot to learn. Unfortunately, we were not able to celebrate the board switch yet, however when the next 'borrel' at 'de Oerknal' will occur the board will hand out a free drink to everyone able to attend. Let's hope it will be soon!

Speaking on behalf of the new board, I can say that this year will be a special year nonetheless, since we will be celebrating our 15th lustrum starting in November. We will be working together with the SLA to create a memorable lustrum year, with most activities taking place in the second semester. In that semester, we hope to once again make the trip to a ski resort, have some fun excursions and lectures, and make some unforgettable memories on an extended version of the All-years weekend that will replace our beloved BEC. I hope that we will be able to see you all on the 'Borrels' and during these activities. For now, I want to wish you the best of luck in the coming year. Stay strong and keep going!

Virtual hugs and kisses,
Your refurbished board member and new chairman,
Floris Blom

From left to right: Bente, Michelle, Nadav, Floris, Sam, Bart, Jari

Meet the Board

Floris Blom – Chairman (by Bente Reus)
The older the wiser isn't it? Well let's at least hope it's true for this year's board. Floris' wisdom does not only stem from his age, but also from his function as Commissioner of Activities and Bar this past year. This year he takes it a bit higher up as chairman. The bar part of his former function fits Floris especially well, with his real fondness for alcoholic beverages. As a true wise man he enjoys a night of poker and whiskey from time to time. Though Floris cannot handle his loss well, so just make sure to let him win (he will probably reward you with a beer, so you will win too). That's enough of the old man jokes for now. Whenever you come across Floris he is there to have a chat, give advice or make you laugh with one of his sharp comments. These sharp comments are accompanied by a large grin on his face, if you haven't noticed it yet just pay attention and you will see it's always (literally always) there. With his wit, charm and perseverance I am confident that he will make a great chairman.

Michelle van Dongen – Secretary (by Jari Hoffmann)
Michelle is the freshest addition to the board. She will be taking on the role of secretary, and I heard that the previous secretary is really happy with that, since after a year of taking minutes and mailing and eeh...

other things secretaries do, he was looking for something else to do. Luckily, Michelle is ready to bring a fresh breeze to the board this year. She will make sure to make everything a bit more organized compared to last year. Don't get me wrong, Bente did a great job, but twice as much womenpower will come in handy this year. Her addition to the board will also skyrocket the level of English grammar and spelling. She loves English literature and has spent half a year studying in Canada. You may think that all she does is study and read, but I've heard some stories about her actually being an absolute party animal. Obviously, I hope to see the animal break loose a lot this year. She would deserve it, since she hasn't had the most traditional of starts of a board year but has shown a lot of enthusiasm and commitment. I hope she has a great and fun year with the rest of the board.

Bart de Mooij – Treasurer (by Sam Hulscher)

When you say money, you must say Bart too. Your penno will be there again for the coming year to ensure that all money flows within the ACD run smoothly. Bart is not only a whole bunch of muscles, but there are also very large brains in his brainpan. Two masters at the same time and a whole lot more. Nobody knows how he does it, but he does. If you ask Bart a question, don't be surprised if you get a sarcastic response in return. Bart is a real 'droogkloot' with witty remarks. If you fancy a nice cocktail, Bart is also there for you. He can serve you the most bizarre drinks, but sometimes he can also throw them over his own T-shirt. I say sometimes, but the term 'Bartvlek' is almost universally known. If you want to know more about Bart, please talk to him, he is always up for a chat. So yes, all in all he is a fine guy.

Nadav Joosten – Commissioner of Education (first half of year) (by Michelle van Dongen)

With already one year as Commissioner of Education behind him, Nadav thought it would be best if he tweaked his function name slightly in Dutch just to keep it exciting. (from Commissaris Onderwijs to Commissaris Educatie) For the first half of the year, he will still be your guy to ask questions about anything educational related and trust me he will figure it out for you to the best of his abilities. Don't hesitate to ask him about anything else as well, cause beside being compassionate and a hard-worker, he is a talkative fellow with (according to him) a great sense of humor. He is certainly good at playing with words and will always be able to keep the conversation going with one of his wonderful adventures, random facts or every detail in the world of Disney there is to know. You can count on him to give you a piece of his mind, since according to him you can't say anything wrong as long as you bring it the right way. With his directness, talkativeness and humour, he will definitely be the pepper to the salt of this otherwise rather blonde board and I look forward to working with him for a year.

Sam Hulscher – Commissioner of Education (second half of year) (by Nadav Joosten)

Sam Hulkscher, as he calls himself (online), our lovely former chairman finally got a real function in his life. Beside doing his education minor to become a teacher he will fulfill the lovely function of commissioner of education this year... Well half a year. So if you want education about cameras, donkeys, dutch music or adten, you can always ask him for advice. Also for the weirdest stories about for example drinking milk after gymnastic class during high school just go to our farmer boy from Heemskerk. But okay, I need to write more about him. Well I could tell about his lovely singing voice, weird humor (he is specialized in puns). Okay some other things you need to know reading this strange piece of literature. At the moment it's around 2 pm and Sam is sitting next to me trying to win a board poker tournament. (FYI he didn't). Personally I've already lost my 15 euros at this point in the night, luckily my mate in the education function is more capable than me so I'm lucky to have such a great successor. I wish him all the luck and best arguments in discussion to be a great commissioner of education <3

Bente Reus – Commissioner of External Affairs (by Bart de Mooij)

Bente is 20 years old, comes from the erug beautiful west-fryslân and will be the Commissioner of External Affairs during this weird but wonderful lustrum year. After all the experience obtained last year together with her neat and punctual planning, she'll be a great fit for the job, even though there is no "extern-ish" anymore. Bente is a smart and bright, blond girl. Who knew that was possible? Maybe it is because of all the

lectures she has organized or maybe she just dyes her hair. I don't know, but I'm glad she's a part of our board. I think I speak for the whole 74th board when I say I look forward to working another year with her, although she can be easily distracted by pictures of cats or plants (not even mentioning pictures of cats with plants). After miraculously surviving one year with the "bitchboys", she'll have to do it again. Poor girl. Luckily, there's some back-up now to help you get through yet another year with us.

Jari Hoffmann – Commissioner of Internal Affairs (by Floris Blom)

Drum roll please... all of you know him from his secretarial duties of the 74th board and his appearances on many 'borrels': Jari Hoffmann. You may have spotted the wild Jari in his natural habitat, the ACD-room at science park, cloaked by his personalized board member hoodie. But here are some fun facts you might not know about our new Commissioner of Internal Affairs. He has a strong appetite for drumsticks and d(ü)rüm döner; he loves to hang around at some drum & bass parties, once they're allowed again of course. His favourite movie is Jim Carrey's classic comedy Dumb and D(r)umber. After a year there is still no one that can beat him at tafelvoetbal. Despite his many great qualities, one of his biggest flaws is that he forgets to take the laundry out of the washing machines drum. But enough facts about Jari, I know he will still be a great addition to the 75th board of the ACD and I'm looking forward to working with him for another year. P.S. As a little encore, as you might have noticed he is the drummer in a band, which also performed at last year's beta band night.

How Do Face Masks Work?

Siebe Lekanne Deprez

As we all undoubtedly know, there is currently a pandemic raging over the world. So far, up to the 5th of October, 35.6 million coronavirus cases have been reported and 1.0 million people died as a result of the virus (or died with the virus).[1] According to the data, the pandemic is not at all over and new cases are reported daily. This is unfortunately also highly relevant in the Netherlands and we are heading for a 'second wave' if we believe the Outbreak Management Team (OMT) and the government. The exponential increase in new daily cases lead to the introduction of additional measurements to reduce the spreading of the virus, one of which is the advice to wear face masks (non-medical N95 respirators) in public places.

From the start of the coronavirus outbreak, the Dutch government did not feel the need to introduce face masks, which lead to countless debates and different opinions over the course of months. Moreover, the OMT still has some doubts about the effectiveness of face masks with respect to the other measurements.[2] But, apart from the political and social discussions about face masks, did you ever wonder how face masks actually work? How does the N95 respirator filter incoming particles and which mechanisms does it use in order to accomplish it? Well, you have come to the right place as that's the topic for today!

As chemist, the first thing that comes into my mind when hearing about a N95 filter, is that it works just like a strainer ("vergiet"), or in the chemist's vocabulary, vacuum filter paper: if a particles' size is larger than the holes in the filter, then these particles are stopped. On the contrary, particles smaller than the size of the holes can get through. However, it turns out that N95 respirators do not work via this principle and are able to block the smallest particles (<0.1 µm) and largest particles (>1 µm) very effectively. The medium-sized particles (~0.3 µm) are the true problem, and let this be conveniently the size of viruses including SARS-CoV-2. To understand the differences in the blocking capacity, we should look at the composition of the filtering layer.

You could think of the filtering layer in respirators as countless 'spider webs' stacked on top of each other instead of one filter layer with small holes. These spider webs are in fact formed by polypropylene fibres through a process called melt-blowing, which is beyo-

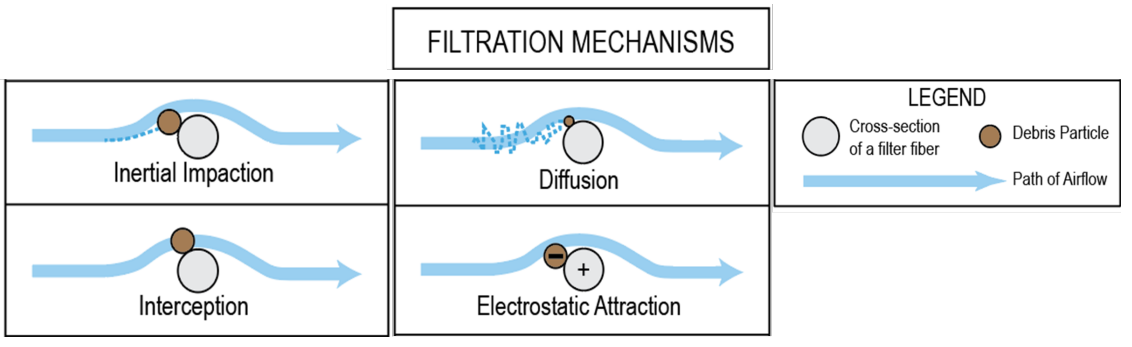
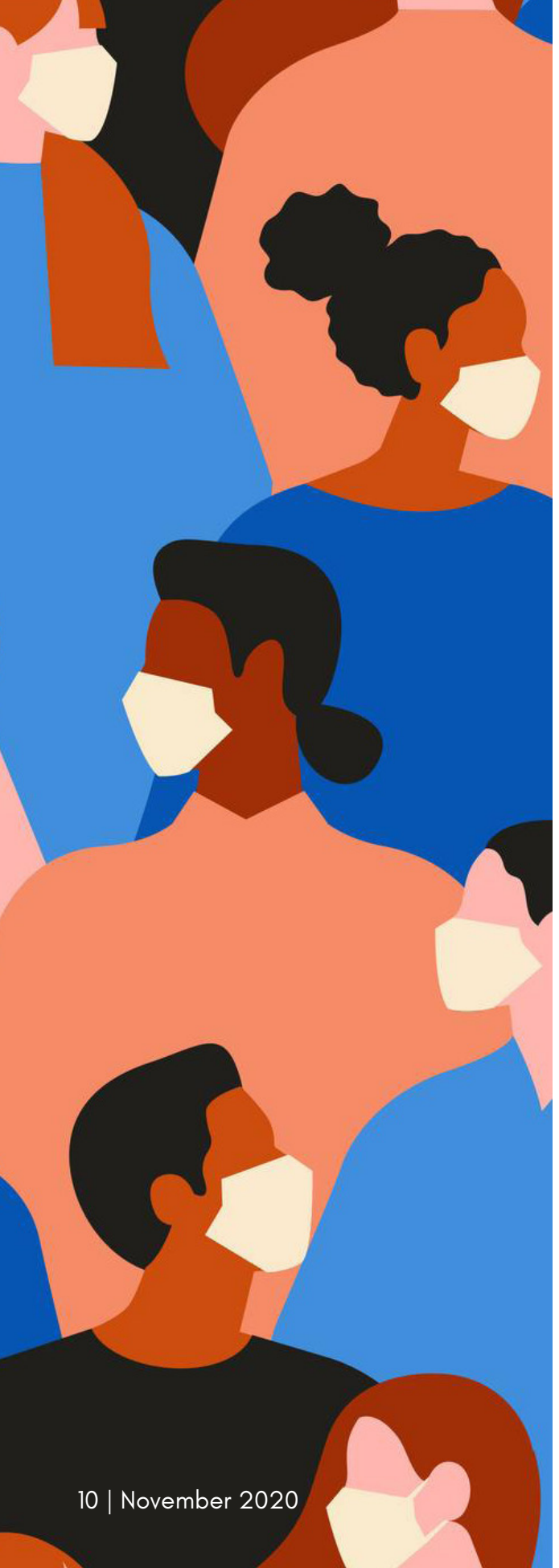


Figure 1. Four different filtration mechanisms. The largest and smallest particles are captured by inertial impaction and diffusion respectively. In addition, the medium-sizes particles are captured by interception (quite ineffective) and electrostatic attraction.[4]



nd the scope of this short overview.[3] Since everything is sticky on the microscale (due to Van der Waals forces), particles of all different sizes will stick to the spider webs when the particles hit one of the fibres. There are, however, four distinct mechanisms that describe how different-sized particles are captured. To catch a particle efficiently, one should take these processes into consideration.

"Both principles are very effective and yield a blocking rate of almost 100%!"

The first mechanism applies to catching the largest particles (>1 µm). Since they move in roughly a straight line due to their inertia, it is almost guaranteed that the particles hit one of the fibres and get captured, which is known as 'inertial impaction' (Figure 1). For the smallest particles (<0.1 µm) things are a bit different: instead of moving in a straight line, they move like crazy and follow a random motion known as 'Brownian motion'. However, the random motion for the smallest particles give the same outcome, namely that the particles are also guaranteed to hit one of the fibres. This method is called (our good old) 'diffusion'. Both principles are very effective and yield a blocking rate of almost 100%!

As I mentioned before, the medium-sized particles are sadly much harder to capture and a larger portion of them passes through the filter compared to particles of other sizes. The underlying reason is that they are carried by the air and move around fibres, contrary to moving in straight lines or random motion. It is the same situation in which you are carried by the current when you swim in a river or in the sea. If a medium-sized particle does hit a fibre by coincidence, then that's called 'interception' and it is way less effective than diffusion and inertial impaction. So, scientists made use of another mechanism to catch the mid-sized parti-

cles, and this is where the ingenuity comes into play: 'electrostatic attraction'.

Just like magnets can be magnetized – creating a permanent magnetic field – fibres can be 'electretized' that results in having a permanent electric field. Synthesizing an electret is achieved by heating or melting plastic fibres and consequently cooling it in the presence of a strong electric field. In this way, the charge carriers of dipoles align with the electric field and the alignment freezes as the fibres are cooling down. The permanent electric fields of the fibres induce a charge separation in particles of all sizes that causes the particles to be attracted to the fibre. Thus, the electrostatic attraction increases the blocking rate of particles, not only the medium-sized particles but also the other sizes. In other words: your face mask is always charged! Finally, the percentage of how many mid-sized particles are blocked by the filtering layer can be easily found on a face mask since the percentage is exactly the same as the number labelled on the masks. For instance, face masks with the label N95 block 95% of the medium-sized particles.

So, how do face masks work? Well there are three main points that make face masks very effective with a blocking rate of 95% to even ~100%. The first factor is that face masks make use of the stickiness of particles on a microscale and can capture harmful particles. This effect becomes considerable when many layers are added on top of each other and form a network of dozens of 'spider webs', catching small particles with random motion and large straight-moving particles. As a last addition, the face masks contain permanently charged fibres that attract particles of all sizes, thereby increasing the catching ability by 10×![5]

1. Worldometer. COVID-19 Coronavirus Pandemic. https://www.worldometers.info/coronavirus/ (accessed Oct 5, 2020).
2. NOS. RIVM: 'Tweede golf uit Spanje en Zuid-Frankrijk naar Nederland gekomen'. https://nos.nl/artikel/2350764-rivm-tweede-golf-uit-spanje-en-zuid- frankrijk-naar-nederland-gekomen.html (accessed Oct 4, 2020).
3. Liao, L.; Xiao, W.; Zhao, M.; Yu, X; Wang, H.; Wang, Q.; Chu, S.; Cui, Y. Can N95 Respirators Be Reused after Disinfection? How Many Times? *ACS Nano.* **2020**, *14*, 6348-6356.
4. Sy-Klone International. MERV vs. HEPA: How Air Filters Work. https://www.sy-klone.com/merv-vs-hepa-how-air-filters-work.html (accessed Oct 4, 2020).
5. MinutePhysics. The Astounding Physics of N95 masks. https://www.youtube.com/watch?v=eAdanPfQdCA (accessed 2 Oct, 2020).

Parmigiana di Melanzane

As we no longer have to travel to the UvA as often as before, some time has freed itself up. What to do with all this time? Try a new recipe of course! I find myself scrolling through thuisbezorgd.nl and no longer seeing any new places to order from, so I went into my edible laboratory and tried a nice recipe. As it tasted incredible (and nothing exploded) I shall share it with you:
The recipe is called 'parmigiana di melanzane' or parmesan cheese with eggplant. It is an oven baked dish with lots of cheese and browned eggplant. After eating it myself I was surprised that it didn't even contain any meat or carbohydrates for that matter, so apart from the copious amounts of salt/olive oil it is very healthy!

Estimated time: 60 minutes
(or 2.5 hours if you are slow like me..)

Ingredients:
- 4 eggplants (1kg)
- 2 tbsp salt
- 1 tuft of basil (roughly 30g)
- 1 onion, diced
- 150mL olive oil
- 2 cloves of garlic, minced
- 1 tbsp dried oregano
- 1 can of mashed tomatoes
- 800g tomato cubes (2 cans)
- 1 to 2 tbsp balsamic vinegar
- 75g flour
- 250g mozzarella
- 100g parmesan cheese, grated

Supplies:
-oven tray of 20x30 cm size

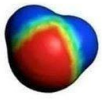
Recipe:
1. Cut the eggplant lengthwise in slices 0.5 cm thick. Sprinkle with salt and set aside in a bowl.
2. Meanwhile, prepare the tomato sauce. Separate the leaves and the stem from the basil and chop the stems. Bake the onion a few minutes in 4 tbsp of olive oil. Add garlic, basil stems and oregano and bake together for a few minutes. Add the tomato mash and heat it through. Add the tomato cubes and bring to a boil. Let it sit for 15 min. Flavour with balsamic vinegar, pepper and salt (not too much salt as the eggplants already contain a lot of it).

Chemical detail:
The method of salting the eggplant is a nice example of osmosis. By creating a concentration gradient water flows out of the eggplant towards the side with the higher salt concentration. This dries out the eggplant allowing us to grill instead of boiling it which creates more of the tasty browning flavours. This is actually a general recommendation for vegetables: if you grill them instead of boiling, they become much more tasty.

3. Preheat the oven at 180°C.
4. Dry the eggplant and remove most of the salt using paper towels and run them through the flour (tip: the eggplants give off more water than you might expect, allowing them to dry for longer periods of time will give an even better result). Brown the eggplant in batches, each time heating some olive oil to create a nice brown crust. When finished, place them on an oven tray to cook all the way for 10 min.
5. Put alternating layers of tomato sauce, eggplant slices, mozzarella, parmesan and basil in an oven dish. Keep a bit of parmesan/basil aside for garnishing at the end. Finally place it in the oven for 15 to 20 minutes until the cheese melts. (If the cheese crust does not yet seem brown enough, use the top heating option on the oven for a few minutes) Enjoy!

If you would like to read more about dishes that highlight the chemistry of cooking, then I highly recommend the cooking book this dish was taken from: Keukenlab by Eke Mariën & Jan Groenewold. Perfect for the cook turned chemist or the other way around as it provides the chemical basis for a lot of kitchen processes!

electrostatic potential maps of common substances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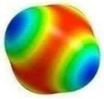
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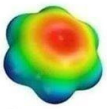

benzene


mango

Nobody:
dz^2 orbital:


warm my head


warm my feet


warm my hands

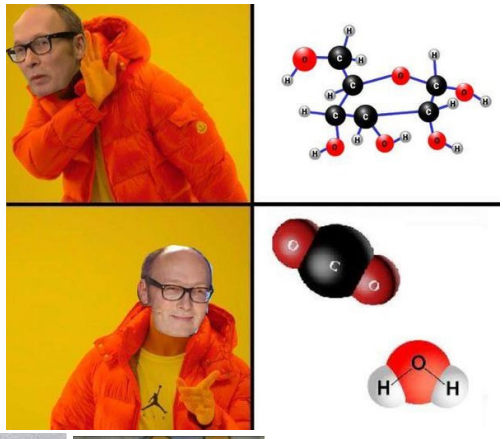
When my lab mates experiments also fail and I don't feel so cripplingly alone haha
warm my heart

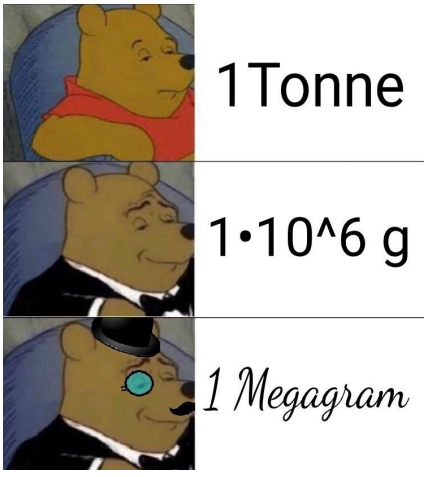
Scientist: attaches on monomer to the other

The madlad who's about to invent polymers:

No Yield = No spectrum interpretation in report

Unfortunately due to Covid-19 we are out of pictures to use for the Blad, so enjoy some memes
Thank you, Amsteldams Cemish Dospuut

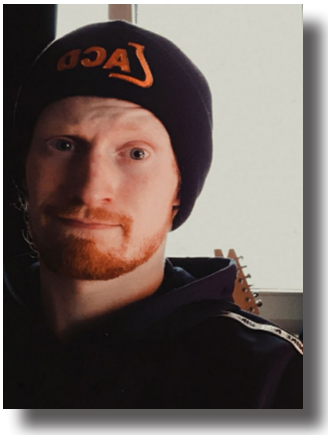




When everybody else has a yield of 90% but you get a yield of 250%

Meet the Freshmen

David



What was your most favourite experience this summer? Going out with friends while I still could, kind of.
Which part of chemistry do you find most interesting? Working with dangerous or explosive chemicals
If you could combine any two compounds out of pure curiosity, which compounds would you choose? Probably a strong manganese heptoxide solution with acetone
Do you have a favourite drink? Red bull or tea (I might be bipolar)
How will you survive the winter this year? With huge amounts of food and music
Which course are you looking forward to? Thermodynamics (next year)
What is your most rememberable Zoom-lecture so far? The one where I blasted Frozen – Let it go through my mic in front of 56 people.

Carlijn

What was your most favourite experience this summer? My favourite experience this summer was going on holiday to Domburg with my friends.
Which part of chemistry do you find most interesting? I personally find synthesis and sustainability the most interesting subject so far, but as we have just started, I am just getting into all the different aspects of this field of study.
If you could combine any two compounds out of pure curiosity, which compounds would you choose? I'd like to combine Francium and Oxygen, just to see if it explodes, and if so, how big the explosion would be!
Do you have a favourite drink? Definitely hot chocolate.
How will you survive the winter this year? Layers. Lots of layers. And soup. And hot chocolate as well.
Which course are you looking forward to? I don't really know the answer to this one, but if I had to choose, I'd say Chemistry, Energy and Kinetics.

Mees

What was your most favourite experience this summer? We went a couple of days to Friesland with a large group of friends and it was really fun. We had a great couple of days!
Which part of chemistry do you find most interesting? I really like organic chemistry, it combines biology and chemistry together and I really liked biology in high school, so I think that is why.
If you could combine any two compounds out of pure curiosity, which compounds would you choose? Probably iron oxide and aluminium powder, because when you heat those two it will create a very hot reaction with temperatures over 3000 K, so that's pretty cool.
Do you have a favourite drink? Limoncello!
How will you survive the winter this year? I have no idea, I'll figure something out. Probably with a lot of hot chocolate and food.
Which course are you looking forward to? 'Chemische Reactiviteit en Biomoleculen', because I really like biology and the processes that happen in biology, so I think that course is very interesting.

Meet the Masters

Tim

What was your most favourite experience this summer? Eating at 3-star restaurant De Librije in Zwolle for the first time as an incredible birthday gift from my girlfriend. As a big fan of food, this was the best gift I can imagine. I'm trying to become as good a home cook as their chef as you can read in the recipe article of this magazine ;).

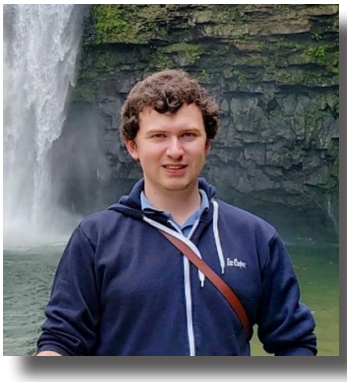
Which part of chemistry do you find most interesting? Biocatalysis! I am intrigued by the way nature can often perform highly complex reactions under very mild conditions where us chemists need high pressure/temperature or exotic compounds. I also see a place reserved for this field in making processes more sustainable.

What was your reason for studying chemistry at the UvA? I wanted to know all about organic chemistry and the fundamentals of chemistry in general and I thought the UvA would help me with that in the best way.

If you could combine any two compounds which compounds would you choose? Iodide and concentrated ammonia. This forms 'klapjood'.

Do you have a favourite drink? Moscato dessert wine.

How will you survive the winter this year? Using aforementioned wine and prolonging the Christmas period for as long as possible.



Charles

What was your most favourite experience this summer? Moving to Amsterdam in the middle of the heat wave.

Which part of chemistry do you find most interesting? Green chemistry

What was your reason for studying chemistry at the UvA? They have a track focusing on energy and sustainability.

If you could combine any two compounds, which compounds would you choose? I'd like to see how big of a bang francium and water would make.

Do you have a favourite drink? Coffee

How will you survive the winter this year? More coffee

What is your most rememberable Zoom-lecture so far? Not one particular lecture, but everyone getting super competitive over Kahoot!

Brian

What was your most favourite experience this summer? Due to the Corona-measures, extended travel to busy places would be irresponsible. Hence, I went to National park Eifel just across the border with Germany for a nature-filled vacation. Finally being able to take some time off from university and classes was enjoyable, although starting with the new year of lectures was no punishment either.

Which part of chemistry do you find most interesting? For my Bachelor, I had the option to specialize in the field of organic synthesis or analytical chemistry. Due to my affinity with numbers, I chose to specialize in analytical chemistry. Separation sciences, com pound analysis and statistics are what intrigues me the most about this field.

What was your reason for studying chemistry at the UvA? During my Bachelor thesis, my professional mindset changed to improving myself and further developing my academic career. Due to a lot of recommendations from teachers to do the Master Track Analytical Chemistry, and the available

courses my choice was clear from the start.

If you could combine any two compounds, which compounds would you choose? What do I look like, an organic chemist?

Do you have a favourite drink? Short answer: Whisky. Long answer: The whisky Lagavulin 16y Distillers edition. The whole process of creating whisky sparked my interest a couple years ago. The differences in processes across distilleries and across the globe provide for varying tastes. Experimenting with ingredients and processes often leads to innovation.

How will you survive the winter this year? Social distancing. Spending money on improving my setup for working from home. Also, coffee.

What is your most rememberable Zoom-lecture so far? One professor having to explain that the distant screams we heard were from an 18-year-old geriatric cat. Subsequently, the name of the cat was questioned on one of the weekly tests!

Bachelor Thesis Project

Retention modelling on SPAM-traps for two-dimensional liquid chromatography

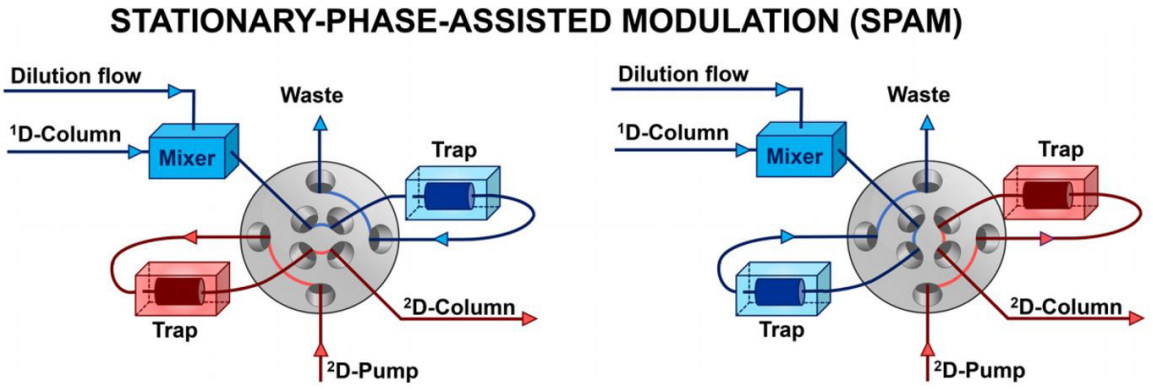
Jesper Ruiter

I am performing my bachelorproject in the group of Prof. Dr. Ir. Peter Schoenmakers, where I am investigating if we can use retention modelling to predict analyte behaviour in the SPAM method in 2D-LC. I can understand that this description could be a little puzzling so let's take a few steps back.

There are a lot of analytical techniques that can be used to separate analytes. One of these is called: High-Performance Liquid Chromatography (HPLC). With HPLC, molecules can be separated based on their charge, polarity, and size depending on the method. Within HPLC there are a lot of retention mechanisms and out of all of these Reversed-Phase Liquid Chromatography (RPLC) is most commonly used.[1] For those who are unfamiliar with this, in RPLC, the analytes are separated due to a difference in retention between a non-polar stationary phase and a polar mobile phase. Non-polar compounds adsorb more onto the stationary phase than the polar compounds and, for this reason, elute later than the polar compounds, resulting in a separation between the analytes.

Okay, so this is great right? Well, there are a few issues with RPLC. The main issue is the time since it can take a long time before an analyte elutes out of the column. One way to solve this is to use what is called a gradient in which the percentage of organic modifier in the mobile phase is increased during the measurement. However, the method development for gradient-elution RPLC can, again, be time-consuming, because a considerable number of experiments have to be performed to find the correct method.[2] This time can be reduced using retention modelling in which you predict the optimal method parameters for a certain chromatographic system.[3]

Alrighty so hopefully it is now clear why retention modelling can be useful. Now let's talk about two-dimensional liquid chromatography (2D-LC). To keep it simple, you use two columns instead of just one. Fractions of the mobile phase from the first-dimension (1D) column are transferred to another column (second-dimension, 2D).[4,5] These fractions subsequently undergo another separation in the 2D column. Using 2D-LC



increases the plate number (which is a measure of efficiency) of the separation. An important part of a 2D-LC set-up is the modulation interface that transfers the fractions of the 1D to the 2D column. This interface can consist of loops or traps (very tiny columns). When using traps the modulation technique is called Stationary-Phase Assisted Modulation (SPAM). To get a better idea of this very short description, see Figure 1 for a schematic overview of the SPAM modulation interface, copied from Pirok *et al.*[6]

As discussed earlier, it can take a long time and a lot of chemicals before you have developed your method and I am trying to find out if it is possible to use retention modelling to predict the retention behaviour of analytes in this SPAM method. So far, I can conclude that the retention behaviour of the traps significantly differs from a regular column. This is a problem since they should contain the same stationary phase and therefore show similar behaviour in retention. I am currently finishing up the project and hopefully will be able to give a definitive answer, but for now, I am afraid that I am going to end this little section with a cliff-hanger.

I do hope you enjoyed reading about some hardcore analytical chemistry and I highly encourage people that are interested in analytical chemistry to look up the interesting projects that this research group has to offer.

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The Chemistry of Autumnal Colours

Why Leaves Change Colour When the Seasons Change

Myrthe Zwart

In the past two months, summer has finally given into a new season: autumn. For some it might mean the season of rain and gloomy days, but it is also the season of hot chocolate, comfy sweaters and the beautiful autumn colours. Whilst this outward change to the vivid colours associated with autumn might seem simple, many chemical compounds and biochemical processes are responsible for this simple joy.

Chlorophyll

In spring and summer leaves are green because of the vital compound chlorophyll, consisting of the pigments chlorophyll a and chlorophyll b (Figure 1).[1] During the plentiful seasons of late spring and summer, the chlorophyll in the chloroplasts absorbs red and blue light from sunlight, and uses it to transform CO2 and H2O into glucose and ultimately into carbohydrates used to store the plants energy reserves. The light reflecting from the leaves of trees is diminished in the red and blue region, resulting in varying shades of green, depending on the particular tree or leaf you are looking at.

Chlorophyll is synthesized in a lengthy branched biosynthetic pathway shared with heme, often starting from the amino acid glutamate. Trees that change colour during autumn are part of the family called Angiosperms. In these plants, the later steps of the synthesis of chlorophyll are light dependent which also leads to paling when grown in darkness. Chlorophyll is not the most stable compound and can decompose to colourless nonfluorescent chlorophyll catabolites, NCCs (Figure 2), which is why it constantly has to be resynthesized by a plant.[2,3]

When the days shorten and temperatures drop in autumn, the optimal parameters for chlorophyll synthesis are no longer met and the reaction slows down. The amount of chlorophyll in the leaves declines and suddenly other pigments, masked by the vast amounts of chlorophyll normally present in spring and summer, start to show.

Carotenoids

The other pigments present in leaves throughout the year are the carotenoids (Figure 1).[2] These pigments absorb light in the blue-green and blue region, resulting in a yellow to orange colour when illuminated

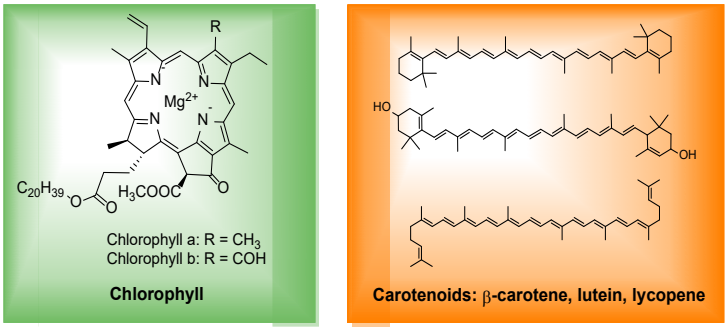
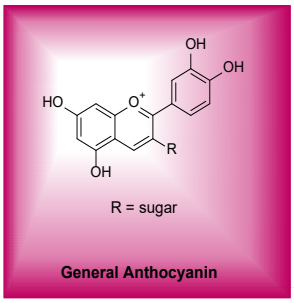


Figure 1. Structures for Chlorophyll a and b and some notable carotenoids.



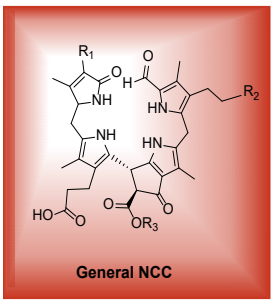


Figure 2. General structures for anthocyanins and NCCs.

Figure 3. Multi coloured maple leaves in autumn.

by sunlight.[1,2] Carotenoids function as accessory light harvesting pigments, extending the spectral range at which photosynthesis can take place, whilst also protecting against photodamage.[4] In spring and summer, the concentration of carotenoids is much lower compared to chlorophyll, therefore resulting in a masking effect. When chlorophyll production slows down and excess chlorophyll is broken down, their colours become noticeable. Just like chlorophyll, the carotenoids are broken down in fall, but at a much slower rate, slowly giving way to a final brown colour.

Some notable carotenoids that are often found in senescent leaves are: β-carotene (found in carrots, orange), lutein (found in egg yolks, yellow) and lycopene (found in tomatoes, red).[2]

Anthocyanins

Most bright red colours in autumn foliage are however not a result of red pigment carotenoids, but of a family of flavonoids called the anthocyanins (Figure 2). Anthocyanins are not present in summer green leaves, but are produced later de novo during senescence.[2,5] Their formation is facilitated by the breakdown of sugars in the presence of energy from sunlight, after which they are released into the cell sap. Anthocyanins absorb the blue, blue-green and green wavelengths of sunlight, which is why they are responsible for the vivid red, purple and magenta shades. Anthocyanin production is often preceded by chlorophyll breakdown and intensity is increased by high light, cool (not freezing) temperatures and mild drought. Since anthocyanin synthesis is light-dependent, leaves might show a unique pattern based on what part of the leaf was exposed to sunlight (Figure 3).

The precise biological function of anthocyanins is still disputed in the scientific community. Some claim the bright colour serves as a defence mechanism to deter herbivores. More recent research has suggested that the accumulation of anthocyanins contributes to the shielding of chloroplasts from excess sunlight, a sort of "plant sunscreen".

Tetrapyrroles

Nonfluorescent chlorophyll catabolites (NCCs, Figure 2) were long thought to be the final breakdown product of chlorophyll in senescent plants.[6] However, upon further research these NCCs readily breakdown into rust coloured materials during TLC research. NCCs can be chemically oxidized under influence of light to a yellow tetrapyrrole chlorophyll catabolite named *Cj*-YCC, which is also measured in autumn leaves, and a pink tetrapyrrole chlorophyll catabolite named *Cj*-PiCC. Together these pigments result in an orange-red colour that was mistakenly labelled as 'rust' in earlier research.

Maybe next time you go for a nice autumn walk, or when you stare out your windows during quarantine, you will appreciate the complex synergistic processes that result in the brilliant shades of yellow, orange, red and brown we have come to associate with autumn.

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Studenten Zoeken Huisvesting

Maarten van Dorp

"De woningmarkt is oververhit" is inmiddels een gevleugelde uitspraak geworden. Na de kredietcrisis die van 2008 tot pak 'em beet 2012 duurde, is de Amsterdamse woningmarkt weer helemaal opgeklommen uit het diepe dal waar het zich toen in bevond. Dat wil zeggen, Amsterdamse woningen worden inmiddels voor gemiddeld €500,000 verkocht. Fantastisch voor de grootgrondbezitter en de belegger, maar rampzalig voor mensen die daadwerkelijk in de stad willen wonen, waaronder wij: de studenten.

Maar studenten kopen helemaal geen woningen, daar hebben we het geld niet voor, wij huren massaal. Hoe heeft dit dan betrekking op ons? Nou, in Nederland maken we gebruik van het woningwaarderingsstelsel (WWS), beter bekend als 'het puntenstelsel', waarin we woningen op basis van verschillende eigenschappen punten toekennen, om vervolgens op basis van de hoeveelheid punten een maximale huur te bepalen. Komt het huis boven een bepaalde hoeveelheid punten uit, dan kan het worden 'geliberaliseerd' en mag de verhuurder de hoogte van de huur helemaal zelf stellen. Laat het dan nou net zo zijn dat onder de eigenschappen die meetellen voor dit systeem ook de WOZ-waarde, de door de overheid geschatte waarde van de woning, meetelt. Dus: torenhoge prijzen op de huizenmarkt betekent voor studenten onbetaalbare huren op de huurmarkt.

Gelukkig hebben we in Nederland goed nagedacht over dit soort zaken en zijn er de woningcorporaties, organisaties die zonder winstoogmerk met de overheid samenwerken om sociale woningen te realiseren. Het zijn ook deze woningcorporaties die de oplossing voor veel studenten verzorgen: studentenhuisvesting. Vaak kleine, maar toch goed bewoonbare woningen met lage en dus voor studenten betaalbare huren. Helaas zijn ook deze huizen beperkt beschikbaar en staan we tegenwoordig jaren in de rij om in te kunnen trekken.

En dan ben ik nu toch eindelijk aangekomen bij het einde van deze al veel te lange introductie. Vanwege de eerste vier woorden van dit artikel ben ik namelijk nieuwsgierig geworden naar hoe dit alles vroeger was. Sinds wanneer doen we eigenlijk aan specifieke studentenhuisvesting? Is de woningmarkt altijd al zo oerend kut voor ons geweest? Daar zijn in de recente geschiedenis best interessante dingen over te zeggen. Het zal niet verbazen dat er direct na de Tweede Wereldoorlog een enorme woningnood was. In Nederland waren er bijna 100.000 woningen vernietigd, bijna 50.000 woningen zwaar beschadigd en bijna 300.000 licht beschadigd en tegelijkertijd hadden we te kampen met een babyboom. Dat een groot deel van de volkshuisvesting op dat moment van dusdanig lage kwaliteit was dat deze door de overheid onbewoonbaar en rijp voor de sloop werd bestempeld, deed de nood zo hoog oplopen dat families in grote huizen verplicht werden een deel van het woonoppervlak af te staan aan woningzoekenden. Waren er een aantal kamers vrij in je huis? Pech gehad, er kwam een andere familie inwonen. Omdat een dak boven het hoofd voor families al een luxe was, stond studentenhuisvesting niet hoog op de prioriteitenlijst.

Toch kwam daar relatief snel verandering in. Zoals ik ook in een vorig stuk over de opkomst en ondergang van de stufi heb geschreven, waren er voor de opnieuw draaiende economie van de wederopbouw meer universitair geschoolden nodig. Met dat doel voor ogen werd in 1953 door minister Cals de adviescommissie 'voorzieningen ten behoeve van studenten' uit de grond gestampt, met als een van de aandachtspunten de studentenhuisvesting. Dat was dan ook broodnodig, want de afwezigheid van woningen was voor veel jongeren een reden om niet aan de studie te beginnen. Daarom adviseerde de commissie voor de bouw van dichtbij het centrum gelegen studentenwoningen met daarin door 8 tot 15 mensen gedeelde faciliteiten. Die woningen kwamen er: een mooi voorbeeld is de

in 1966 gerealiseerde Weesperflat hier in Amsterdam. Het duurde natuurlijk wel een aantal jaren voordat die woningen allemaal gebouwd waren en tot die tijd bleven de studenten niet stil. In 1963 bivakkeerde er enige tijd een lid van ASVA in een houten ton op de dam. Het beeldmateriaal daarvan is te vinden op YouTube onder “Kamernood onder studenten in Amsterdam (1963)”: een aanrader.

Rond die tijd werd door studenten van diezelfde ASVA de Stichting Studentenhuisvesting Amsterdam (SSH-A) opgericht. Het kwam voor een deel voort uit de Centrale Stichting Studentenhuisvesting, een samenwerking van een aantal technische bedrijven die middels extra huisvesting meer hoogopgeleide arbeiders aan hun werknemersvijver wilden toevoegen. Mede dankzij de SSH-A werden een aantal grote bouwprojecten voltooid aan het begin van de jaren 70, waaronder het jullie vast niet onbekende Uilenstede. Die bouwwoede aan het begin van de 70er jaren, gepaard met de bevolkingskrimp van 17,4% waar Amsterdam tot 1980 mee te maken had zorgde ervoor dat de woningnood voor studenten op een laag pitje door sudderde.

Maar het kon niet te lang sudderen voor de hele boel overkookte. De woningbouwers waren na de korte sprint al buiten adem en aan het einde van het decennium was er niet alleen woningnood, maar stonden er ook veel panden leeg; Amsterdam was rijp voor de krakersrellen. Dat de raadszaal van de Amsterdamse gemeente in 1979 door krakers werd bezet met onder andere de eis voor meer jongerenwoningen was slechts het begin.

De politie zou namelijk geleidelijk gekraakte woningen gaan ontruimen en in 1980 leidde dat tot een ware veldslag tussen krakers en de ME. Die laatste partij had namelijk de opdracht gekregen Vondelstraat 72 leeg te vegen, maar zodra ze dat hadden gedaan werd het door een woedende menigte direct weer ingenomen. En die menigte was niet alleen zo woedend, maar ook zo groot en zo strijdlustig dat de oproerpolitie werd verjaagd door de oproer zelf. Gewapend met stenen, amsterdammertjes en alles dat maar uit de straat getrokken kon worden, hebben ze zich de gehele Vondelstraat toegeëigend. De schade: 53 verwondde agenten. Daar was het drama nog niet mee rond, nee, het werd nog veel intenser. Krakers hielden voet bij stuk totdat de rupsbanden van Nederlandse tanks door de Amsterdamse straten rolden.

Helaas moet ik het voor dit artikel daar bij laten en jullie een tweede deel beloven. In de volgende editie gaan we het hebben over pantservoertuigen in Amsterdam, een woonboot ter grootte van een cruiseschip en hoe het er nu voorstaat met de al flink rumoerig gebleken woningmarkt.

Chemistry vs. Electrical Engineering

Myrthe Zwart

Since quarantine, most of us have been glued to our screens and devices. With the increasing importance of electrical devices, we decided to have a little chat with the future creators of these devices. This edition, we turned to a more technical university and interviewed students from Electrical Engineering at the TU Delft.

The Electrical Engineering Student on Chemistry

First of all, what is your name and why do you study Electrical Engineering?
L: Hi my name is Lotte Zwart and I started studying Electrical Engineering because it is a combination of computer sciences, mathematics and physics. I also wanted to do something practical and be able to physically interact with it.
K: My name is Karen and I started studying Electrical Engineering because it is technical, but also broadly applicable. I could, for example, go and work in healthcare, but also find a really technical job.

What do you think Chemistry entails?
L: I think chemistry is magic, you add a random substance A to a random substance B, and suddenly you have a dye for a solar cell. Pure magic.
K: A lot of throwing substances together and seeing what colour it will form. Other than that I don't really know, they know a lot about compounds and what happens when you add them together.

Who is 'the' Chemistry student?
L: Very typical. Also very depressed, because their reaction goes to shit if you add one drop too much of a reagent. They are just like mathematics students: they didn't know what they wanted to do, so they chose something they did and were good at in high school, except it's a theoretical bachelor so in the end you still can't do much with it.
K: Those people make a lot of their own stuff, like creating your own shampoo and doing experiments with cooking. Also making a lot of stupid puns about chemistry.

How do Chemistry students overestimate themselves?
K: MATHEMATICS
L: AND PHYSICS
K: Yeah, basically mathematics and physics.
L: The rest will be fine.

What are Electrical Engineering students better at than Chemistry students?
L: The application.
L: Answering the question: why are you doing this? What is your end product?
K: Automating.
K: You have redox reactions but we really do more interesting things with electrons.
L: Yes we are really pro at that.
K: AND MATHEMATICS.
L: And being autistic, you are very precise (perfectionist) and we are 'auties'.
L: 'Beunen'. If it doesn't work: just work harder. If it still doesn't work yet: duct tape.
L: And fixing bicycles.

What are Chemistry students better at?
K: Working neatly, social interaction, chemistry.
L: You guys understand how a battery works, I just plug in a cable, and cleaning: you suddenly have to think about how to clean things.
K: 'Veilig beunen': if you are going to work on something then you take some more precautions to work safely.
L: Making and executing a plan. We are like: just look what happens, throw something against it, if it doesn't work, throw more at it. Oh and they are much better at writing reports.

What do Chemists do all day?
K: Cleaning their lab.
L: Looking at the titration tap, waiting for something to happen.
K: Writing in your lab journal: Dear diary, today I produced stuff.
L: Dear diary, it took 3 hours for my reaction to get going and then it was too exothermic and I had to stop it, maybe tomorrow it will work.
K: Dear diary today I threw shit all over my lab coat, now it's not pretty and white anymore.
K: Dear diary, today I threw hydrogen peroxide over my lab coat to make it nice and white again.
L: Dear NEW diary, I made my previous diary explode because I accidentally made TNT.

The Chemistry student on Electrical Engineering

What is your name and why do you study Chemistry?
P: My name is Perry Blommaart and I'm a second year bachelor student. I study chemistry because I like to be able to explain the world on a molecular level.
E: My name is Emma and I started studying chemistry because I wanted to know more about the world around us, what it's made of and how we can use it to create new things, such as pharmaceuticals and cosmetics. I like that chemistry is both a separate science, and at the same time involves lots of physics, mathematics and biology. I think chemistry will always be relevant and can be used to make a difference in our society by contributing to sustainability and medicine, for example.

What do you think Electrical Engineering entails?
P: Mostly electric circuits, building new batteries and learning about everything related to electricity.
E: I don't know much about Electrical Engineering, but my first thought was: everything that involves wires and, of course, electricity. I assume it involves a lot of physics, mathematics and programming. To me it seems a highly relevant, applied field of science that is both theoretical and practical, and is focused more on designing than discovering.

Who is 'the' Electrical Engineering student?
P: The Electrical Engineering student is one of those girls or guys who build an electric car, which wins a solar car race in Australia.
E: Very smart, probably! I imagine they are innovative and future-oriented, but at the same time also very concerned with current developments. If there is such a thing as a typical Electrical Engineering student, I think a common quality would be that they're good at systematic thinking, working meticulously and maybe a bit introverted.

How do Electrical Engineering students overestimate themselves?
P: I think that Electrical Engineering students overestimate themselves in their ability to actually build really cool batteries and electrical motors.
E: Do they? Maybe they think they work even harder than or are smarter than other students, but that could apply to any type of student. Instead of an overestimation, a pitfall in a future job could be communication with those that have no knowledge of the subject, because I can imagine that it might be hard to explain what they are doing.

What are they better at than Chemistry students?
P: Definitely everything with electricity and working with or building machines or batteries.
E: Mathematics, haha. Maybe also adhering to the 'rules' of their discipline, working precisely and systematically.

What are Chemistry students better at?
P: We are definitely better in explaining molecular principles and real life events on a molecular level.
E: I think Chemistry students are perhaps better at creating new things by thinking out of the box and combining or discovering other things. And drawing molecules, I hope!

What do Electrical Engineering students do all day?
P: Making electric circuits and batteries.
E: I assume pretty much the same as other students. So, studying.

Smaakmatrix

Inspired by the Parool

Scientific

Beer-related

Horrible

Brilliant

The Nobel prize in Chemistry has been awarded to two women

The 'Heel interessant' meme template from conspiracy theorist Lange Frans

Wintertime: an extra hour of sleep

UvA handsanitizer stinks

On 8/10/20 the ACD website had a total of 1,000,000 visits!

Baileys seasonal flavours

No alcohol purchase after 20:00