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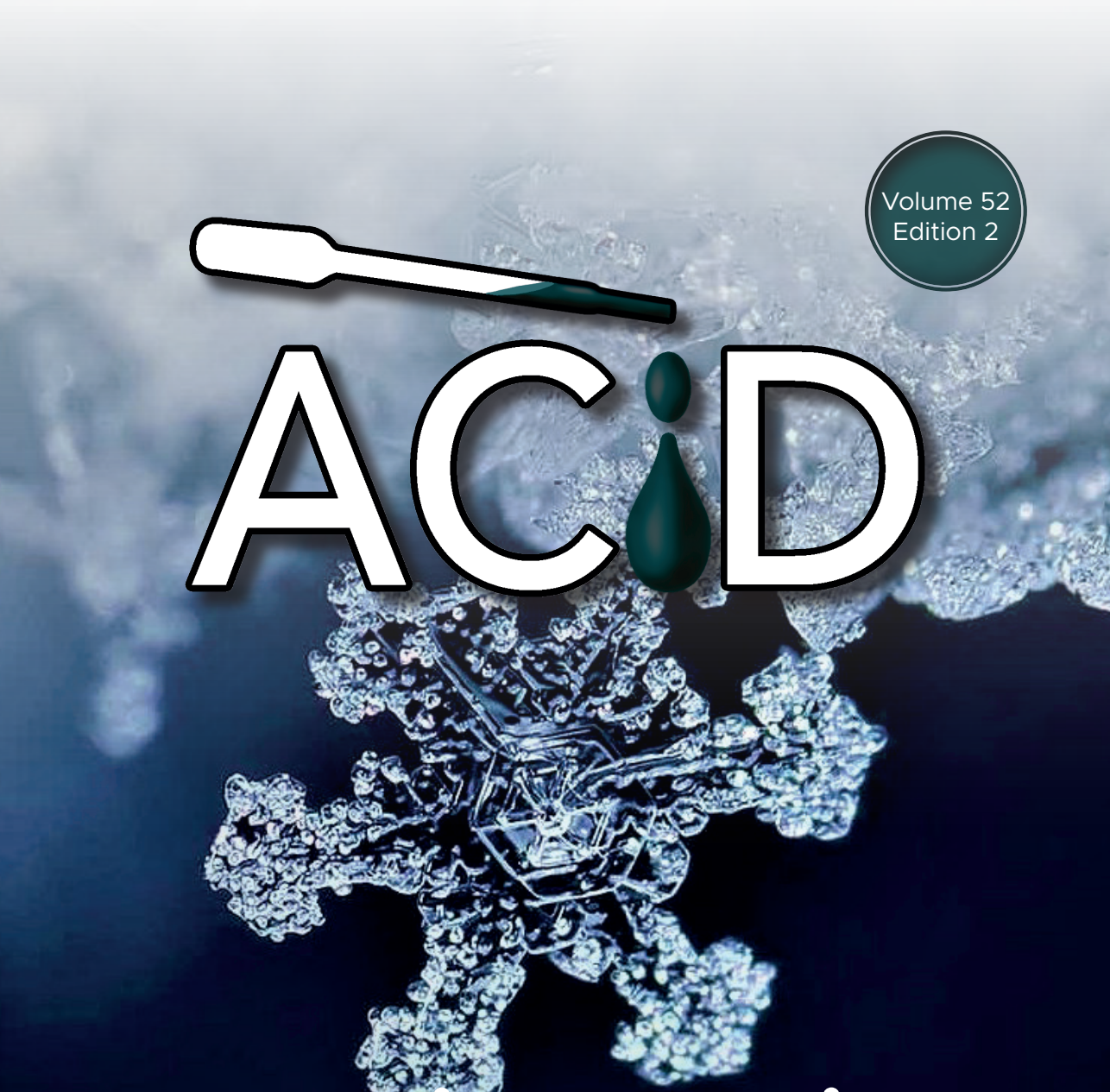

ACiD

Sweet Winter Holidays

Maillard Reactions & Caramelization

Amsterdams Chemisch Dispuut

PhD Research: Pieter Laan

Strategies towards supported bi-atomic catalysts – Molecular approaches for heterogeneous catalysts

Who Are the ACD'ers?

Interview With Professor Timothy Noël

Colophon

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From the Editor

Dear reader,

We hope that you have enjoyed the brief period of winter weather that has hit the Netherlands, and went ice skating and built some snowmen. In the second semester, corona still has a firm grip on our society and university, but practical education has restarted and the goverment even decided to half the tuition fees for next year. As you may have noticed, switching to a different presser has resulted in a slightly different size of the Blad. Although our size went down a little bit, the quality of our articles remains unaffected! This edition we dive into the chemistry behind Maillard reactions and caramelization and you can put this new knowledge into practice by preparing our recipe. We would also like to introduce you to the UvA's newest professor, Timothy Noël, in an in depth interview! Good luck in the second semester and enjoy reading!

On behalf of our entire editing team,
Myrthe Zwart

Content

From the Chair

Dear ACD'ers,

At the moment of writing, the first day of winter, we are only just a week into the new lockdown and exams are over. A nice time for a little break from studying and having some fun, one would suggest, but how to do that during a lockdown? Luckily, we are just a few days away from spending Christmas with (a part of) the family and celebrating the end of this year we call 2020, where the word 'anderhalvemetersamenleving' has become the Van Dale word of the year. Let's hope 2021 brings us some brighter events and that the vaccines can quickly become available for everyone.

Now I will be talking about some of the things that the ACD managed to do during these past few months, once again taking place in the online environment. First of all, the SLA started their year with the festive opening of the lustrum at the evening of the 6th of November where a lot of different games were played and nice prizes won. A few weeks later, the SLA invited us all for another activity: Murder Mystery. Divided in small groups, the members off the ACD could show off their detective skills. Maybe the people who solved the mystery should consider a master in forensic sciences.

Furthermore, the LEC and SLA worked together to create a symposium called 'ACD loves Earth' about the chemists point of view on sustainability. One of the highlights of this being online was the possibility to invite a guest lecturer from Canada; Prof. Dr. Jennifer Murphy. She gave a talk on her analytical work on NO_x and ammonia in the United States. Another insightful lecture the LEC hosted was the guest lecture by prof. Paul Jennings on in-vitro toxicology. In order to learn more about toxicology and all of the other of the vast amount of chemistry related research groups the UvA and VU have to offer, the first orientation market was organized. This was a great opportunity for people looking for a research project to get to know the different groups.

But enough about the study related activities, we were also trying to keep in touch with everyone by hosting a number of social activities of which the ABC, CWAL, EJC and MAC took good care. Starting with a delightful pub quiz where I learned what the West-Friese question "Nôh hoeveel koeraampies het je vader?" meant. Apparently, it's about asking if your dad owns a large cow farm, which implies that he is very rich or something. Besides that great lesson, multiple game nights were held, where qualities such as drawing, lying and comedy were put to the test in several games. In the final activity before the exam week, Christmas cookies were baked assisted by lovely tunes of Christmas classics.

The ABC also created the Top 75 des ACDs to commemorate the songs that all ACD'ers liked the most. Even though this year has been quite the Rollercoaster, I know for sure that another song will take the number one spot on the list. The CWAL has also awakened the creativity in some of our beloved active members during their Bob Ross painting class. Despite no one coming close to the perfection of the artist himself, mostly due to the use of acrylic paint by the active members

instead of his oil paint (I suppose), some amazing replicas were still identified.

Finally, I would like to wish you all a great start for the upcoming semester and I hope to be able to see you soon in real life!

Kisses,
Your Chairman,
Floris Blom (and apparently our treasurer Bart)

Het wel en wee van de OC part 2

Sverre Overdijk

Quite some time has passed since the last Wel en Wee, almost a whole semester. Half a year in which the Program Committee has not been idle. Currently, we are trying to get the response rates on the course evaluations up. I am sure a lot of you steadily fill out the forms, and we are truly grateful for that. However, to the people not filling out the evaluations I strongly want to urge you to do so. If you fill out the forms, it is not only beneficial for us, the program committee, but also for you, the students who still have to follow the course and our future students. Not only is a higher response rate statistically more accurate, a low response rate gives the lecturers a chance to claim the course scores low because the people that filled out the forms are outliers and do not represent the mean of the students. So, please fill out the course evaluations no matter your opinion on the course.

Last Wel en Wee I told you briefly about the new curriculum for the bachelor. The curriculum committee tasked with creating the broad outlines of this new curriculum is now done. The most important change is the introduction of four different tracks which are Synthesis and Sustainability, Chemistry of Life, Analytics and Photonics & Quantum and Computing. An introduction to the four tracks, as well as core subjects just like the current ones, will be given in year one. In year two, one of the four tracks is dropped and in the third year another one. In this way, you can specialize in the subjects you want to follow. Of course, some things will also stay the same. At the end of year two there will still be a short research project, and year three will still contain the possibility to do a minor, as well as the usual literature research and the bachelor project. We as the OC made sure any hiccups or problems we could predict beforehand were known to the curriculum committee, so everything will go as smooth as possible when the new curriculum takes action, starting with the upcoming first year students next year.

Furthermore, the OC is busy following up on the course evaluations you filled out last year. The parts of the upcoming courses in the next two periods, which scored badly on the evaluation, have been discussed with the concerning lecturers and improvement has been promised. This is why filling out the evaluation forms is so important, and in this way we can also keep track of the courses' improvement.

In the next Wel en Wee we will keep you up-to-date.

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

Sweet Winter Holidays

Maillard Reactions & Caramelization

Siebe Lekanne Deprez

The Christmas holidays are over now and 2021 has begun. Although the holidays were a bit different due to the lockdown, I noticed that a central theme always arises during the winter break, we all of a sudden see commercials coming out like crazy about making the holidays 'gezellig' during which we have to look out for each other.* Do not get me wrong, I like this sense of belonging, but I became interested in the fact that the supermarket commercials always include a Christmas dinner with well-prepared dishes that made you hungry (these are nonetheless commercials for supermarkets…).

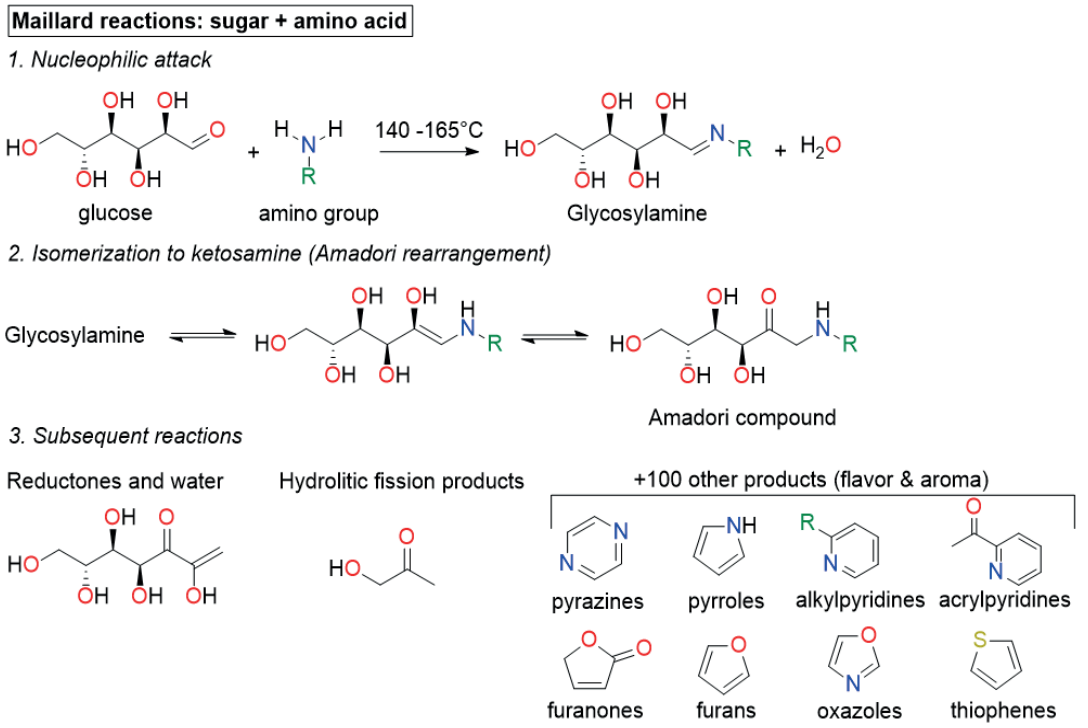
These commercials made me wonder again about the chemistry of preparing food and which chemicals are responsible for the delicious flavors and aromas. I immediately thought of two quite famous (and poorly-understood) processes that happen during preparing food at high temperatures: Maillard reactions and caramelization. I had heard of them, but I did not know the details of the processes. Thus, these two processes are discussed in the following article on, of course, an adequate chemistry level!

First, let us introduce the two processes on a general level before heading into the "real" chemistry part. In 1912, Louis Maillard figured out that the browning of food of, for example meat, bread and French fries, was caused by chemical reactions between amino acids and sugars that happen at elevated temperatures. It is important to realize that these reactions are non-enzymatic and thus require high temperatures between 140 °C and 165 °C to overcome reaction barriers; no wonder why almost all baking and cooking recipes involve heating to at least 140 °C. The result of raising the temperature are dozens of products, causing a brown color and very appealing aromas (if done correctly).

At around the same temperature (≈ 165 °C) another process kicks in: caramelization. While Maillard reactions are reactions in which sugars and amino acids react with each other, caramelization involves decomposition (pyrolysis) of only sugars. Just like the Maillard processes, caramelization is non-enzymatic and also results in the browning of food and it is important for – you guessed it – making caramel. Unfortunately, differentiating caramelization from Maillard reactions is fairly difficult with the naked eye and can cause some confusion about thinking they are the same process. But these are not equivalent and please do not make the same mistake as I did.

Now, what are the reactions mechanisms of both processes that I have been talking about so far? Scheme 1 shows the main steps that occur during the Maillard reactions, but you should know that this process and caramelization are highly com-

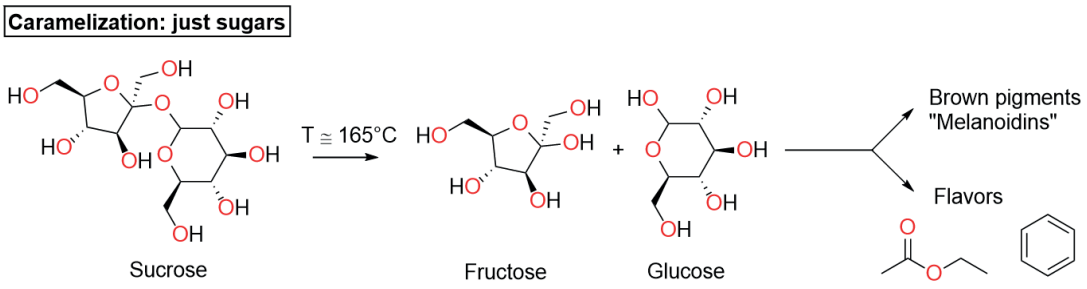
* We had in the Netherlands during the winter holidays: Albert Heijn, Coca-Cola, Jumbo, Plus, Bol.com, Lidl, Dirk, Kruidvat, Coop & Staatsloterij



Scheme 1. Overview of the Maillard reactions.[1] A careful chemist would have noticed that this reaction can be catalyzed by adding a base. The amine gets deprotonated by the base and becomes more reactive/more nucleophilic. In practice this is used for instance to make pretzels darker.[2]

plex and are not fully understood. During the first step, we have a nucleophilic attack of the amine group in the amino acid to the carbonyl of a sugar – glucose in this case. The result is glycosylamine (which contains actually an imine) and water. After a few isomerization steps, an Amadori compound is created in which both a carbonyl and an amine are present which is called a ketosamine. Different pathways are possible from here on, leading to reductones, small hydrolytic fission products and of course our brown-colored compounds called melanoidins. Besides these products, smaller and more volatile products are formed that cause the aromas and flavor we know all too well.

Continuing with the caramelization process, it involves only sugars during the first step, unlike the situation in Maillard reactions. Instead of a nucleophilic attack, a decomposition occurs of a disaccharide or larger ('sugar chains') at around 165°C (Scheme 2). In this example sucrose decomposes into monosaccharides fructose and glucose. The monosaccharides can then react further with other sugar compounds via condensation reactions that resemble Maillard reactions.[3] The result is dozens of aromatic compounds that give caramelized food their appealing sweet and nutty taste. Also, melanoidins are formed and change the color of the food to a more brownish color. To speed up the caramelization process,



Scheme 2. Overview of reactions involved during caramelization which is also an example of pyrolysis – decomposition by heating.[4] Maybe you have noticed it, but the first step is not entirely correct since the number of atoms is not the same on both sides. This is because an intermediate is formed by the loss of water and consequently, fructose by a condensation reaction.[5]

the environment can be made acidic (pH < 3) or alkaline (pH > 9).

Finally, I should also address what happens if you overdo the reactions because well, we are chemists after all and like to experiment. In case the temperature is too high and/or the exposure to high temperatures is too long, several unfavorable reactions can occur. One of them is that monosaccharides break further down into smaller molecules and get oxidized, in order words, you burn your food until there is only some black carbon left. Another unfavorable effect is that the carcinogenic compound acrylamide can be produced to which you might not want to be exposed to. Thus, please do not push the limits if you cook, bake or something else so that you can safely enjoy the delicious brown and sweet products of the wonderful reactions!

1. Compound Chem. Food Chemistry – The Maillard Reaction. https://www.compoundchem.com/2015/01/27/maillardreaction/ (accessed Jan 3, 2021).
2. Matz, S. *Snack Food Technology*, 2nd ed.; Springer, Berlin, 1984.
3. The Tartan. How Things Work: Cooking. https://thetartan.org/2013/11/25/scitech/howthingswork (accessed Jan 4, 2021).
4. Aguiar, C.; Rocha, A.L.B.; Jambassi, J.R.; Baptista, A.S. Factors Affecting Color Formation During Storage of White Crystal Sugar. *Focusing on Modern Food Industry* **2015**, *4*, 1-10.
5. Locas, C.P.; Yaylayan, V.A.; Isotope labeling studies on the formation of 5-(hydroxymethyl)-2-furaldehyde (HMF) from sucrose by pyrolysis-GC/MS. *J. Agric. Food Chem.* **2008**, *15*, 6717- 6723.

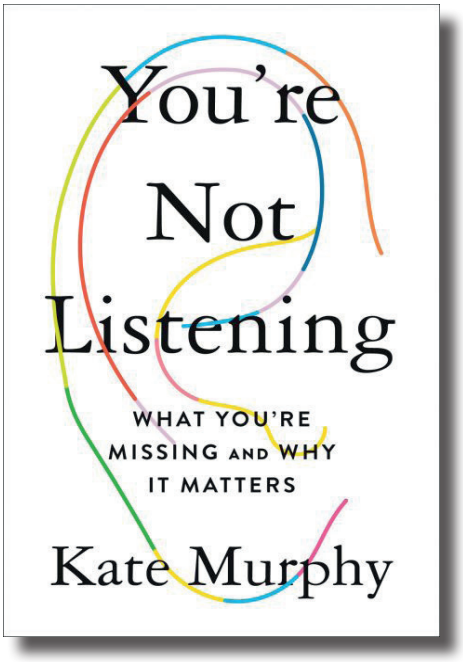
Book Review Part 2: Get Through the Winter

Siebe: You're Not Listening - Kate Murphy

If anything became clear to me during New Year's Eve is that people were tired of 2020, and why wouldn't they be with all the disasters and alarming messages ranging from covid-19 to climate change to social politics? I would like to zoom in on one aspect in particular: the increase of polarization in countries. It can lead to people hating and despising each other simply because they have different beliefs and political views, even within families. With this in mind, I kept wondering if some of these conflicts could be simply resolved if people started really listening to each other. But then came the questions: how do you listen to someone and what is the effect if you start listening to someone?

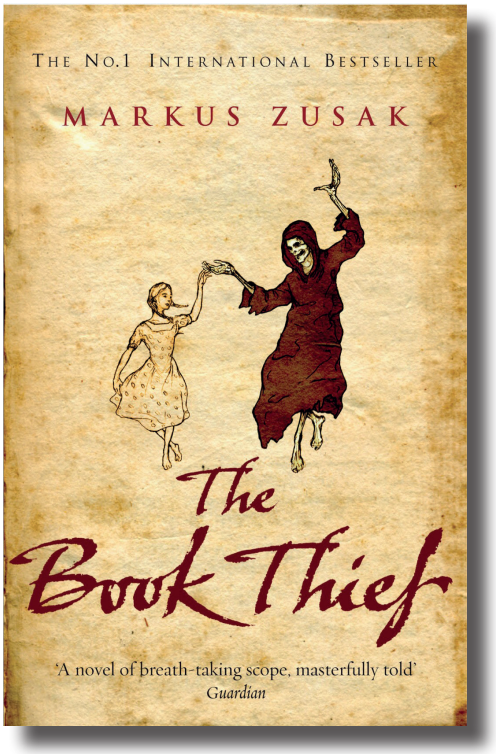
Well, journalist Kate Murphy describes in her book 'You're Not Listening' the art of listening very clearly and she takes you on a journey where she describes different aspects of listening. Her explanations are based on experiences and many investigations in which she talked to priests, CIA-agents, radio producers, bartenders, astronauts and many more. She describes the importance of listening to each other in an era where a significant part of our communication happens digitally. How often did you try to talk with another while one of you was chatting on his/her phone?

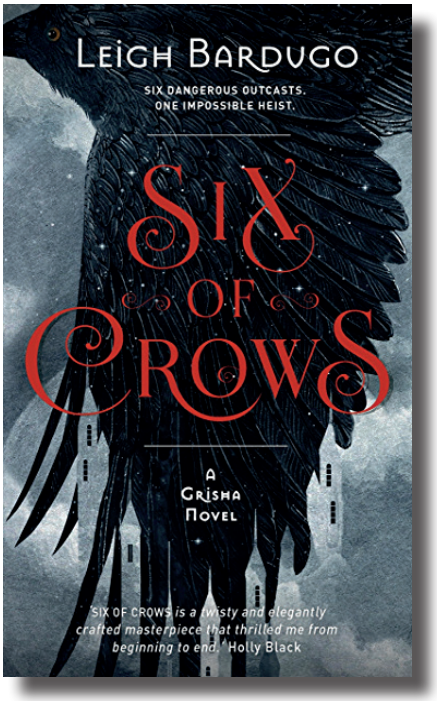
Kate reminds us how to have a conversation with someone and guides you in becoming a better listener. In the end, you will better understand the art of listening and how much you didn't know about listening.



Michelle: The Book Thief - Mark Zusak

Powerful books in my opinion are those which still make you think of their events, or certain quotes, years after you have read them, and I have to say that The Book Thief by Mark Zusak definitely falls into this category. In this story, you follow a girl named Liesel Meminger while she is coming of age in Nazi-Germany during World War II. I won't spoil anything else of the plot, but I can assure you that you will fall in love with the characters, of which their personalities are described with a vividity making you believe they are standing right next to you. You might even find compassion for the special narrator himself. The story is after all told by none other than Death himself and the phrase 'Even Death has a heart' has never been more fitting than for this story. I have to warn you: this book might leave you devastated, I surely had to cry at the ending, but it will also make you appreciate the beautiful aspects humanity has to offer.





Myrthe: Six of Crows - Leigh Bardugo

An impossible job, an elaborate plan and a team consisting of criminals. The reward is beyond their wildest dreams, but the consequences beyond their worst nightmares. Six of Crows is a fantasy heist story with the same surprises and elaborate plans as the classic heist movie Ocean's 11, plus a dash of magic. Interestingly, it is not the great plot, action, world building or well thought out and written heist that make this book so good, but actually the characters. Each one of them is flawed and unique, with incredibly detailed backstories, and the change of narrator each chapter, although odd at first, gives them so much depth. Will this powder keg of a team explode or can they put their differences aside long enough to get the job done? Despite officially being part of a series, Six of Crows is a great stand-alone novel that will keep you on the edge of your seat!

Tim: Flow - Mihaly Csikszentmihalyi

Every one of us has experienced a state in which you become fully involved in an experience and feel like it is effortless at one time or another. This may be during running, where it is called the runner's high, when writing a text and the inspiration just streams out of you or even when writing your thesis and it feels effortless (okay this last one is dubious, I admit). All these experiences are what Mihaly Csikszentmihalyi has called *the flow experience*. You are more than likely already familiar with this term as when someone says 'I was in the flow', and this book is exactly where that term comes from.

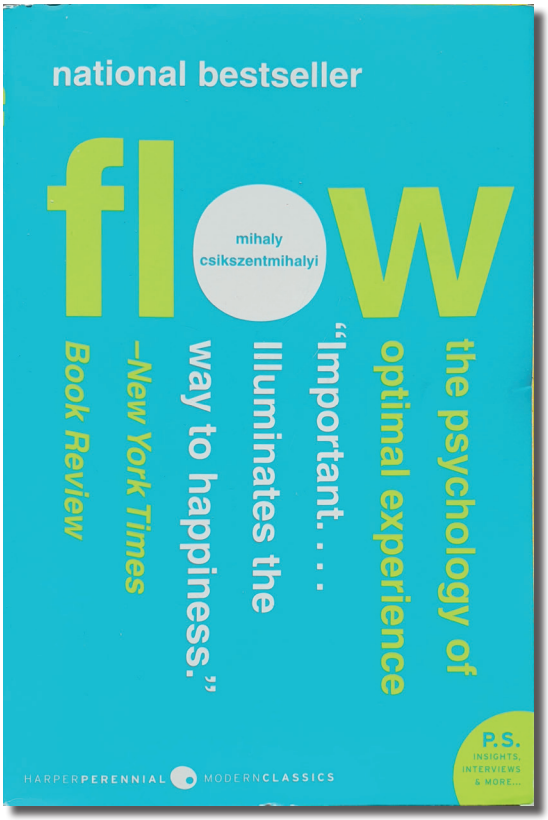
Now wouldn't it be ideal to experience this state as often as possible? That is what this book tries to investigate. What do these flow experiences have in common? What are the requirements to experience one, and how can we use this knowledge to improve our wellbeing? At first I must say it sounded like another typical self help book: fancy words, little actual value; but when reading the book, I got a lot of helpful ideas that I could actually put to use.

The most important one I got from this book is the paradox between work and spare time. In one of his group's studies they found out that when asked 'would you rather be somewhere else?' when at work, most people said yes. However, when asked to rate their happiness/experience of flow, this was much higher at work than compared to their spare time.

The reason, Csikszentmihalyi argues, is that while we often tend to want to relax because we think it makes us happier, the requirements for flow experiences are better met in most activities that require effort. In my opinion, the most important requirements he discusses are 1) the activity must have a clear goal, 2) there is direct feedback whether the goal has been met, 3) it is not too difficult/nor too easy, and 4) you feel that you have personal control/impact on the outcome. When reshaping our activities to meet these requirements we can increase the chances of them leaving us fulfilled and happy.

Interestingly he draws this concept even further than just work. He applies it to relationships, family, and most importantly: leisure. To illustrate the importance of leisure he quotes C.K. Brightbill: 'The future will belong not only to the educated man, but to the man who is educated to use his leisure wisely' (and to the woman of course).

If you want to read all his examples of flow experiences, how he applies it to other aspects of life, such as relationships, and how and why he thinks flow is the key to a fulfilling life, then I would recommend picking up the book.



Crème brûlée

by Tim Lugtenburg

As the holidays are over again you might expect a healthier recipe in this edition. But those New Year's resolutions can begin after this one ;). This dessert classic is a lot simpler to make than I initially expected and tastes a lot better than some of the premade ones you can find in the supermarket. What makes this dessert so popular is of course it's caramelized sugar layer on top and the contrast between the soft pudding and the hard crust is what makes it so special.

Ingredients:
- 5 egg yolks
- 120 g sugar (and some for on top)
- 1 teaspoon vanilla extract
- 500 mL heavy cream
- 18 teaspoon salt

Equipment:
- torch burner
- ±6 ramekins

Recipe:

1. Pre heat oven to 180 °C. Mix the heavy cream with salt and heat until just hot in a small pan. Add vanilla extract at the end.

2. Separate the yolks from the egg white and mix the yolks with the sugar until a nice paste has formed. Add a bit of the heated heavy cream to this paste to allow it to pour more readily back into the small pan. Pour into around 6 ramekins (the typical Crème brûlée dish) and place them in a baking dish. Fill the baking dish with boiling water until halfway up the side of the ramekins. Bake for 30 to 40 minutes. Place ramekins into the refrigerator for several hours/ a couple of days.

3. Right before you wish to eat them, top them with a teaspoon of fine sugar (because this caramelizes more easily) in an even, thin layer. Caramelize the sugar until it looks nice and brown. Enjoy!

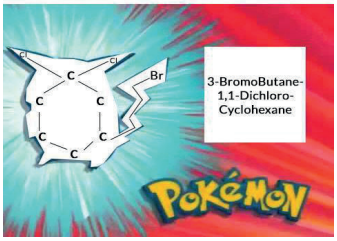
Chemical detail:

This time around I will discuss an important chemical process for desserts: caramelization. Like the Maillard reaction which I will surely discuss in another recipe to come, caramelization is classed under non enzymatic browning. Unlike the Maillard reaction however, the process is pyrolytic meaning that it thermally decomposes the sugars at elevated temperatures and only when it is dry. (for a more in depth look at caramelization and the Maillard reaction, please take a look at page 5)

Interestingly, this last bit is what causes browning to only occur on the outside of bread whilst the inside remains fluffy. The reason for this is that the water present in the core prevents it from reaching temperatures higher than 100 °C, whilst the outside can reach much higher temperatures resulting in those nice brown crusts.

1. New York Times cooking - crème brûlée https://cooking.nytimes.com/recipes/9039-vanilla-creme-brulee (accessed 25 dec 2020)
2. The Spruce Eats - caramelization https://www.thespruceeats.com/what-is-caramelization-995761 (accessed 4 jan 2021)

If you ever guessed this right, your childhood was AWESOME!!



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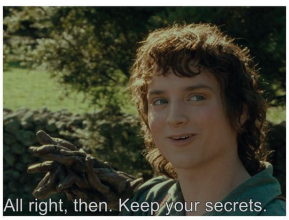

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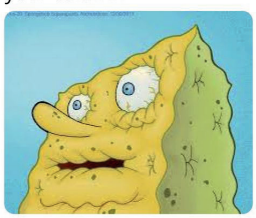
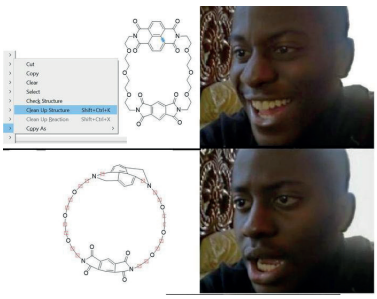




Sjaars: *Stop op een scheitrechter*
Scheitrechter: *boem*
Michiel:

NMR
GESCHIEDENIS TOETSEN BE LIKE

WELKE GEBEURTENIS ZIE JE OP DEZE FOTO?
STOFFEN COSY-SPECTRUM

Made possible by the Amsteldams Cemisch Dospuut!

Nobody:

First year students at the practical:

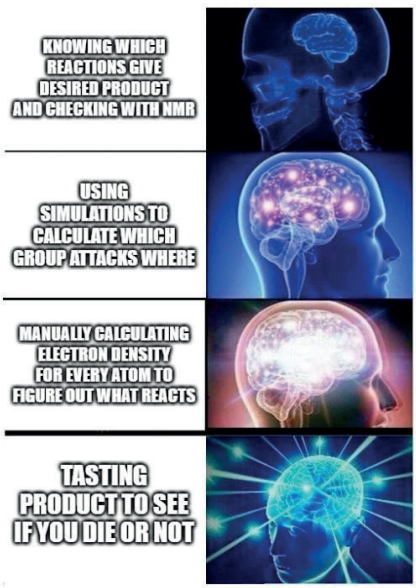
Lawmakers: plastic straws are ruining the oceans, we must ban them!

People who use a whole box of pipet tips in one 3-hour lab:

Working in the lab during the Covid pandemic

Mijn alcohol tolerantie na een jaar zonder borrels

Wanneer je de hele dag practicum doet, maar alles aan het eind van de dag toch weggooit.







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Strategies towards supported bi-atomic catalysts

Molecular approaches for heterogeneous catalysts

Pieter Laan

In the coming decades scientists must establish a sustainable and renewable way of producing energy and raw materials. In this regard, (electro) chemical conversion devices exhibiting heterogeneous catalysts will play a crucial role. These catalysts often consist of a solid support with dispersed metal species on it. Classically, these metal species are present as nanoparticles on a support. As catalysis occurs at the surface of these metal-assemblies, only the surface atoms of the nanoparticles contribute to the catalytic reaction. Therefore, decreasing the size of the metal particles in order to efficiently utilize every precious metal atom has become a new frontier in heterogeneous catalysis in the past decade.[1] **(Figure 1)**

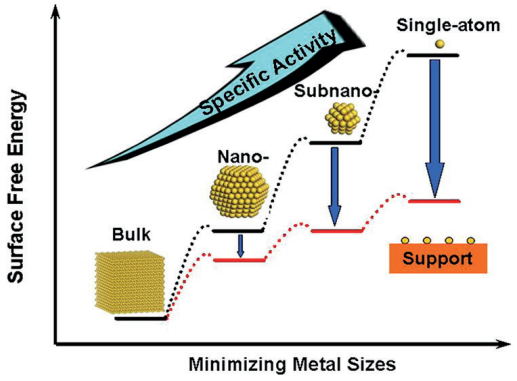


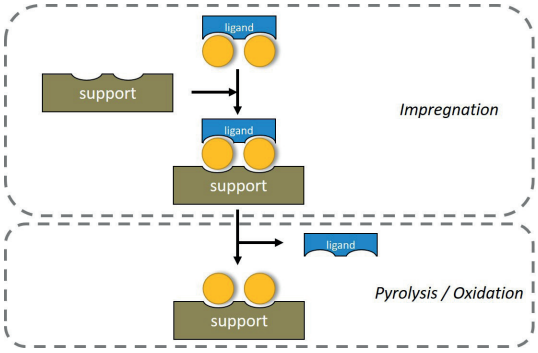
Figure 1. Schematic illustration of the changes of surface free energy (black lines) and specific activity per metal atom with metal particle size and the support effects (red lines) on stabilizing single atoms. Copied from ref 1.

In 2011, the smallest possible metal particles on heterogeneous supports were synthetized for the first time, the so-called single-atom catalysts (SACs).[2] In addition to the fact that SACs have the maximal atom efficiency, downsizing the catalytically active metal species to single atoms was found to result in unique activity and selectivity of these materials in the years that followed.

However, reactions that require multiple atomic sites, for geometrical or electronic reasons, cannot be catalyzed by SACs so effectively. For this reason, important electrochemical conversions such as alcohol oxidation reactions or the four-electron oxygen reduction to water could not be performed with pure metallic SACs for example. In an attempt to tackle these problems, we got inspired by nature in which many catalytic reactions are dependent on a pair of metal atoms as active site rather than an isolated single metal atom. Essential in this regard is thus a synthetic methodology that enables scientists to incorporate two metal centers in close proximity on a support to form so-called bi-atom catalysts (BACs). Such a method with applicability on a large industrial scale is not present yet and is therefore the main focus of my PhD.

There are a number of ways to address this challenge. In my PhD project, we develop approaches to pre-organize these two necessary metal centers in close proximity by the use of an organometallic complex. Both homo- and hetero- bimetallic com-

plexes will be considered. Then, these complexes must be anchored selectively and uniformly on a support. To achieve this, a strong interaction between precursor and support is essential and thus we install certain anchoring groups on the precursor which can have (covalent) interactions with the support. Thereafter, the ligand scaffolds will be removed carefully by oxidation or flash pyrolysis to create a fully inorganic material decorated with isolated metal pairs that have free vacant sites. We already established that this strategy works effectively for iridium based SACs with superior water oxidation performance and is schematically depicted in **Figure 2.**[3]



► **Figure 2.** Schematic representation of the proposed synthetic method to synthesize bi-atomic catalysts via wet chemistry methods followed by pyrolysis or oxidation. Yellow circles represent metal atoms.

Atomic-scale structural information of these materials will then be obtained and its activity and stability in (electro) chemical conversions will be examined. This will be followed by operando spectroscopic investigations to identify relevant reaction intermediates and to study the reaction mechanism. The described work will be carried out in two different research groups of the Van 't Hoff Institute for Molecular Sciences. The organometallic complexes are designed, synthesized and fully characterized at the 'Homogeneous, Supramolecular and bio-inspired catalysis group' in collaboration with prof. Joost Reek and the steps that follow will be carried out at the 'Heterogeneous Catalysis and Sustainable Chemistry group' under the supervision of dr. Ning Yan.

In short, within this NWO-funded VIDI-project, we try to develop innovative research lines in the field of bi-atom catalysis. We aim to make new catalytic materials that help towards more sustainable and renewable ways of producing energy and raw materials. Furthermore, we attempt to obtain fundamental understanding of cooperative catalysis effects of these bi-atom pairs on heterogeneous supports during (electro)chemical conversions. The obtained knowledge will help to understand and improve the heterogeneous catalysts in electrochemical devices such as fuel cells, metal-air batteries and biosensors.

Bachelor- and master- students are always very welcome to inform on research projects via email or WhatsApp.

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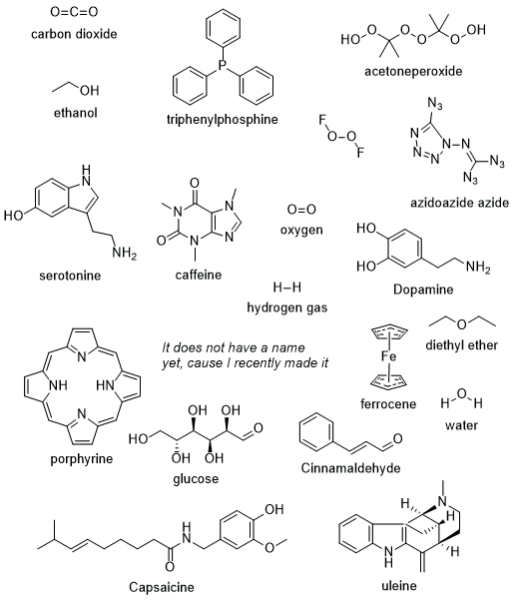
Who Are the ACD'ers?

Michelle van Dongen

Once upon a time, the world was exposed to a unique creature better known as the ACD'er. Rumour has it that this specimen was last seen during the winter holidays, which he would have liked to last a week longer. We will try to describe this somewhat hidden creature to you to our best extent, so you might recognize him in case he will ever decide to roam the halls of Science Park again.



Favourite winter food and drink, favourite animal, favourite Christmas movie, favourite molecule

This creature satisfies his winter thirst not mostly with beer, but rather peculiarly with hot chocolate with whipped cream. Nevertheless, (irish) coffee, tea, cold water and Glühwein can often also be found in his presence. Both vegetarian,meat and VGA'tje lovers are present among them, but you could mostly attract their attention by serving '*Stewed pears to the max*' for a Christmas dinner. To improve the chance of luring him to your home even further, you could consider putting on either *Home Alone* or *Home Alone 2* or could even try *A Christmas Carol, The Muppet Christmas Carol, The Grinch, Last Christmas, The Polar Express, Hachi, Harry Potter, Wall-E, Die Hard, Love Actually, Grease, the Prestige or Pulp Fiction.* More than enough choice we would say, although it remains a guess since some of these creatures don't even know their favourite film themselves. Fortunately, you could also attract them by offering one of the things they can't live without, their favourite molecule or meme/stickers.

Depending on his aptitude for animals, it is slightly more common for him to be in possession of a cat than a dog, but even a horse, chickens and other bird species are possible. A slight population preferably keeps no pets at all and a certain unique individual will even *pet his plants*.

Temperature dependence

We can't really make a statement about its favourite outside temperature. Where some are thrilled by the thought of making snow angels and holding snowball fights as soon as the temperature drops, others prefer the warmth of their residence or can only complain about the cold. A few don't even understand the concept of snow, poor beings.

Favourite pastimes

This specimen is a versatile somewhat travel-minded creature with both a tendency for active as well as more passive activities. You might find him baking, bouldering, filling in surveys, playing board/computer games or even read-

ing. They are famous for their beer drinking and dancing, can often be found in the gym and are also known to have an unhealthy relationship with Netflix or YouTube. Finding this creature sleeping is also no extraordinary event and he will always be accompanied with some sort of music or musical instrument like a drum. Although he likes watching TV, most of these creatures will not use this device for watching soccer. If he decides to tune in on this sport, it will be either both female as well as male or only male soccer. Just like the world around him, he was forced into a hibernating state but once out to roam his environment, this species sure knows to find a way to laugh. At least, as soon as he can remember, because the common phrase '*ik weet het geen eens meer*' often rolls from his tongue. Comedy nights, debut comedians and Arjan Lubach can be found on his evening programme, as well as a variety of music artists in the pop, dance or rock genre.

Study environment

The ACD'er is renowned for his passion for Chemistry, but some of these creatures could have been found in other areas of study as well, as soon as they overcome the '*I don't know*'-phase. Interestingly, the ACD'er would mostly have been a *(psycho)biology, biomedical* or a *medicine* student. These choices are quickly followed up by areas near or outside the science faculty. Even an air traffic controller could have been a possibility, highlighting once again this creature's versatility.

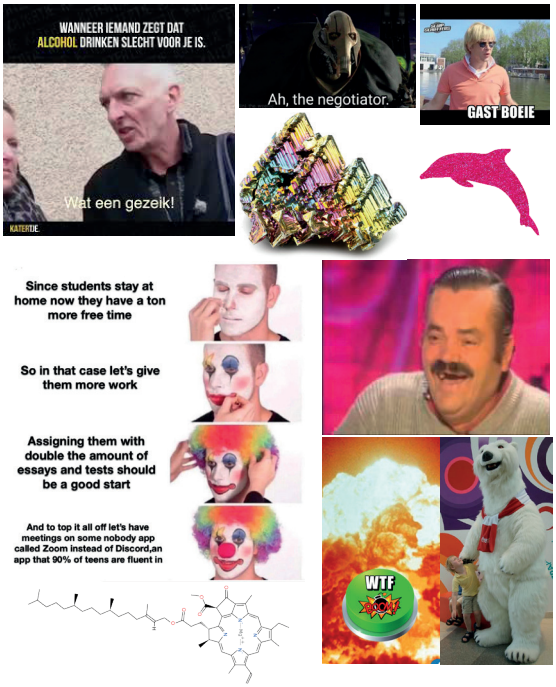
Honorable Mentions

Earth Sciences	Criminology
Physical Education	Forensic investigation
Astronomy	History
Architecture	I don't know
Computer Sciences	Econometrics
Business administration / economics	Media
Law	Physics
Math	

Future prospect

Contrary to ordinary belief, the ACD'er does not roam the halls of Science Park or the VU forever, but moves out further into the world after obtaining his Bachelors or Masters degree. Some are prone to start working or conducting sustainable ground-breaking research immediately, also known as '*grown-ups*' stuff', but others would first like to travel the world or cry and celebrate which would probably be accompanied by the famous Dutch phrase of '*wijnen, wijnen, wijnen*'. A few have more concrete goals like becoming the prime minister, join the military or just boast about their newly obtained title. Staying a bit closer to the present, some ACD'ers have a few resolutions in mind for the upcoming year. These resolutions vary from passing their courses and obtaining their degree to staying in shape and healthy, stressing less, remaining in closer contact with their friends and family and staying up-to-date by reading a proper newspaper. Sounds as if the ACD'er has his priorities right and we can't wait to see them again in the wild.

Some more of the ACD'ers favourite things



Welcoming Professor Timothy Noël and His Flow Chemistry Group

Tim Lugtenburg & Michelle van Dongen

At the start of this study year, Professor Timothy Noël joined our chemistry department at the UvA with his new research group of flow chemistry. This new professor received his MSc degree in Industrial Chemical Engineering from the KaHo Sint-Lieven in Ghent (Belgium) and obtained his PhD at the Laboratory for Organic and Bio-organic Synthesis at Ghent University. Then he crossed the ocean for his postdoc at the Massachusetts Institute of Technology (MIT) to develop new continuous-flow methods for cross-coupling chemistry under supervision of no one other than Professor Stephen L. Buchwald. In 2012, he came to the Netherlands first as an assistant professor and in 2017 as an associate professor at Eindhoven University of Technology. With such a resumé, the Bladcommittee would not let the opportunity pass by to ask him for a welcoming interview and was very excited to include a piece where you readers can get to know him and his group a bit

better. For us, he came across as a very ambitious, humble, and inspiring man and we look forward to seeing a lot of his research in the future.

The passion for (flow) chemistry

So, where did his ambition and interest for chemistry start? We quickly discovered that his interest was initially not just reserved for chemistry. For his undergraduate degree, he considered physics, chemistry, engineering and even psychology, but a combination of chance, the versatility of engineering and his love and aptitude for organic chemistry landed him in the field of flow chemistry. As many of us may attest to, his inspiring chemistry teacher in high school also played a role. He recalled a story of an especially difficult organic chemistry exam in which he was the first to achieve full marks. His own teacher had to look up some of the reactions he wrote down to verify his answers and that is when his teacher said, "*Perhaps you should do something with organic chemistry*".

Fast forward a few years and Timothy Noël had just finished his PhD when the opportunity arose to join the famous professor Buchwald at MIT in Massachusetts (USA) who you probably know from his cross-coupling reaction. Once again, chance played a role as professor Buchwald suggested upon his arrival "*I would like you to do something in flow chemistry*" and Noël answered "*sure, let's try*". At first he was unsure whether he'd be up for that, but he soon realized that his knowledge of both chemistry and engineering was very valuable in flow chemistry and enabled him to solve challenges faster. It was not long before other people came to him for advice, and he immediately felt that he and flow chemistry were a match.

The road to the UvA

After his time in the USA, he wanted to go back to his heimat Belgium, but found a position as assistant professor in Eindhoven. However, TU Eindhoven, as an engineering university, missed a bit of the focus on pure chemistry, such as organic and photochemistry, and missed certain measurement equipment required for his favorite research field. Fortunately, he came in touch with Joost Reek from our university, as well as Francesco Mutti and Jan van Maarseveen, with whom he already had contacts, and was offered a full professorship position. He liked the idea of accepting a full professorship here because then he could combine his favorite research topics of homogeneous catalysis, organic chemistry and flow chemistry in an environment where all the measuring equipment and expertise is at hand whilst also realizing one of his personal goals: becoming a full professor before the age of 40.

What characterizes Timothy Noël?

This personal goal perfectly illustrates the highly passionate nature of this professor. Noël himself comes across as a highly passionate individual who enjoys the competition that the academic world has to offer. This can also be seen in his admiration for other people with a passion for what they do. It does not matter what the object of this passion is as long as it is there: this goes from chefs that get up early in the morning to prepare the days' meals to the work ethic of a Tour de France cyclist. When asked who has inspired him the most, he named Apple's cofounder Steve Jobs for his innovative ideas but was quick to note that he disliked the way Jobs treated people. For Timothy Noël, the ideal boss is not the classical hierarchical one that gives his demands from above, but he strives to be one that actually works as a member of the team. His team ideally consist of passionate people as well, the ones that show fire in their eyes while working on their subject. When transferring from Eindhoven to Amsterdam, we wondered what had happened to the students and postdocs etc. in his group. It turned out that all the people that had more than a year left

in their project came along, which for him was a signal that he was doing something right.

As he has done research in Belgium, the USA, and our own country, we wondered what culture differences he has experienced and which culture best fits his personality. It turns out that he found the USA and the Netherlands to be more alike as we both have the '*no nonsense attitude*' as well as a certain degree of meritocracy. While of course most of us can agree that nowhere feels quite like home, he did prefer the mentality of rewarding those that have accomplished the most and have put in the most effort over the academic mentality in Belgium where seniority is more highly valued. His competitive nature also coincides well with the mentality of the Dutch and the Americans, so he believed those cultures to be the best fit.

His research

While highlighting his personality and history that landed him at the UvA, you might begin to wonder what his research goals regarding his Flow Chemistry Group actually are. He mentioned that he would like to continue what he started in Eindhoven, which is to expand the field of organic chemistry to its fullest extent by using flow chemistry and technology. An example of the benefit flow chemistry can offer, can be found in photochemistry. In one of his research projects which was published in *Science*,[1] he proposes a flow chemistry method to functionalize C(sp^3)-H bonds of light hydrocarbons by using the excited photocatalyst decatungstate anion ($^*[W_{10}O_{32}]^{4-}$) that extracts a hydrogen atom and creates an alkyl radical, which can be trapped via a reaction with a Michael acceptor to provide desired hydroalkylated adducts. This reaction requires a lot of photons so that it can proceed very quickly without too much side product formation. On top of this, high pressures are needed to liquify the alkanes. For both these aspects, flow chemistry can be of tremendous use. We would like to advise you to read the articles mentioned on his website page if you would like to know more!

► **Figure 1.** Artificial leafs. Credit to TU Eindhoven – Bart van Overbeeke.

The crystal ball of Timothy Noël: what are his future goals?

On top of the many things already achieved by him, there is still plenty left in the pipeline. He aims high and would love to have a reaction or reactor named after him, something that people think of in the same way they do with his mentor Buchwald's cross coupling reaction: "*Wow, did he come up with that?*". An example of this is his artificial leaf (Figure 1),[2] which he would like to see on the rooftops contributing to our world's sustainability. This artificial leaf is inspired by the function of the leaf's shape found in nature and aims at collecting sunlight, focussing the energy on a narrow wavelength region, and finally transporting that energy to embedded microchannels where it can convert reactants in a more energy efficient manner. While he wants to reach the top, he does not want to do it at the cost of social interactions. He would prefer that people feel that they did amazing work after working with him ánd that he was a nice guy to work with at the same time.

Advice for ACD'ers

We also asked him what he has learned about being a researcher and what advice he would like to give our readers. He mentioned that whether you enjoyed your bachelor- and/or master thesis can be an indication for a future academic career. If you loved your thesis, then a PhD might be something for you and it is totally normal to be scared at the beginning. Even Buchwald and he himself were scared and we all have to start somewhere. As said by him: "*Dare to take that jump and take risks in your research.*" He mentioned that he never truly experienced a difficulty in choosing what to do. One of his teachers said that you can never pick a wrong course and, if you want to learn the other subjects, you can always buy a book to teach it to yourself. His advice to ACD'ers is therefore: choose something you are passionate about and fully commit to it. Always try to do your best, but do not let it become mentally harmful and try to enjoy it to the best extent. As for chemistry being the right choice? Well, "*Chemistry is one of the crucial fields of our time and will play an important role in solving the current environmental issues.*" We couldn't agree more.

If you would like to read more about Timothy Noël and his research, please visit his website: https://www.noelresearchgroup.com/research/

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Chemistry vs. Computer Sciences

Siebe Lekanne Deprez

Online studying, online working and online socialisation. A device with only hardware is quite useless when it comes to personal computers. Software is one of the most important features of our modern devices, along with the people creating this software. This edition, we talked with two elusive programming creatures from Computer Sciences.

The Computer Sciences Student on Chemistry

First of all, what is your name and why do you study Computer Science?
A: Hi I'm Anton. I decided to study Computer Science because I didn't know what to do with my life and choosing computer science kept most of my options open.
R: Hi, I'm Robin. I study computer science due to my love for mathematics and my urge to do something practical with it.

What do you think Chemistry entails?
A: I think that it is probably a lot of solving chemical equations. After that, finding and developing methods to most efficiently take one chemical and form it into another.
R: Do stuff with test tubes and chemicals. Maybe thermodynamics and research on molecule form and function.

Who is 'the' Chemistry student?
A: A person with glasses probably looking similarly greasy to a computers science student.
R: Anyone in a lab coat really!

How do Chemistry students overestimate themselves?
A: Their general understanding of the world I assume since it is a highly technical field like computer science and the parallels to the real world are low.
R: This shouldn't be coming from a computer science student, but personal hygiene might be something that they overestimate themselves in. They're so busy cleaning their apparatus that they just forget about themselves.

What are Computer Science students better at than Chemistry students?
A: Computers, dealing with large data sets, a general understanding of problems that might be encountered.
R: Fixing printers (just kidding). I don't know, generally I feel like there are a lot of dumb people in our study.

What are Chemistry students better at?
A: Chemistry, maybe more social skills and being female (statistically speaking).
R: Drinking beer out of test tubes? I guess you're not supposed to drink out of those, but I know you guys have :)

What do Chemists do all day?
A: Probably fuck around until it's crunch time after which they load up on homebrew Ritalin. I assume they are similar people to computer scientists so watch anime, play video games, smoke weed and not interact with girls.
R: Squander over the meaning of life... Who knows, probably the same as us minus the hentai. Chemistry students are famously averse to hentai!

The Chemistry Student on Computer Sciences

What is your name and why do you study Chemistry?
My name is Jens Tolboom and initially I wanted to study dentistry, but I did not pass the selection. Studying Chemistry was my plan B and after one year, I liked it so much that I continued this study.

What do you think Computer Sciences entails?
I think Computer Science is about how computers work and learning several programming languages. The study can also involve how to optimise computer programs, but there are plenty of other subjects within computer science that I can think of right now.

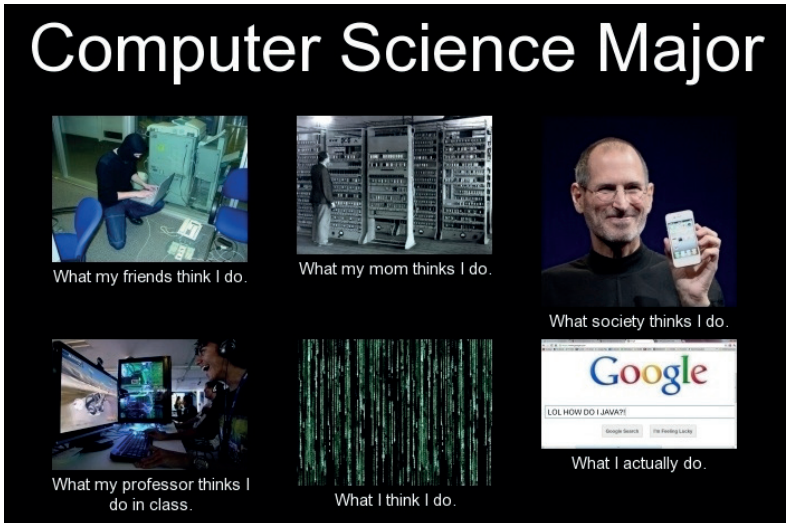
Who is 'the' Computer Sciences student?
Someone that is really interested in problem solving and likes to program a lot; that can spend a whole day trying to solve a single problem. As for the appearance: I think of a person with glasses, hair in a ponytail and who is quite introverted.

How do Computer Science students overestimate themselves?
I actually think that they do not overestimate themselves and are fairly modest like Bill Gates who tries to help people by donating money even though he could choose not to.

What are they better at than Chemistry students?
Chemistry students are probably better in communication because they have more experience being involved in public discussions and in society as a whole. Moreover, I think chemistry students can look at something from different perspectives than computer science students. This makes it easier to explain a chemistry problem to someone who doesn't understand chemistry

What are Computer Science students better at?
Definitely gaming, that for sure. Also staying focused the whole day on one thing and still be encouraged to continue with the same thing the next day.

What do Computer Science students do all day?
Working till far after midnight and waking up really late. Besides that, they go to the university, follow their courses, do a lot of programming and are die-hards. Oh, and beating me with table football at the university.



Smaakmatrix

Inspired by the Parool

Scientific

Beer-related

Horrible

Brilliant

Using your lab goggles to protect your eyes from the snow

SNOW

The daily first-year weather reprot, made possible by Aron

Breakout rooms during lectures

Ice skating on natural ice

'Zondag met Lubach' is back