

Volume 54
Edition 1



ACiD



Rampvluchtig

A Chemical Analysis of the Bijlmerramp

Amsterdams
Chemisch
Dispuut

The Chemistry Nobel Prize of 2022: Click Chemistry
Isn't It Ionic?

Ionic liquids for fiber recycling

Interview with Lab-Manager Simon Mathew

Meet the Freshmen and Masters!



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From the Editor

Dear reader,

It is getting colder, it is raining more and the leaves are falling from trees, giving a terrible mess. In other words, it is autumn. But do not worry, we are back again and are delighted to present the first ACiD of the academic year! In this edition, the old board says goodbye after a wonderful year, and the new board members introduce themselves. Furthermore, we meet the freshmen and new master students, get insider's information from the OC and gain more insight about the Nobel Prize of this year. Diving more into chemistry, the role of uranium evaporation in the Bijlmerramp is analyzed, which matches the theme of this edition "air". We also learn more about depolymerization processes in ionic liquids and about what being a lab technician entails from Simon Mathew's point of view. Finally, we have a delicious recipe, an amazing Sinterklaaspoem, and we see the return of the Chemistry vs ... rubric. As always, enjoy!

On behalf of our entire editing team,
Siebe Lekanne Deprez

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The Old Chair Says Goodbye

Dear ACD'ers,

The new academic year has started, the start of new things, new challenges, and new experiences. For me, the new challenge has been starting with my master's degree along with a group of excited peers.

From an ACD perspective, the last month of my board year started with the faculty introductions of both the new bachelor's students and the new master's students, both ending with free drinks around Science Park. After the introduction week, the academic year really kicked off with lectures, tutorials and practical courses. The first week ended with the first Friday evening borrel, back in the brainwave, where I caught up with a lot of people that I hadn't seen for a couple of months during the summer break. In the next few weeks, the Friday borrels continued with the Meet-the-Freshmen borrel. Besides borrels, there was also an excursion to AMOLF, which is located next to the Science Park. Here the ACD was able to see research performed outside of the university itself, gaining broader insight into the different fields of research. During this period, there was also a Meet-the-Masters activity at the VU, where I got to meet new master students, some from the Netherlands, but also a lot of international students.

After this week, it was time to say goodbye to a year with a lot of experiences, challenges, exploring, discussing, arranging, and of course, partying. Because on Wednesday the 28th of September, it was time for the Transfer General Meeting. Where it was time to end the board year and let the new board start for real with being in charge of handling the association. I hope everyone has enjoyed the last year as much as I have and is ready for a new year with a new board, which I know will create an amusing year for everyone. As the last thing, I want to thank everyone for the beautiful year that I have had, it wasn't possible without our members being present, without active members organising activities and helping us as a board when necessary, and most of all I want to thank the rest of my board for all their hard work and amusement, which they brought into my board year. For now, it is time to say goodbye, but I know the association is in good hands and I have high expectations for the rest of the academic year. I wish the new board the best of luck and for the last time: Goodbye!

With kind regards,
Your former chairman
Martijn ten Brink



Het Wel en Wee van de OC

Evelien van Erven

Dear reader,

It's a new year, which means a new composition of the OC, which means a new columnist. I'm Evelien van Erven, a second year bachelor student and the new student member of the programme committee for this year. Now, Sverre has already introduced the OC and talked about this year's composition in his last column in ACiD 53.4, so I won't go into that.

But what have we been up to this past period?

We have a couple of new members, which have been welcomed into the committee and are currently being educated about their responsibilities and the best ways to fulfill those. In the first meeting of this year we discussed feedback we had gotten from students taking online exams, and complaints about computers not properly working. This has been coupled to the programme directors and is in our opinion in a good position for improvement. We also discussed a classical 'obstacle' for first year bachelor students: the course Physics for chemical sciences. The result of last year's UvA Q questionnaire was a lot better than usual, which we of course made the professor well aware of, although there were issues with the prerequisite purchase of a rather expensive book that most students didn't use all that much. These issues are also being discussed with the course coordinator and we are looking for cheaper options regarding that.

For the old curriculum bachelor's students having to redo courses, this and last year have been a bumpy ride, with less and less courses being optimised for them. This has not gone unnoticed,

and (among other things) remarks about the limited number of resits available for the old organic chemistry course before the credits are made completely unavailable have been communicated to the course director of the bachelor. We are currently awaiting a response, as it is not allowed to deny students an adequate number of resits allowed to finish a course and get their ECTs. The university cannot deny a student these credits by prohibiting access to exams.

To finish this column, I would like to address the system we currently use for course evaluations, UvA Q. It's been ten years since its implementation, and all programme committees have run into the problem of it being a fairly unstable system. During the faculty programme committee meeting (FOC) with the committees of all studies and the faculty student council of the FNWI, we were notified that the UvA is considering the implementation of a new system to replace UvA Q, and as programme committees we plan to use our right to judge these new methods thoroughly. In the coming columns I will keep you posted on developments regarding this new evaluation method and any other important matters the committee addresses.

OC mail: ocs-science@uva.nl

OC page: student.uva.nl/sck/content/az/opleidingscommissie/opleidingscommissie

The New Chair Says Hello

Dear ACD'ers,

I am very excited to tell you all about what the new board has been up to last month! It has been a month filled with fun activities. The first year's weekend (EJW) was once again a blast. The Transfer General Meeting took place shortly after and the new board was officially installed. This was, of course, followed by the constitution borrel! Another event that took place was the first activity of the ACTIE!: bouldering. This new committee started with an awesome activity and I am excited to see what they will be doing for the rest of this year. The symposium was also very interesting and I want to thank the LEC for their hard work. Last but not least, the Kabouterborrel with the NSA was another great success this year!



Coming back to the new board, I could introduce all board members, but it is more fun for us to introduce ourselves. So let's meet the board!

Your new chair,
Fay Heemskerk

Meet the Board

Fay Heemskerk, Chair

Written by Max

Fay is the head of our board and the head of the association. She fulfils this role with passion, and she is always prepared to help anyone who asks her to. She makes sure that everyone plays their part on the board. The only problem with Fay is that of all the alcoholic drinks, she doesn't drink beer (yet), but the rest of the board is working on that. You can nearly always find her at the ACD parties and borrels, and if you do, it is likely she'll be drinking a Vodka-Fanta (as can be seen in the picture above with her Chair piece).

Anne-Fay de Jong, Secretary

Written by Fay

As the only blonde from the board, Anne-Fay stands out among all the brunettes. This year's Sexy Sec has been active since day one and can

often be found at ACD borrels and activities. She is the one who answers all your emails and will help you with any questions you might have. However, do not ask Anne-Fay what she remembers from our constitution borrel, she might not know an answer to that question.

Sverre Overdijk, Treasurer

Written by Anne-Fay

Being the only master's student on the board, Sverre bridges the gap between the bachelor's and master's members and participates in the Master Activity Committee. Besides following courses in the Molecular Science track, he cares for the financial stability of the association as the current Treasurer. Sverre enjoys bouldering to take his mind off finances and chemistry, as well as everything Italian, like the music, food, and hand gestures.

Carlijn Pool, Commissioner of Education

Written by Sverre

Carlijn is our energetic Commissioner of Education for this year. Her first introduction to the ACD was at an external borrel, where she was the only first-year student to show. She also immediately made it very clear it is 'Carlijn with a C'. After this, she immediately became an active member as a vul-sjaars, the stock clerk for the snacks and drinks in the ACD rooms. Furthermore, Carlijn originates from the most beautiful of towns: Diemen.

Tim de Groot, Commissioner of External Affairs

Written by Carlijn

You may recognize Tim as the Treasurer of the 76th board, but this year he is our enthusiastic and lovely Commissioner of External Affairs. You can always find Tim in the ACD room, where you can ask Tim all kinds of questions about the ACD website and ACD in general. But in the rare case, if he is not in our room, you should start looking at our neighbour's rooms where he, as a real Commissioner of External Affairs, is bonding with external parties.

Max Rutjes, Commissioner of Internal Affairs

Written by Tim

Last but not least our youngest board member. After a first year of enjoying all the borrels and activities the ACD has to offer, Max decided he wanted to organise them and here he is as our Commissioner of Internal Affairs! Every week he works hard with the General Bar Committee (ABC) to organise the borrels and with the Party Committee to put on our amazing parties. Next to all this hard work, he sometimes manages to find time to study, as he is in the second year of his bachelor's degree.



Top to bottom, left to right:
Max, Carlijn, Anne-Fay, Tim, Sverre, Fay



Click Chemistry

The Chemistry Nobel Prize of 2022

Jiri Sanramat

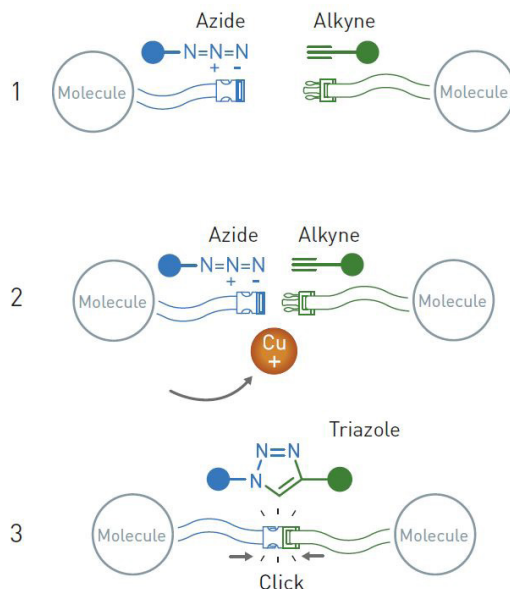
In 2009 Ralf Mackenbach won the Junior Eurovision Song Festival with his song 'Click Clack'. Now, 13 years later, the 2022 Nobel Prize in chemistry is given to Barry Sharpless, Mortel Meldal, andCarolynn Bertozzi for their work on Click (and biorthogonal) Chemistry. Sharpless, the father of click chemistry, intended to develop a synthetic method so effortless and convenient, that two molecules would 'click' together.¹

The idea that anyone can perform good chemistry, has made click chemistry applicable for those without a strong synthetic chemistry background. Allowing for enormous advances to be made in scientific fields such as material science, chemical biology, drug development, and

many more. The snowball that Barry Sharpless started rolling, became an avalanche when both he and the Danish Mortel Meldal, independently from each other, found the 'copper-catalysed azide-alkyne cycloaddition' that would become the flagship of click chemistry.^{2,5,4} In these reactions you can click together an azide and an alkyne to form triazole moieties, which are a common group in pharmaceutical compounds. They showed that their reactions were reliable and could be performed in water. Cu(I) was found to be the active copper species and turned out to accelerate the cycloaddition between azides and alkynes up to 107 times, with the 1,4-disubstituted isomer as the main product.²

Carolynn Bertozzi then later created click reactions that can be performed inside living organisms.² These so-called biorthogonal reactions occur inside cells, without disturbing their normal cell chemistry. Her contribution to click chemistry started in the 1990s after she modified the Staudinger Reaction.⁵ She introduced an azide to the cells' glycans (carbohydrates that are often present at the surface of proteins and cells) and connected fluorescent molecules to these azides. This invention in itself was already a large contribution to biochemistry. However, Bertozzi was hungry for more.

At the same time, the copper-catalysed azide-alkyne cycloaddition of Sharpless and Meldal was getting attention. Their work was interesting for Bertozzi because she realised she could get 'click' and alkyne to the azides on her glycans.² The only problem was that copper is often toxic to biological systems. After intense literature studies, she found work from 1961,⁶ in which azides and alkynes can react without the help of copper if the alkyne is in a strained ring structure. When this was tested in cells, it worked very well and in 2004 she published a copper-free click reaction: Strain promoted alkyne azide cycloaddition.⁷ Thereafter, she refined her method, allowing it to work better in cells.



In the twenty years since click chemistry was introduced, it has been studied extensively. There are even indications that click chemistry can be used to combat tumours, which is arguably the holy grail of medicinal research. One could say that the work of Sharpless, Meldal, and Bertozzi clicked together to eventually win the 2022 Nobel Prize.

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Rampvluchtig

Siebe Lekanne Deprez

Every now and then I encounter a subject of which I knew nothing and subsequently am totally surprised about the fact that I missed it. One of these instances involves the “Bijlmerramp” as depicted in the Dutch tv series called “Rampvlucht”, which aired between September 29 and October 4. Its name refers to the airplane crash of a Boeing 747 on the 4th of October 1992 into an apartment building located in the Bijlmer (Figure 1). The series highlights the (tragic) story of the crash and its aftermath of which each episode made me wonder more and more about why it took so many years to aid the victims that were indirectly affected (e.g. living nearby the crash site). In fact, many mysterious events happened before and after the crash that are still not understood today. The makers of the series (Lourens Blok & Edson da Conceicao) wanted to start the discussion again thirty years later about the events that took place and they achieved just that.

But the goal of this piece is not to rant about how good the series is, no, the goal is to reflect on the intercourse between (medical) scientists, affected citizens, and the role of the government in addressing the aftermath; although citizens near the disaster experienced severe health effects in the months and years after, researchers in hospitals did not want to carry out medicinal research and the government was ignoring the complaints of the citizens. Eventually, *six years* after the crash, the citizens got aid, but by then some of the patients had already died... Thus, I wonder: Why did it take so long?

First, let this be clear: the deeper one dives into the current issue, the deeper the rabbit hole goes until one reaches the conspiracy realm, which I rather not enter. Instead, I focus on the discussion about the presence of depleted uranium in the Boeing 747 – a potential candidate for the severe health effects. In particular, the discussion is all about whether the fire that broke out could have evaporated (*i.e.* oxidized) uranium and been inhaled by bystanders.

Depleted uranium and health effects

The presence of uranium in airplanes is at first sight a curious one since the element is known for being radioactive and dangerous for humans. Besides having a bad reputation, uranium also has a considerably high density and was used as a counterbalance for Boeing 747s built before 1981. In these situations, a specific type of uranium is used, called depleted uranium, which specifies a certain uranium isotope ratio in the material. Depleted uranium is made during uranium enrichment wherein less radioactive uranium is collected as a byproduct, hence being “depleted”.

The reader may recall that elements come in various nuclear compositions as dictated by their neutron-to-proton ratio. Uranium comes in three natural* isotopes: ^{238}U , ^{235}U and ^{234}U .¹ Each isotope has a certain half-life and ^{238}U is the safest isotope for humans since it has the longest half-life of 4.5×10^9 years (Table 1). ^{235}U and ^{234}U are more dangerous and the former is used in fission reactions (for energy generation or war-intended purposes). Because depleted uranium contains relative-

* Here, natural means that it can be found in nature. In other words, the isotopes are quite stable with a long lifetime, enabling humans to find them in the environment.



▼ **Figure 1.** Photograph taken after the disaster showing the damage of the Boeing 747 crash.

ly more ^{238}U and less ^{235}U and ^{234}U , it is the most suitable and safest material for counterbalance.

Yet, the crashed Boeing 747 contained 282 kg of depleted uranium and it has been estimated that 150 kg had evaporated during the crash.² This may be concerning because inhaled uranium is dangerous due to its radioactivity and chemical properties (Table 1).¹ Since all three isotopes decay by releasing an energetic helium nucleus (α -decay), the radiation can actually be halted readily by the skin which is not dangerous as the skin consists of already-dead cells.¹ However, if uranium is inhaled, then the radiation reaches lung cells, damaging them and potentially leading to cancer. Regarding the chemical properties, inhalation of uranium is dangerous because it shares similarities with d-block metals by disrupting enzymatic activity and leading to organ failures.³ Citizens near the crash site became anxious in the weeks after the crash, as they experienced lung and health problems that coincided with the discovery of depleted urani-

um in the Boeing 747. The Dutch government and medicinal scientists dismissed (even denied!) their worries because a Dutch study showed that uranium does not evaporate at the temperatures reached in the fire (around 500°C), and they attributed the health effect to post-traumatic stress disorder.⁴

Intercourse between citizens, scientists, and government

What followed was years of ongoing discussion between citizens, scientists, and the government from 1992 to 1998. The citizens near the crash site became more ill and requested the government to map out all the health complaints by means of medicinal studies. Furthermore, the scientists were discussing back-and-forth about the (cor) relation between uranium and the complaints, while also investigating other potential causes related to the immense doubt about the contents of the cargo. Finally, the government wanted to move on to other political issues and stood firm about commencing no medical investiga-

	²³⁸ U	²³⁵ U	²³⁴ U
Half-life (years)	4.5·10 ⁹	7.0·10 ⁸	2.5·10 ⁵
Natural Abundance (% by weight)	99.28%	0.73%	0.0058%
Depleted Uranium (% by weight)	99.8%	0.2%	0.001%

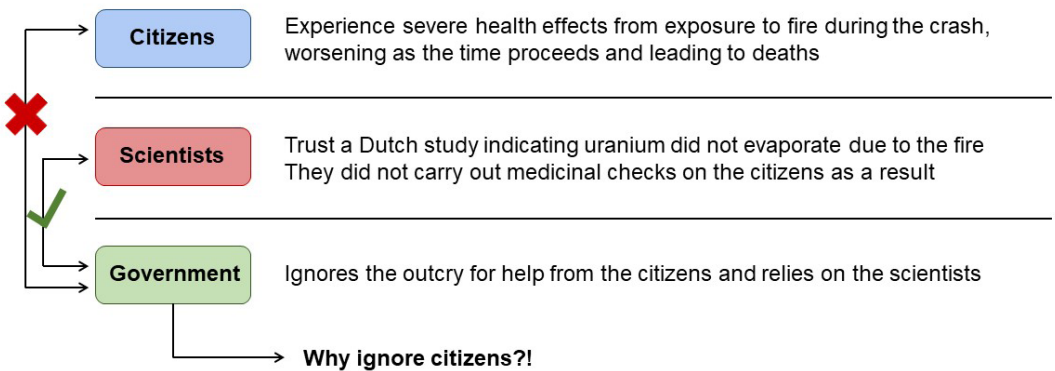


► **Table 1.** Uranium isotopes found in nature and in depleted uranium. The isotopes are ²³⁸U (blue), ²³⁵U (green) and ²³⁴U (yellow) and their half-life, abundance in naturally occurring uranium and in depleted uranium are tabulated. On the right side, the hazard symbols are shown, indicating carcinogenic and radioactivity hazards.

tion, which was also due to the said Dutch study (Figure 2). Crucially, the government made the aftermath worse for all the involved actors by ignoring the complaints and not being transparent about their insights into the crash. Six years and a parliamentary inquiry later, a medical study was finally conducted among the victims in 1998.

Do you want to know the main outcome regarding the uranium exposure? Well, although depleted uranium is dangerous when inhaled, there was not enough evidence that uranium was the main cause of the health complaints.^{5,6} Moreover, the estimated inhaled concentrations were actually less than one received from daily background radiation (i.e. ionizing radiation from the ground and space).⁷ Thus, it was found that depleted uranium was

not the main contributor to the negative health effects and even to this day much confusion and doubt still exists about the most significant cause. There are hypotheses that PFOS (perfluoro-octane sulfonates; derivatives of PFAS) occupies a dominant role as it was used to extinguish the fire in 1992 and it contributes to cancer development. Even today, elevated PFOS concentrations are measured around the crash site.⁸ Another hypothesis is that the cargo of the Boeing 747 contained malicious chemicals used for warfare purposes such as DMMP, the precursor to one of the most dangerous nerve gasses named sarin.⁹ However, it may be impossible to find out because one would need to investigate the victim's bodies by, for example, measuring harmful compounds that were excreted a long time ago. Pinpointing correlation is extremely difficult for these examinations of the past. In addition, if a theory



▼ **Figure 2.** Overview of the communication channels between the actors: citizens, scientists, and governments in the period after the crash (1992 – 1998).

cannot be proved or falsified anymore, conspiracy theories come into the picture as humans try to relate and connect events to make sense of the situation themselves.

This brings me to the conclusion. Even though uranium was thought to be a major factor in causing illness and cancer among the affected citizens, it turned out to be highly unlikely. The real cause is not known for certain but had the government acted sooner, it may have been known and much suffering for the affected citizens could have been prevented. Furthermore, suffering, distrust, and loss of credibility of the citizens towards the government could also have been prevented if the government would have listened more to the citizens and shared more documents and information. With the recent pandemic mostly led by the OMT without

other actors, or the occurrence of the child benefits scandal (Toeslagenaffaire), it is apparent that these mistakes keep repeating, unfortunately. The reader might wonder how these mistakes can be prevented in the future, and I would love to hear it.

Disclaimer: I am aware that the tv-series frames events and unproven theories in such a way as to evoke negative and intense emotions from the viewer, which is confirmed by the makers themselves.¹⁰ Therefore, I tried to emphasize when facts are proven or still uncertain and to take multiple perspectives into account.



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Sinterklaas Cheesecake by Jiri Sanramat

'Zie de maan schijnt door de bomen. Makkers staakt uw wild geraas. 't Heerlijk avondje is gekomen...' Het heerlijk avondje ('the delicious evening') has come indeed, and delicious this Sinterklaas cake will be! Inspired by culinary genius Rutger Bakt, this chocolate kruidnoten* cheesecake is an ideal dessert for a pakjesavond with your friends. It is everything that pakjesavond stands for: pepernoten, chocolate(milk), and being force fed with some fancy dessert by that family member/friend with too much time on their hands. Besides, it is a quick and dirty recipe, just like my experiments, and it will take you not much longer than an hour to prepare. This makes it an ideal task to bestow upon yourself if you do not want to make a sinterklaas rhyme or surprise for your secret Sinterklaas.

**Due to a lack of a satisfying translation for "kruidnoten", the Dutch word will be used instead of "gingerbread buttons" or "spice nuts".*

Ingredients:

- 300 gr kruidnoten
- 90 gr melted butter
- 400 gr cream cheese (at room temperature)
- 100 gr fine sugar
- 2 eggs
- 100 gr sour cream
- 20 gr corn starch (maïzena)
- 1 tsp vanilla extract
- 150 gr dark molten chocolate
- Chocolate kruidnoten for garnishing
- Baking mold (25 cm)

Preparation:

Pre-heat your oven at 175oC and grease your baking mold with butter. Grind the kruidnoten and the molten butter to it. Now mix the butter and kruidnoten crumble and spread them on both the bottom and sides of your baking mold. Press the crumbs until it becomes firm and make sure that the crumbs near the sides form a layer about 3 cm thick. Bake the bottom for 8 – 10 minutes in the oven. After baking, let it rest until it has cooled down completely.

Lower the temperature of the oven to 130oC and place an oven dish with boiling water at the bottom of the oven. This will make sure that your cheesecake bakes even.

Mix the cream cheese and fine sugar shortly, then add the eggs, sour cream, corn starch, and the vanilla extract. Whisk until you have a smooth substance. Take a quarter of your cream cheese mixture and add it to the molten chocolate. Then add that cream cheese/chocolate mixture to the remaining $\frac{3}{4}$ of your cream cheese mix. Use this cream cheese/chocolate extravaganza to fill your cake bottom and even the surface of the filling. Bake the chocolate cheesecake in the oven for 40 – 50 minutes.

After baking, let the cheesecake cool down to room temperature and place it in the fridge for at least two hours. Before you serve it to your 'stuffed from dinner' friends and family, decorate the cheese cake with the chocolate pepernoten. Now go write your poem!



Source: <https://rutgerbakt.nl/sinterklaas-recepten/chocolade-kruidnoten-cheesecake-recept/>



Isn't it ionic?

Anna May Inzenhofer & Jiri Sanramat

You are probably (or hopefully) wearing it right now: clothes! And chances are that you even have too many clothes. Be honest with yourself, how many clothes do you have in your closet that you don't wear? With the rise of fast fashion in recent years, people have been buying more clothes than ever. Despite the scrutiny that the fashion industry has come to endure, the fast fashion market has grown from 91.2 billion dollar in 2021, to 99.2 billion dollar in 2022.¹ With an annual growth rate of almost 9%, the fashion industry is not expected to slow down any time soon.^{1,2}

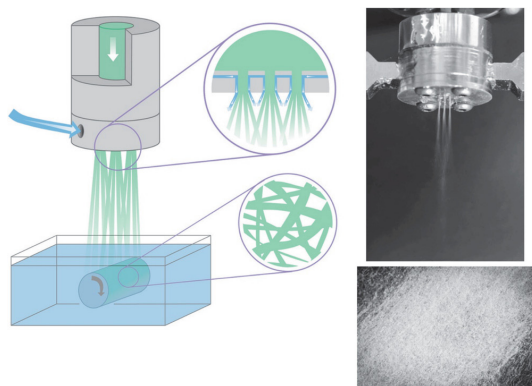
Every now and then, we decide to throw away excess clothing. But what happens when we throw these clothes away? Your clothing is made from all sorts of fibers, but most common (about 72%) are cotton and polyester (PET) fibers.³ Unfortunately, the majority of textile waste is not recycled. Our current cotton production cannot sustain the growing need for more cellulosic fibers.⁴ The textile industry is therefore searching for methods to recycle textiles, both synthetic and natural.

There are currently two methods for fiber recycling: mechanical and chemical recycling.³ Chemical recycling is mainly for polyester textiles.⁵ Polyesters are in theory 100% recyclable, and recycling of polyesters generates about 85% less air pollution compared to new polyester production.^{5, 6} Mechanical recycling is commonly used for natural fibers, such as cotton. Benefits of mechanical recycling include less water consumption, less farming land needed, and less fertilizers needed.³

Cellulose, unlike polyester, is derived directly as a polymer from nature. Chemically recycling cellulose is akin to the manufacture of so called man-made cellulose fibers (MMC).⁷ MMC fibers are generally made from lignin-cellulose, aka

wood. Actually MMC fibers play a prominent role in prominent clothing brands like Monki and H&M's zero deforestation campaigns.⁸ Once dissolved, we use the wood pulp to regenerate the cellulose fibers into new fibers.

Commercially, most cellulose is processed by the Viscose process through its modification to cellulose xanthate using (hazardous) CS₂ to make viscose rayon-like fibers. The environmentally friendlier alternative is the Lyocell method, where cellulose is physically dissolved in N-methylmorpholine-N-oxide (NMMO).⁹ Which method is used depends on what physical properties (viscosity, crystallinity) the regenerated fiber needs to have. Afterwards, the cellulose strands are regenerated and shaped by a dry-jet wet spinning process (Figure 1).



▼ **Figure 1.** Conventional dry-jet wet spinning process used to generate cellulose fibers.⁹

But, back to chemical recycling of textiles. Cotton in textiles can be recycled in the same way wood is generated into MMC's. However, the environmentally friendlier method using NMMO comes with some disadvantages. NMMO is thermally unstable at the required dissolution temperatures

of 100°C and involves oxidative side reactions of both the cellulose and NMMO. Additionally, the NMMO process is not a complete substitute for the Viscose process as completely different fibers are obtained.

A potential solvent alternative may be ionic liquids. Being salts, ionic liquid's dissolving capabilities can be fine-tuned by modifying either the cation or anion. Ionic liquids are non-volatile and thus thermally much more stable. Additionally, they have been shown to preferentially dissolve cellulose in common clothing blends like PET/cellulose (Figure 2).

Unlike other chemical recycling methods that degrade PET, as discussed previously, it was possible to recover the polyester strands from the solution.

More research still needs to be done in making this process more sustainable for industrial application. As with the Lyocell process, regeneration and recycling of ionic liquids are a challenge. Pilot-scale processes are already being developed in Finland, experts in the pulp and paper industry, to dissolve both textile and newspaper waste in superbase-derived ionic liquids.^{11,12} Looking forward, the biggest issue for using ionic liquids commercially is their high cost and thus also suitable ways to recycle the ionic liquids for a closed system process.

A nice review for those interested:

Xia, Z. Processing and Valorization of Cellulose, Lignin and Lignocellulose Using Ionic Liquids. *J. Bioresour. Bioprod.* **2020**, 5(2), 79–95.

<https://doi.org/10.1016/j.jobab.2020.04.001>.

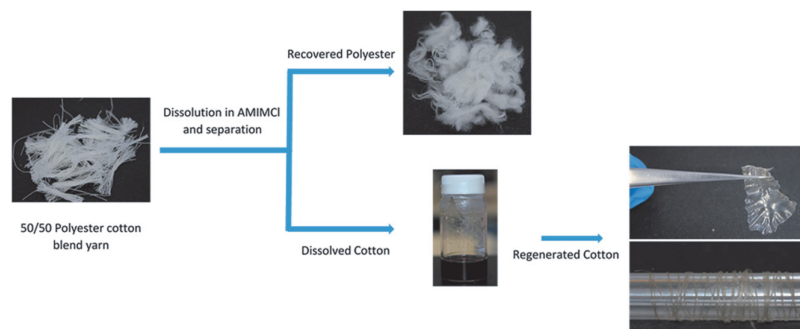


Figure 2. Dissolution of cotton and regeneration of fibers using ionic liquid AMIMCl, recovery of PET.⁹

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Meet the Freshmen

Rianne van Diest & Jiri Sanramat

What was your best experience this summer?

Martijn: The Intreeweek for sure! I liked the chilling in the park and getting to know other people.

Fenna: I went on holidays to Berlin, Paris, and Ireland with friends, which was really nice!

Storm: I've experienced so much! I was on a canoe trip in Sweden, and we got to pick our own sleeping spot in the wild nature. I think the best memory is making a campfire there.

How are you going to survive this winter?

Martijn: Wearing warm hoodies and vibing next to the infrared heater! I'm actually more of a summer-person. For me, 20-25 degrees is the optimal temperature.

Fenna: A wake-up lamp! I like autumn the most, because summer is quite hot, and winter is very dark. However, I really like the public holidays in the winter! For Christmas, we have family from Germany coming over.

Martijn: I really like Christmas too! We go to visit family in Germany for Christmas every year.

Storm: Vitamin D pills! I used to be a winter person, but now I like summer more, because it is warm. In the winter, there is mostly rain and no snow.

Why did you choose to study chemistry?

Fenna: I want to do art restoration, and for that, either chemistry or art history is the best preparation. Chemistry seemed more fun to me. I really like painting and drawing too.

Martijn: Chemistry is applicable in all aspects of life, which I think is very interesting.

Storm: I found it really interesting in high school, so I was sure I wanted to study Chemistry. Since I already live in Amsterdam, I decided to study here.

Is it what you expected?

Fenna: I was surprised that everyone is really social!

Martijn: Yes, the group is closer and more social than I expected. I was looking forward to the practical courses as well, and I really like them.

Storm: I didn't really know what to expect, because I didn't go to the trial study day (proefstuderen), but I like the study!

What chemical would you like to make in the lab out of curiosity (hypothetically)?

Martijn: I think it would be nice to make a battery out of polymers, so that no metals are needed at all.

Fenna: It might be nice to adjust hydrogen gas so that it is easier to store.

Storm: Uhhh, something with medicines? Or batteries?

What do you expect to learn this year?

Martijn: How to handle apparatus and working in the lab; I expect we will be drilled in these subjects this year. Besides, I look forward to learning about organic, inorganic, and analytical chemistry.

Fenna: I hope to learn the basis of all different directions within chemistry, and to get better at writing. Besides, I'm looking forward to learning more about analysis, which is useful for art restoration.

Storm: Learning all the protocols of working in a lab, and academic writing. Also, I hope to learn how quantum chemistry works, and how this relates to chemical reactions.

Which course are you looking forward to?

Fenna: Biochemistry seems interesting to me.

Martijn: Organic chemistry lab, because I like polymers, or inorganic chemistry lab, because thermite is cool.

Storm: Inorganic chemistry because of thermite as well.

What was the most exciting thing about the first few weeks of study?

All: The lab!

Storm: I especially liked the practicum where we made oil out of coffee.

Martijn: You are not just learning about the molecules, but you are working with them as well. The preparation is less fun though.

Fenna: I agree...

Martijn: Also, the TA's are nice, but it has happened multiple times that they contradict each other.

Do you have a quote or funny story from your first few weeks?

Martijn: I was talking about yeast converting sugar into ethanol, and how the yeast dies when ethanol concentrations are too high, but Storm only heard a few pieces of this story and then shouted 'Ethanol is alive?!'.

Fenna: One night of freshman weekend, I was sitting outside with others. Suddenly, a few people from the first-year committee ran outside with a large pan. They asked another member of the first-year committee to throw up in the pan for the bingo, without giving any context. Then, someone downed a pitcher of beer and 'filled' the pan. We don't know what happened to the pan after that.

Storm: During mathematics college, Martijn randomly said: 'What is the emu-war?'

Martijn: After the 2nd World War, veterans in Australia got land to grow vegetables, but emus were ravaging their property. To fix the emu-plague, the ministry sent three soldiers. Well... they lost from the emus.

What is your favourite drink?

Storm: Cola zero is always nice. It's like coffee for hot days, because it is cold. Besides, it cannot degrade, so you can always drink it.

Martijn: I really like a mocktail of cane sugar, ginger ale, and lemon on ice.

Fenna: A cappuccino!

Are you in a committee, or do you want to join one?

Fenna: I'm in the Blad-committee to learn the design of the Blad. I will start with designing a few pieces for this edition.

Storm: I'm in the First-year committee (EJC) as a general member. Our next activity will be at the VU, but I cannot tell too much about it yet. It will be something like a tea party, but more fun.

Martijn: I'm thinking about joining a committee. I'd like to organise activities, but not too large-scale.



From left to right:
Martijn,
Storm and
Fenna

Meet the Masters

Nina Chen

What was your most favourite experience this summer?

My favourite experience this summer was going to the Fleadh Cheol, an Irish music festival in the countryside of Ireland, and listening to live traditional Irish music with some of my friends. I knew some of the people that were performing music and it was really great to see people celebrating Irish culture and music.

What part of chemistry do you find most interesting, and why?

I find inorganic chemistry the most interesting, especially materials chemistry. In my bachelor's thesis I got to use materials chemistry knowledge to design and create electrocatalysts that would potentially transform agricultural waste into fuel, which was incredibly fun. I think it is very exciting to see how creative some chemists are with their understanding of materials.

What is your reason for studying chemistry at the UvA?

I have wanted to study in Amsterdam since I was 17, and I chose UvA because of the Sustainability and Energy track, as it ties my interest in how we can use chemistry to help solve climate change related issues.

What is your favourite drink?

Malibu and sprite, but that's expensive...

How will you survive winter this year?

Lots of blankets and bad romantic comedies.



Michiel van Well

What was your most favourite experience this summer?

Teaching wind- and kitesurfing at the Surfschool Veersedam was amazing. On some days we got up early to have some time on the water for ourselves before the lessons started. On other days we would stay until the sun set. I remember one time where four of us had a blast playing in the waves with our kites while the

Siebe Lekanne Deprez

sun was setting on one side and the moon came up on the other side.

Which part of chemistry do you find most interesting, and why?

I think oscillating reactions like the Belousov-Zhabotinsky or the Landolt reaction are chemically incredibly fascinating while also beautiful to watch. Finding new ones is tricky though.

What is your reason for studying chemistry at the UvA?

After finishing the Bachelor in Nijmegen, it was time to switch up the location. Moving to the capital for the Molecular Science track of the UvA/VU joint master seemed like a good option to do so.

If you could combine any two compounds out of pure curiosity, which compounds would you choose?

Sulfuric acid and hydrogen peroxide. While piranha solution is an all-time classic, it is still satisfying to see that it gets rid of most organic problems you might encounter. Just don't add it to acetone.

What is your favourite drink?

During this time of the year, it's hot chocolate for sure. A good one requires copious amounts of chocolate and whipped cream. Depending on the occasion small marshmallows and/or rum are a pre.

Interview with Simon Mathew

Get to know one of our lab-managers

Anna May Inzenhofer

I had the pleasure of interviewing a prominent member of the homogeneous catalysis research group, Simon Mathew. After finishing a Ph.D. in his home country, Australia, he went on to do four postdocs in three different countries—Japan, Switzerland and The Netherlands—publishing many high-impact papers across several different fields. Currently, he is employed as a lab-manager at the UvA. Some answers have been paraphrased for clarity and continuity.

Growing up, did you always know you wanted to stay in academia?

I've always been attracted to puzzles. Of course, industry has puzzles of its own, but they are not at the frontier of the unknown, like in academia.

So you never wanted to work in industry?

I like to work with industry where possible. There is something special about the prospect of seeing your science applied in the real world, even better if it addresses pressing issues. However, the limited scope of “crazy” that you can do in industry—famously known as “Friday afternoon experiments”—are not as possible in many industrial research workplaces (but there are some).

Tell me a bit about your post docs, what kinds of projects were you involved in?

In my Ph.D. I did a lot of supramolecular chemistry with dyes, exploring photoinduced properties¹ and creating devices on surfaces.² For my first postdoc in Japan (Kyoto University), I worked on solar energy conversion^{3,4} (Hiroshi Imahori) and light-induced cancer phototherapy⁵ (Tatsuya Murakami). Following this, I went to Switzerland (EPFL) to work on a project sponsored by Solvay, making high efficiency dye-sensitized solar cells (Michael Grätzel).^{6,7} After that, I returned to Kyoto and worked on MOFs⁸ (Susumu Kitagawa), membranes for gas separation/purification⁹ (Easan Sivaniah), exploring block copolymers (with Horiba) for water purification, as

well as water splitting. I brought my knowledge of photoelectrodes to Amsterdam, working with Joost Reek to create photocatalytic devices for solar fuel production. I had so much fun working with Joost that it was an easy decision for me to stay here for a bit longer.

How is the job of a postdoc different from that of a PhD?

A lot of people think that you are free to do whatever you want as a postdoc. While this is sometimes true, it really depends on the grant you have. You still have to answer to whomever is funding you. Also, writing grants and finding alternative avenues for funding is enjoyable, but you just have to be prepared to fail a lot, coupled with the opportunity to keep trying.

Is there anything chemistry related that you're particularly proud of?

First and foremost, I would say I am most proud of the students who I have mentored and collaborated with. To see my students publish wonderful



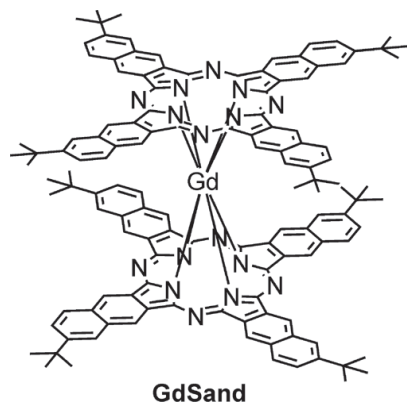
papers^{10–12} and move on to greater things is truly awesome. Making high-impact papers is gratifying, but for me what really counts is the (potential) application. For many this means citations, but I mean packaging fundamental science into a solution and delivering it to the doorstep of a problem. For instance, in Japan, I had a dye (Figure) that has super absorbance but wouldn't fluoresce, instead it only gave off heat (energy gap law). So I thought, let's change the application! I ended up using that molecule as a phototherapeutic to treat cancer (in vitro only) via light-induced heat generation.⁵ There is nothing more satisfying than killing cancer.

Any funny stories you'd like to share?

This one time in Japan, a (genetically modified) mouse got loose and was lost in the labs for a couple days. So when I got to the lab, there were cardboard barriers we had to jump over to get inside. Turns out this happened every other month. In Australia, Japan, Switzerland and in the US (during a short research visit), whenever a TV crew would come they would only want to see one thing — pretty colors and crazy glassware. Once I realized this, I always strive to make the most ridiculous, nonsensical glassware setups (with gas bubbling, dye solutions, dry ice) so it looks good for the camera, but hilariously ridiculous for any chemist who watches.

You work as a lab technician now, what does a day in your life look like?

Damage control. People break things (and don't tell me). There's also a lot of organization involved, looking at safety and infrastructural problems.



For instance, there was a water leak last week in the labs and it's up to me to get a fix in place. I also mentor students and participate a lot in day-to-day research.

How does chemical waste get dealt with?

The UvA outsources to a company that picks up the liquid and solid waste. That's why we have to sort it out according to the type of waste it is (halogenated etc.). The vapors from our fume hoods go through a scrubber system and then go outside. That's why it's important to always empty your personal waste bottles from your fume hood at the end of the day. Funny story: In Australia we had to get rid of a Phosgene cylinder (chemical warfare agent in WW1). Turns out no company in the continent would touch it, so we ended up asking the military, who came with an armed convoy and took the cylinder to the desert where it was used as target practice for a \$100,000 missile during a military exercise.

You've worked in so many different countries, can you tell me a bit about the different lab environments?

In Adelaide, where I did my Ph.D., there wasn't really any chemical industry nearby. It would take 2–6 months to ship chemicals. So to save time (and time is precious), we dealt with issues on site (i.e., synthesize everything). When a machine would break, we'd go to the local hardware store and "MacGyver" solutions with household items (lots of duct tape!!). We had to distill our solvents (dichloromethane, hexane, ethyl acetate) from the barrel and even (sometimes) reuse deuterated solvents and packed silica columns (rinse with methanol and reuse). You can actually use a column about 5 times. I would have to purify simple organic materials, like absolute ethanol (using magnesium ethoxide) or my own fuming nitric acid (distilling from conc. sulfuric acid). It was a really tough way to develop as a scientist, but it also makes one appreciate the luxury of good facilities and funding.

In Japan, people would make their own TLC sheets (lol, no thanks), reuse Pasteur pipettes (yuck) on top of using communal Schlenk lines (not a fan). They also work much more there, from 9–9 and lab meetings on Saturday morning. That said, people

work really well together there – without expecting anything in return – and we can learn from that. For example, a superparamagnetic gadolinium complex I made (Figure) could not be characterized at my university beyond mass spectrometry, but after talking to my professor, he had arranged a collaboration with another group (unknown to us) to perform MRI studies by the afternoon.

Generally speaking, people parametrize things in terms of cost–time–performance, that means if you prioritize one of these you better pony up the other two. In Switzerland, it was only about performance, so I basically had an unlimited budget but a whole lot of pressure (no time).

Having seen all these lab environments, do you have any suggestions for the UvA?

The UvA does a pretty good job at safety, promoting work–life balance and puts a decent amount of money into having great facilities. In this sense, chemistry students at the UvA have the opportunity to conduct some pretty cool research and should not take it for granted. However, there are some practical things that should be considered. First of all, don't make Ph.D.'s start in September because they won't find housing. As far as sustainability and diversity goes, the UvA (and basically the whole world) could work on making things less about optics and more about instigating actual change. While some progress has been made, there is still some way to go before we reach a meritocracy.

How do you deal with the uncertainty of moving around so much and not knowing what country you'll end up next?

Detachment is an underrated skill and I tell this to my students a lot. Of course, it's important to care about what you do as that is your drive and what gets stuff done. However, it's just as important to know when to stop caring, because you can't perform if your mental health is suffering. Moving continents comes at considerable expenses in both cost (relocation, flights, furniture), time (waiting for visa, etc.) and performance (learning your way through a new country takes time), but the prospect of a new adventure is my main driving force!

What does the future look like for you?

Opportunity-based. I like living and working in The Netherlands, the people are relaxed and fun-loving (like Australians) and the students at the UvA are really great to work with. While I hope to find a role with greater academic content, it's all opportunity based right now. There are still several pressing problems that our society faces – including climate mitigation, the transition to renewable energy and human health – to which the Netherlands strives to make an impact, and to which my broad chemistry knowledge can contribute real solutions. Finding a balance between developing better living through chemistry while still having fun is not easy, but a worthy challenge indeed.

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Chemistry vs. Anthropology

Anne-Fay de Jong

Anthropology

First of all, what is your name and why do you study Anthropology?

My name is Loeka. I'm a third year Cultural Anthropology student. I initially started studying anthropology because I was very interested in cultures from around the world and wanted to understand how those came to be, how they interact with one another and how we might be similar or differ in our beliefs and practices.

What do you think Chemistry entails?

I understand Chemistry to be the study of matter; analyzing structures, behavior and characteristics of matter and using this information on the elements and their interaction with each other to help find solutions to relevant societal problems.

Who is 'the' Chemistry student?

Students that are fascinated by life on the molecular level. Most of the Chemistry students I've met are very passionate about their discipline and faculty and are eager to use their knowledge and skills in areas of importance to society, such as sustainability or health.

How do Chemistry students overestimate themselves?

In my experience, chemistry students often assume that the knowledge they produce compared to, for example, the social sciences, is objective and therefore more 'real', because it is mainly quantitative and does not involve interpretation. I believe they overestimate themselves in this way, or maybe underestimate other disciplines, like anthropology. All production of knowledge is relative to the researcher's perspective and the context in which it was produced. Even just the questions that the researcher asks are embedded

in the (hidden) social values of the researcher.

In what do Anthropology students overestimate themselves?

Anthropologists tend to argue that the norms and values of one culture should not be evaluated using the norms and values of another to try to avoid ethnocentrism. I think we sometimes overestimate the positive outcome of this. I don't think Cultural Relativism is necessarily bad, but I think it can be problematic. Some things are just universally unacceptable, but if we don't call them that, there will never come about social change or activism.

What are Anthropology students better at than Chemistry students?

We are very reflective of our own ideas, prejudices and positionality when doing research. And I think our research methods, ethnographic fieldwork for example, and the fact that we research from an holistic perspective makes it possible for us to describe the human experience in a broader and deeper way.

What are Chemistry students better at?

I often feel like anthropologists are very good at describing and explaining social phenomena, but not so much at trying to solve social problems. I think Chemistry students are often more involved in actually trying to find solutions to certain problems and/or come with solutions quicker, as anthropologist's holistic approach takes more time to get results.

What do you think is the major difference and the major similarity between Chemistry and Anthropology students?

I don't think Chemistry and Anthropology can really be compared, they're that different, but I suppose what might make chemists and anthro-

polo­gists similar is our scientific interests. I think we are both interested in behavior (behavior of matter and behavior of people) and the complexity of human life and nature, we just study these things on completely different levels and with very different methods.

What do Chemists do all day?

I think Chemists mostly work inside laboratories or other controlled environments to conduct experiments and lab practicals.



First of all, what is your name and why do you study Chemistry?

L: My name is Lars. I am a fourth year bachelor student Chemistry. I was interested in all beta courses since high school and mostly in Chemistry. Chemistry is also quite broad so you can go all kind of directions after your study which was a big advantage for me.

D: My name is Damian and I'm a second year bachelor student in chemistry. Ever since I got chemistry in middle school I'm interested in chemistry. This is mainly due to the best teacher I've ever had so far.

What do you think Anthropology entails?

L: Anthropology is the study of people and their behavior and stuff like that. They study how cultures are formed and how different cultural groups interact with each other.

D: I believe Anthropology is the study of people in the broadest way. Like they want to know how people form social relations in different ways and how they define forms and meaning to their lives.

Who is 'the' Anthropology student?

L: In my opinion the Anthropology student is fascinated by people and is an open person, wanting to get to know others.

D: In my mind 'the' Anthropology student is mostly interested in other people, but not in the psychological sense. They want to know all about relations people form and try to understand them.

How do Anthropology students overestimate themselves?

L: They might overestimate themselves in how good they are with other people. As they study people they think they know everything about people and interactions, while this might not always be the case.

D: I think they overestimate themselves in their people skills. Since they study the social relationships, they think they're good at them.

In what do Chemistry students overestimate themselves?

L: Chemistry students sometimes think they (and other beta students) are better than people with an alpha study.

D: Nothing, we're perfect.

What are Chemistry students better at than Anthropology students?

L: Analytical thinking.

D: Handling numbers. We have to do it all the time. Also puzzling to find a solution to a problem.

What are Anthropology students better at?

L: Social skills.

D: Social skills probably.

What do you think is the major difference and the major similarity between Anthropology and Chemistry students?

L: I think Anthropology and Chemistry differ a lot from each other. The biggest difference is probably that Anthropology is only focused on people and Chemistry is not focused on people in any way.

D: I think the major difference between Anthropology and Chemistry students is the focus. The social study focuses more on people while the chemistry students aren't in any way. The similarity is probably the quest for answers.

What do Anthropologists do all day?

L: Study people.

D: Watch people and probably think about the social relationships they've got.

Dear readers,

The Sint has had a lot of free time in his long, long life.

He has only one workday a year, and he lives in Spain for the rest of the time.

So plenty of opportunities to study and give you this rhyme.

One of the most important elements for the atmosphere, as we of course all know.

Characteristic for this time of year, one of winter's blessings would have to be snow.

Relating back to chemistry, the molecule responsible for this is H₂O.

*Tiny clusters of crystals will stick together, high above the cold dark city,
until they become too heavy for the clouds to hold, after which they coat the world
in a white so pretty.*

*For us to be warm, then, a hot drink is crucial. A cup of coffee for some, or tea for
others.*

*The caffeine is for the hardworking night owls, while theobromine and theosophylline
are its somewhat milder brothers.*

*Along with the drinks, we serve spice nuts and spice cookies, a typical Dutch phenomenon,
in which the most important ingredients are nutmeg and cinnamon.*

*The chemicals which cause these tastes are cinnamic acid and eugenol, nothing too
placid and both very flavourful.*

*When the Sint comes to the Netherlands for his celebration, he transports himself on
his horse and steamboat, hardly any innovation.*

Instead of a steam machine, the Sint might use some solar panels and hydrogen(e).

*After seeing what makes the holidays so special, let's finish it off with the most
important of all.*

*The chemical which releases when you see your loved ones, is oxytocin, responsible for
the feelings of social bonding, so distinctive for holidays in winter and fall.*

*With this positive feeling, the Sint will send you off. And even if you don't celebrate
Sinterklaas, the Sint will send you lots of love.*

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Inspired by the Parool

