



# ACID

## The Scent of Metal

Where does the metallic scent of coins come from?

Amsterdams  
Chemisch  
Dispuut

What Happened to Our Attention?  
Colours in Animals  
Academia or Industry?  
An interview with Tessa Röell  
Chemistry Undercover

Volume 53  
Edition 3



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# Colophon

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# From the Editor

Dear reader,

Now that lockdowns are at least over for the time being, and a lovely spring/summer sun is shining down on Amsterdam, it is time for a new edition of Acid magazine! We will provide you with a list of our favourite spots around the city so you have some new places to visit. Have you ever wondered why coins and other metals have a particular smell and yet we do not die from it? Perhaps you have marvelled at the wonderful colours of some animals and want to know how they come about? Or what causes one to wander off from that thesis or tutorial even more today than in the past? Those and other questions will be answered. Yours truly unfortunately no longer smells anything (including metals) at the moment due to Covid, but rest assured a lovely recipe is provided by Rianne!

We hope you have as much fun reading this edition as we had making it!

*On behalf of our entire editing team,*

Tim Lugtenburg

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# From the Chair

Dear ACD'ers,

Since the last time of writing, everything has slowly returned to pre-covid times, or as we like to say, corona seems to have become a beer again. The ACD has continued with its normal Friday night drinks from 17-22 where I have spoken to first-year bachelors, last year masters, and even researchers of the many different research groups. Speaking of these research groups, we had our second orientation market of the study year, for the first time ever at the VU! I really enjoyed the event, where all different sides of chemical research were presented by PhD'ers, postdocs, and others with their personal poster. But the largest event since last time has been our foreign excursion to Munich. In Munich, we have visited the two large chemistry faculties of the two different universities, the LMU and the TUM. I always enjoy seeing the differences in labs, buildings, and management of universities compared to the UvA and the VU, but I also enjoyed the differences between the two universities themselves. For me, the LMU seemed to be focused more on the pharmaceutical and organic chemistry and seemed to primarily focus on fundamental research, while the TUM focussed a lot on catalysis and was collaborating with companies, which in turn focusses on applied research.

Besides visiting universities, there were also diverse cultural trips. A cultural walk through the center of Munich and even a day trip to Augsburg where everyone had a choice between three museums to visit. While in Augsburg, I also went to visit the two large churches, both built in a more gothic style and finished with some more baroque figures.



During the trip, there was also time for a lot of more fun things. For example, we visited an authentic German Biergarten and the Hofbräu brewery in Munich where we got a tour through the whole brewery, seeing hops, grains, and water, being fermented to form the well-known golden drink. In the brewery, I also managed to drink the freshest beer I have ever had, directly from the fermentation tanks, unfiltered in a glass. During the evenings, there was plenty of free time to visit restaurants and discover the Munich nightlife.

Now back in Amsterdam, the summer is on our doorstep, bringing the times of a lot of outside activities, barbecues, and long evenings in the sun, but as of writing this, first the Kabouterborrel where we join forces with the NSA turning the whole Brainwave into a gnome infested bar. But talking about this summertime, the year will also end again with the beautiful Flux festival where the whole of Science Park will turn into a festival terrain with barbecues, bars, and hopefully a lot of sun. I hope to see everyone there or earlier on one of the upcoming activities of the ACD.

From your chairman,  
**Martijn ten Brink**

# Het Wel en Wee van de OC Part 3

*Sverre Overdijk*

Dear reader,

We have already arrived at the third Wel en Wee of this year, and it has been quite a while since the last one. Since the last Wel en Wee we have done a lot, of which the most important task was the approval of the new Onderwijs- en Examen Regelement (OER) for the bachelor program, and the Teaching- and exam Regulation (TER) for the master programs. The most important developments in this regard are part of the OER and arise from the new curriculum and the disappearance of the old one. Some of the old courses disappear in their current form, and the new form will not be a sufficient replacement. While the students were quite all right with this for most of the course, quite the discord arose surrounding Thermodynamics. As you all probably know Thermodynamics is a so-called hurdle course for a lot of students, and a lot of students were already discontent with the course. However, due to the curriculum switch, the course would disappear, and if the course wasn't passed by then, there would be two exams next year to still do so, without any lectures provided. Of course, the students were not content with this solution, neither was the OC, nor the FSR, so the program agreed to supply frequent questionnaire hours in the upcoming years.

Furthermore, the pronouns in both the OER and the TER are changed to gender-neutral forms. Personally, I think this is a really positive change in terms of inclusivity.

On another note, the UvA Q broke down, again. This time in a brand-new way. Everything regarding the questionnaire went fine, and all your valuable input is luckily saved correctly.

However, when reviewing the questionnaires, the comments on the lecturers are mixed up, meaning we could not use this. Hopefully, the UvA Q results are available to us soon, so we can act on points you as the students raised your concerns on.

Now onto the more positive notes. The last time I told you about the new teacher members joining the OC, and everything is smooth sailing so far in the collaboration within the committee. Furthermore, while the curriculum switch meets some resistance from the higher years, the first years are overwhelmingly positive on the new curriculum. The new courses are received well, as is the transaction between the different courses. We did however receive some comments on the lack of practice questions for the exams. This is something the lecturers are required to give, in at least the form of a question representable for the exam. As the OC we have mentioned this to the lecturers again, but if you do not have such an indicative question, please discuss this with your lecturer.

**OC mail:** [ocs-science@uva.nl](mailto:ocs-science@uva.nl)

**OC page:** [student.uva.nl/sck/content/az/opleidingscommissie/opleidingscommissie](https://student.uva.nl/sck/content/az/opleidingscommissie/opleidingscommissie)

# The Scent of Metal

Siebe Lekanne Deprez

In the first edition of this volume, we discovered the origin of the scent of rain where we attributed the scent to chemicals that were launched from the ground into the air during rainfall. The scent is also known as 'petrichor' and humans perceive it as a pleasant, earthy smell. The important aspect is that the scent is not coming from the rain itself but from the chemicals on the ground, even though humans associate it with rain. A similar and equally interesting situation is when humans 'smell metal'. I am sure that you have experienced smelling an unpleasant odor after you touched or came into contact with metal objects such as coins, keys, or beer openers. Often people associate this smell with metal and call it a 'metallic smell', but does the scent truly originate from metal objects or is there more going on than meets the eye, or in this case, the nose?

## **Actually, smelling metal could be quite dangerous**

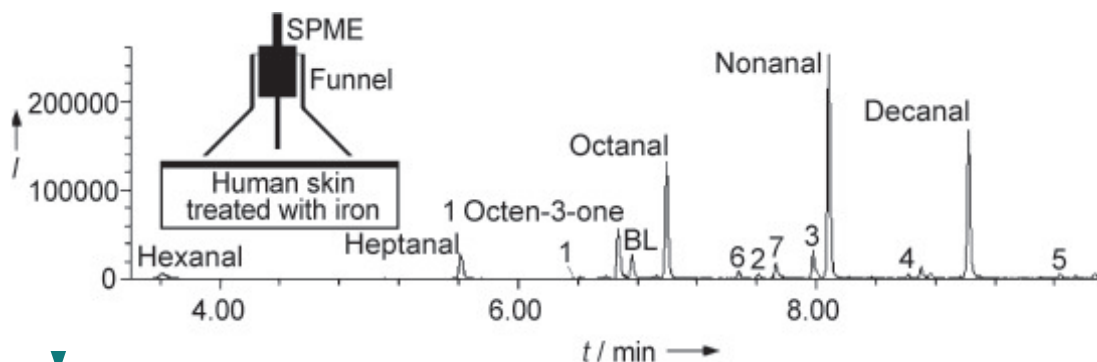
Let us first think about what smelling metal entails. A person perceives a scent when a particle/chemical binds to a receptor in the nose, which causes a signal that leads to the brain. The chemical must evaporate for this to happen, and well-known examples of volatile compounds are aromas – small, organic molecules. There is, however, a problem when we apply the concept to smelling metal, since it would mean that metals evaporate slowly, but experimental evidence suggests otherwise. For instance, almost all metals have a boiling temperature well above 500 °C, which is the result of the atoms being arranged in lattices. Electrostatic forces (and electron delocalization) are very significant in these lattices and the bonds between the metal atoms are very strong. So, metals do not easily

evaporate, which agrees with what we experience in our daily lives: our devices and metal objects are not slowly degrading because of evaporation.

And we should be glad that metals do not evaporate easily. Because if they would, it could possibly lead to metal poisoning, although I speculate here. The concentration threshold for smelling metal species does not necessarily have to be dangerous/toxic as humans are able to smell compounds at extremely low concentrations (in the order of 0.01 ppb<sup>1</sup>). Nevertheless, stories about breathing in mercury vapor, the metal species with the lowest boiling point at 357 °C, do not sound very pleasant and I could imagine that the same would apply to other metal species such as lead or chromium. It actually turns out that even if metals would evaporate easily, humans will still not be able to smell them because your nose is not sensitive to any metal in its pure form, meaning metal itself does not have a smell. Thus, metals do not vaporize readily at room temperature and it is not possible for humans to smell metal atoms, but what is it then that we do smell?

## **Smelling metal is about smelling chemicals on your own skin**

Believe it or not, but this question was covered in a study in 2006 conducted by Glindemann *et. al.*,<sup>2</sup> and later in an experiment by NileRed,<sup>3</sup> who we of course know as chemists. The research goal of the study was to underline the cause of iron smells in their engineering environment. The researchers hypothesized that the smell might have originated from human contact with iron surfaces as the previously suspected compounds (PH<sub>3</sub>) did not smell like anything when purified. The researchers took two kinds of samples,<sup>a</sup> one from sweaty hands after they touched iron objects and



**Figure 1.** Chromatogram of a sample of the human skin after it came into contact with iron. Several organic compounds are shown, including the most important one for the metallic smell named 1 octen-3-one.

another one from clean hands. They analyzed the samples using SPME GC/MS and the spectrum corresponding with the sweaty hands sample is shown in **Figure 1**. As can be seen clearly, multiple organic compounds with a length between C6-C10 had been measured, while the sample with clean hands did not show any organic compounds<sup>b</sup> (not shown). The researchers thus concluded that the typical metallic smell was not coming from the metal itself, but from certain volatile organic compounds on your skin. How did these compounds get there?

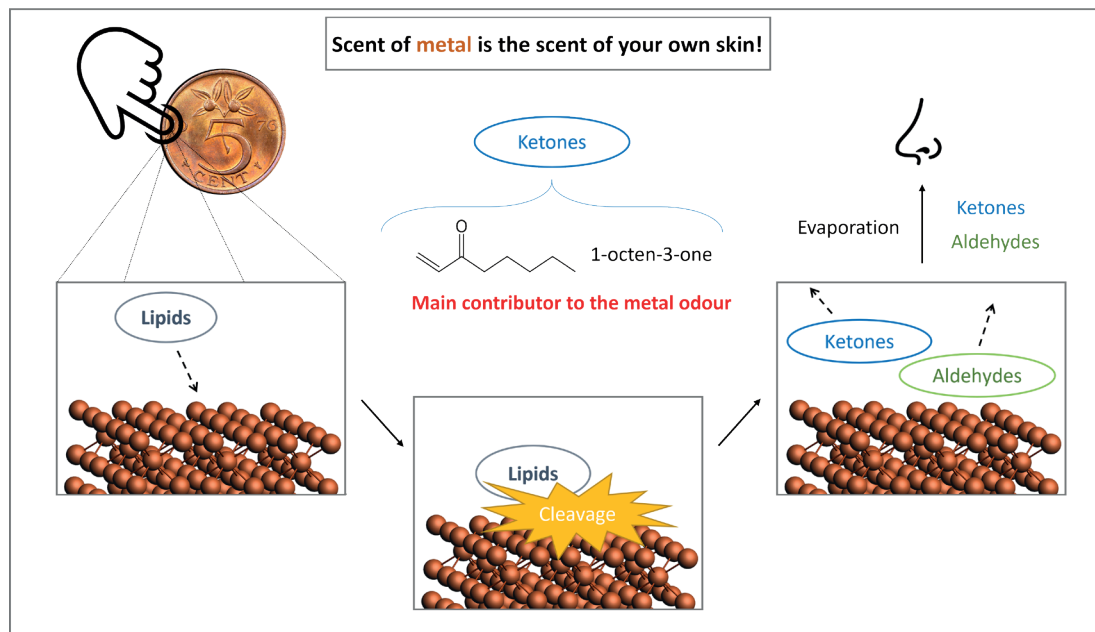
The proposed explanation is the following: when human skin comes into contact with metal surfaces, in this case iron, copper or brass, then certain chemicals on your skin quickly react with the metal, forming the measured compounds. The researchers found that lipid peroxides were the main candidates as they were cleaved in the measured ketones and aldehydes. Based on the outcome, a mechanism shown in **Figure 2** was proposed. During the contact between sweaty skin and metal, chemicals on the skin corrode iron to  $\text{Fe}^{2+}$  species, which are quickly oxidized to  $\text{Fe}^{3+}$  species in seconds. While this process

is happening, lipid peroxides on the skin are reduced/cleaved and it is these compounds that we smell. As the researchers said themselves: *“This fast reaction creates the sensory illusion that it is the “metal in itself” that we smell right after touching it. Similar mechanisms underlie the skin–metal odors of iron, copper, and brass (Supporting Information) used as every-day objects.”* Therefore, we actually smell our own skin odor when we smell metals.

But there is more. NileRed decided to empirically investigate the mentioned conclusion and he carried out an experiment on his own.<sup>5</sup> The video is truly interesting to watch and I recommend it to all of you. He found that the main cause of the metal odor is 1-octen-3-one (**Figure 2**), being also one of the molecules found in the chromatogram in **Figure 1**. In addition, he noted three important aspects. The first one is that 1-octen-3-one was producing the metal smell only at low concentrations; the smell changed when the concentrations were higher. He also noted that different metals produce different metallic smells as the speed of the reactions depend on the metal species. Finally, since people have various skin compo-

**a** As a matter of fact, they took way more samples using different kinds of metals such as copper and aluminum, and they also investigated the ‘garlic smell’ that can sometimes be perceived

**b** Except for the baseline peak used as solvent for the GC-MS analysis.



**Figure 2.** Illustration of the process behind 'smelling metal'. When a person touches a metal piece, lipid peroxides on the skin quickly react with the metal surface, causing the lipids to be cleaved into ketones and aldehydes.

sitions, my metallic smell differs slightly from your metallic smell, although the main component remains 1-octen-3-one. These three aspects show that not only 1-octen-3-one accounts for the metallic smell, but also that the metallic smell is different for everyone and depends on the skin composition and type of metal!

### Is there more to the metallic smell?

In conclusion, we saw that the typical metallic smell does not originate from metal atoms themselves since metals do not readily evaporate and have no smell on their own. Instead, we smell the chemicals evaporating off our own skin – most notably 1-octen-3-one – after they have reacted with the metal surface during metal-skin contact. These chemicals include volatile carbonyl compounds such as aldehydes and ketones and they form because of the cleavage of lipid peroxides.

But, if you do not believe anything I have mentioned so far and want to investigate this matter yourself, feel free to perform the experiment! Get some coins or another metallic object and wash them thoroughly. Then, smell them without touching the coins with your skin. Next, pick up the coins with your hands, fiddle a bit and smell the coins again. Do you notice a difference?

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2. Glindemann, D.; Dietrich, A.; Staerk, H-J.; Kusch. P. The Two Odors of Iron when Touched or Pickled: (Skin) Carbonyl Compounds and Organophosphines. *Angew. Chem. Int. Ed.* **2006**, *45*, 7006-7009. DOI: 10.1002/anie.200602100
3. NileRed. Can you actually smell metal? <https://www.youtube.com/watch?v=BqLH-nTZE0c> (accessed Feb 21, 2022).



# Wanted: New Board for Stichting Studiereizen Chemiestudenten (SSC)

Rianne van Diest

*As some of you already know, I recently went on a study trip to Boston, organized by SSC. Now, they are looking for a new board!*

## What is SSC?

SSC is an independent committee that organizes educational trips every other year, focused on (pharmaceutical) chemistry. The trips are organized for master students of Chemistry and Drug Design and Safety, and third-year bachelor students of Pharmaceutical Sciences. More information can be found at <https://stichtingstudiereizenchemiestudenten.wordpress.com/>.

## But I don't know anything about pharmaceutical chemistry!

No problem. Of course, an interest in the topic is important, but we also hit subjects like NMR, analytical chemistry, green chemistry, and polymers. Besides, the curricula of Pharmaceutical Sciences and Chemistry have quite some similarities.

## Okay, then why would I join the board?

- You are guaranteed to go on this exciting and exclusive trip. Only 19 students could join this year!
- You are in charge of the program. Is there a certain museum, or company you'd like to visit? Discuss it with your board!
- You gain many connections by contacting companies, universities, and sponsors.
- It is very educational, looks great on your CV, and is less demanding than the ACD board.

## Are you convinced yet?

The board lasts two years but can be combined with your study. If you are interested in joining, please email [ssc.vcsvu@gmail.com](mailto:ssc.vcsvu@gmail.com).

Disclaimer: you must be enrolled as a student at the time of the trip (2024) to join the board (and the trip).

## Hmm, not sure about all that responsibility...

You can also accompany me on the trip as a participant! For me, it was an amazing and unforgettable experience with lots of opportunities. You can check out all the fun activities we did on my Instagram, or ask me about them during the next Friday afternoon drinks.



# Colour in Animals



*Arthur Grooteman*

Many people know about the vast array of colours that animals can possess, whether it's their fur, scales, spines, feathers, or any other type of exterior characteristics. When considering this massive difference between species, a question arises on how these animals maintain or even change colour present among these body parts. Impressively, nature has several different ways to facilitate this!

Usually, the mechanism by which colour is created in these matrices is a combination of light-matter interaction using absorption mechanisms such as chromatophores in pigments. Additionally, many animals scatter specific wavelengths using structural mechanisms. A combination of both chromatophores and structural scattering has been observed as well. Absorption usually occurs when the energy of an incoming photon is enough to excite an electron from the HOMO to the LUMO, determining which colours are leftover and which ones get removed as a result. A specific result of this mechanism is that it becomes a non-iridescent colour, where the angle of observation does not change the hue of the colour.

There are different kinds of classes of pigments that create different colours; most of them have different functions unrelated to their ability to absorb certain wavelengths. As a result, many animals did not adapt to colour generation until a secondary function arose from these characteristics after the main physiological function was fulfilled.

The most well-known pigments are the melanins which produce brown and black colours in addition to offering protection from UV radiation and microbial resistance. Light yellows, oranges, and dark reds are usually produced with carotenoids, which seem to function as antioxidants against oxidative stress. Interestingly, these are usually acquired through diet rather than other means, with enzymes facilitating the conversion to carotenoids. When they get covalently bound to proteins they tend to red-shift the absorption which causes a blue coloration to become prevalent.

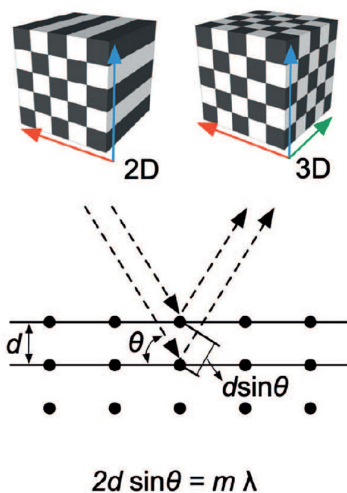
Ommochromes take the role of both the melanins as well as the carotenoids with colour generation

with some spiders being able to change the rate of metabolism to change their colour over several days. This allows them to be able to camouflage themselves depending on the colour of the plant that they are residing on.

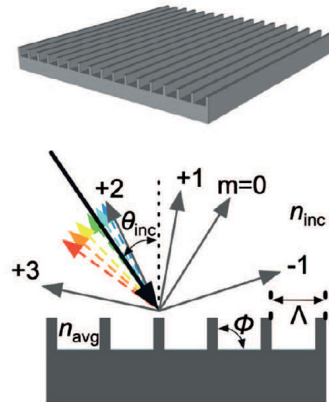
Lastly, bilins are a class that offers protection against parasites in certain mammals, which produces a green colour. When a metal ion chelates to them, it can create a blue- or red-shift dependent on the kind of ion together with other conjugates such as proteins or saccharides.

The structural mechanism for colour production is (usually) based in the periodic arrangement of tissue creating refraction, diffraction, interference and scattering of photons. Interestingly, blue is usually a structural colour. Like with the chromatophores, different mechanisms exist which can be characterised as iridophores. These are special cells that have alternating arrays of protein-rich cytoplasm as well as extracellular channels.

One of the most common examples is guanine crystals; many types of reptiles, fish, and spiders make use of this by storing guanine in a



▼ **Figure 1.** Illustration of a 2D and 3D photonic crystal.



$$n_{\text{avg}} \sin \theta_m = n_{\text{inc}} \sin \theta_{\text{inc}} - m \frac{\lambda_0}{\Lambda} \sin \phi$$

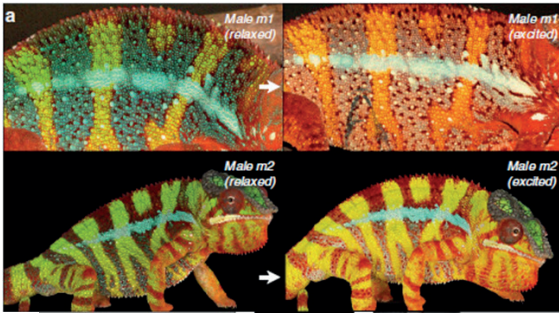
▼ **Figure 2.** Illustration of diffraction gratings.

crystalline form in so-called guanocytes. The shape and orientation of the crystals changes whether organisms become a matte white colour or a more of a silvery colour. When these crystals are highly ordered, they become a photonic crystal, characterised as a periodic optical structure allowing for different types of scattering.

There exists another type of structure known as photonic glasses; these have the same characteristics as photonic crystals, but the periodicity is less apparent. This creates a very specific type of scattering dependent on how periodic a specific tissue is; as a result, they cause non-iridescent colours like chromatophores.

Lastly, iridescence is usually caused by diffraction gratings present in tissues where tissues are ordered with parallel ridges or grooves. Even though they are not specifically for colour generation, they are used in combination with pigments containing chromatophores to produce spectacular rainbow colours.

Even though colour generation exists using one of these mechanisms in many animals,



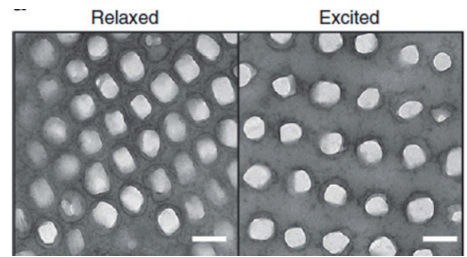
▼  
**Figure 3.** Reversible colour change in two male panther chameleons.

the combination of elements such as pigments overload on top of a structural element is where the more interesting colour systems come to the foreground. The following few paragraphs will be an exposition on some different types of unique combinations.

### Chameleons

Among reptiles, chameleons are usually the most well-known with the ability to regulate their colours. There are many types of chameleons and while most people are under the impression that all chameleons can change into every colour imaginable, this is not the case. The subspecies of chameleon that is able to drastically change their colour are panther chameleons. These are the ones that are able to achieve almost every colour ranging from reds to greens to purples; even so, they are bound by their genetics. A blue patch on a chameleon is unlikely to completely change to red and vice versa due to the large shift in reflected wavelengths necessary to achieve this.

As with many reptiles, chameleons are able to change their colour by utilising iridophores, specifically by using guanine crystals embedded in cells surrounded by their scales. It is believed that this ability arose from the fact that changing colour allowed for regulating their body temperature as well as broadcasting moods to potential



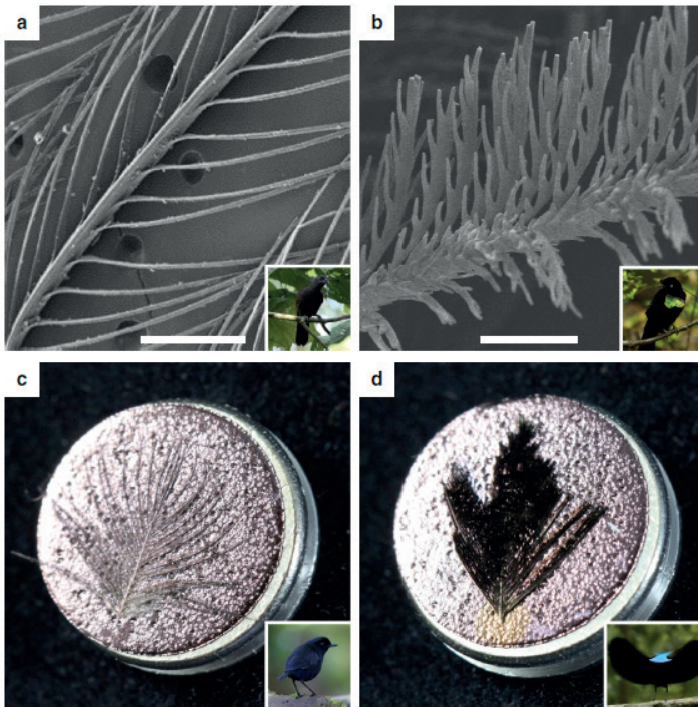
▼  
**Figure 4.** Lattice of guanine crystals in relaxed and excited states.

mates and competitors, alongside camouflage. There are two layers of skin present which each have a different function to allow for colour change. In adult males, this upper layer is fully formed and contains closely packed guanine crystals arranged in a triangular pattern. This results in an alternating pattern of high and low refractive index within this matrix, allowing for the properties of a photonic crystal to arise. Interestingly, the spacing between crystals is the factor that allows them to change colour as the crystal size is consistent. When the skin becomes excited the relative spacing between guanine crystals increases, and their reflectivity can shift. As a result, green scales can become yellow or reddish. Red scales become brighter due to an increased number of chromatophores occupying the same space.

### Paradise birds

Another interesting group to consider is birds, which frequently have brilliant colours in addition to iridescence present in their feathers. One subspecies that stands out among the rest are the paradise birds. Some species of paradise birds exhibit 'superblack' characteristics aside from the iridescent properties in their feathers.

Typically, the structural properties of feathers are determined by the feather barbs and barbules



**Figure 5.** a: SEM of a normal black feather. b: SEM of a superblack feather. c: gold coated normal black feather, appearing gold. d: gold coated superblack feather, retaining its reflectivity.

through their shape, size, and orientation which creates the shiny appearance that many different species exhibit. If structural absorption is added to this list, it can create a superblack appearance.

Superblack feathers are made from highly regular barbules arranged in vertical tilted arrays, which creates the property of reflecting less than 5% of incoming light. For paradise birds specifically, this number is reduced to between 0.05% and 0.031%. The reason why this happens is because of the vertical tilted arrays: these cause deep curved cavities when the feathers overlap each other. As a result, almost all light that falls onto these cavities gets absorbed. This creates some odd macro effects: even when the feathers were coated in gold dust, their reflectance stayed almost the same. When perceived, this creates the effect that colours surrounded by these superblack feathers are brighter than they appear, which can affect potential mates as well as competitors.

Considering how specialised these materials are in form and function, it's easy to see why nature is a good source of inspiration as starting point for developing new materials. There is much left to learn from the structures present within animals for the future. Hopefully, this has given you a little insight into how nature has some very creative ways to regulate colours!

1. Hsiung, B.-K., Shawkey, M. D., & Blackledge, T. A. (2019). Color production mechanisms in spiders. *The Journal of Arachnology*, 47(2), 165-180. <https://www.jstor.org/stable/26872306>
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# Quark Pancakes

by Rianne van Diest

Now that Tim has provided you with plenty of delicious recipes for dinner, this seemed a nice opportunity for me to give you a breakfast recipe: pancakes!

## Ingredients:

- quark (200 g)
- flour (80 g)
- 2 eggs
- cinnamon (1 tsp)
- baking powder (1 tsp)
- pinch of salt
- powdered sugar or maple syrup
- toppings

## Preparation:

1. Mix the quark and eggs together. Then, add the flour, cinnamon, baking powder, and salt. Mix it well, so that there are no clumps left.
2. Heat a pan with some olive oil or butter.
3. Take some batter with a large spoon and gently pour it into the pan. Pancakes are supposed to be fluffy, so don't spread or squish the batter. Make sure the fire is low, otherwise the bottom of your pancakes will burn.
4. Wait for the top of the pancakes to dry.
5. Place a spatula beneath, and flip the pancake to the other side. Make sure to do this steady and quickly, to prevent your pancake from falling apart. This might require some practice, and as is often said: 'The first pancake always fails!'. It's no shame.
6. Take the pancake out when both sides are golden brown. Serve with some powdered sugar or maple syrup, and some toppings if you like. My favorites are banana and chocolate paste!



### Chemical detail (pancake fluffiness):

Flour contains hydrophobic proteins, glutenin and gliadin, that are responsible for gluten formation. In an aqueous environment, they create a gluten network by forming disulphide bonds with each other. For fluffiness, air bubbles need to be captured in this network. Here, baking powder comes in. It consists of sodium bicarbonate and an acid. When the powder gets wet, these compounds react,  $\text{CO}_2$  is produced, and your pancake rises!



# Academia or Industry?

## An interview with Tessa Röell

Anna May Inzenhofer

*As the end of our master's degree draws nearer, we must ponder this age-old question: What exactly would I like to do with this degree? And I, dear readers, have found myself at a crossroads. Will I use my degree to become an "independent researcher," i.e., complete a Ph.D., as companies like to say? Or will I attempt to go straight into industry? And then the question, will I even be able to find a job as a chemist? Or will I be confined to a position on the sidelines of chemistry, rarely applying the theoretical knowledge or lab skills I worked so hard to acquire?*

*I came into this interview dubious of my chances to land an enjoyable researching job in the industry without a Ph.D. Hopefully, those in a similar position can read this interview and feel refreshed (as I certainly was), knowing that it is, in fact, possible. In this interview, you will get a glimpse into the job of Tessa Röell, an associate scientist at International Flavors and Fragrances (IFF) in the fragrances sector. As one of the few people on our LinkedIn with the job title "scientist" without a Ph.D., she stood out to me.*

*Happy reading!*

Tessa did her bachelor's in chemistry with a minor in food technology, as well as her master's (Molecular Sciences Track) at the UvA/VU. Her passion for organic chemistry led her to a bachelor's thesis in Jan Marseveen's group and a master's thesis in Eelco de Ruijter's group, doing natural product synthesis design. The choice not to pursue a Ph.D. was based on a preference for team collaboration as opposed to individual research. So, although she completed more than

the required credits for a master's degree, she thought, "why not look for another internship?" And by seeking advice from her professor at the UvA, who just so happened to have contacts at IFF, she found that internship, and, luckily, the internship qualified as a 'literature thesis'—the practical side of the internship being graded as a 'minor research project'

### **Internship at IFF**

Tessa ended up working in the same department as her contact at IFF, the fragrances department. Curious to learn more about fragrances, she set about working as an intern in the fabric-care team. She investigated chemical compounds that might improve the working function of fragrances. The trick, Tessa said, was having that compound interact both with the clothes and the fragrance. All in all, she loved the international atmosphere and team collaboration in the company so much that she applied for a temporary job opening as a lab technician. After a half year at that position, another full-time and "way cooler" position opened up. She applied and was accepted as an associate scientist.

### **Working as an Associate Scientist**

Much to my surprise (and relief), her day-to-day as an associate scientist entails quite a bit of lab time. Some day-to-day tasks include designing and executing experiments, analytical analysis of the products, and conversations with the perfumers about a products performance and fragrance character. Tessa's department is not quite R&D, as those are based in the U.S. She works in the Scent Technology and Innovation team, made up of a good mix of people with and without PhD's.



All of which have a master's degree. R&D runs rigorous screenings for different prototypes and sends their best ideas to her team to optimize the formula. If the technology works well, she will collaborate with other teams to scale up the process, tweaking the formula if needed. Tessa shared a bit about the project she is working with now involving biodegradable microcapsules.

### **Sustainability: Microcapsules**

The microcapsules' function is to attach to fabrics after a washing cycle and stay there until "broken" with mechanical force, aka putting clothes on. Until now, microcapsules were made of microplastic. However, the European Chemicals Agency will soon prohibit the sale of microplastics containing products. So, time is of the essence. Polymer chemistry is heavily involved here, which Tessa learned about on the job. Adding that, "you don't have to match the profile 100%." Fitting into the team and a background in chemistry often will suffice.

### **Challenges**

The most challenging aspect of Tessa's job now is the pressure to make sufficient, sustainable capsules quickly enough. IFF would, of course, like to be the 'first' among its competitors. Another aspect very different from academia is working within a specific price range to make your product. And then, of course, the classic struggle of experiments that just do not seem to work.

### **Favorites**

Her favorite part of her job? Well, Tessa had a few. For one, she likes working in a team and enjoys dealing with a variety of departments: R&D, the perfumers (people that make the fragrances), scale-up teams, the commercial teams, etc.

What Tessa likes very much about her job is that to see the results of an experiment, she need only bring the formula to the 30 washing machines in the department next door. "If you rub the

towel and it smells better than the reference," that means the microcapsule did not break, and your experiment was a success. Not to mention, "it is really cool to be working on something that is going to be good for the environment and so applied that it even ends up on the shelves in the supermarket"

### **Future Aspirations**

As you can tell by the extensive "favorite parts" section, Tessa really enjoys her job and has no desire to go back to do a Ph.D. Tessa was in the midst of compiling her "personal development" plan for IFF and choosing between different career paths. "Of course, the obvious career path would be a promotion—more responsibility, leading more projects, more individual work." Afterward, she could have a managing role. However, as Tessa prefers group work, she is hesitant to follow this path. Another option within the company is to learn about another team—the so-called "stretch assignment"—with the possibility of joining that team. This is also an option available to her colleagues with a Ph.D. It seems like she was leaning towards this option but was still undecided.

### **General advice**

Tessa chuckled at my cliché question of general advice, saying that I should "have some faith." She herself had been in the same position, asking these same questions just two years ago. Indeed, giving such general advice is difficult, but she surmised that companies looked for enthusiastic applicants. Admitting that she may have gotten lucky with the opening at IFF after her internship, she still did not think it was necessary to do a research project at a company to find a job there.

*There you have it, a success story sure to motivate. Whichever path you choose, be enthused, have a little faith—we've got this.*



# Favourite Spots

The Blad Committee's favourite places in Amsterdam

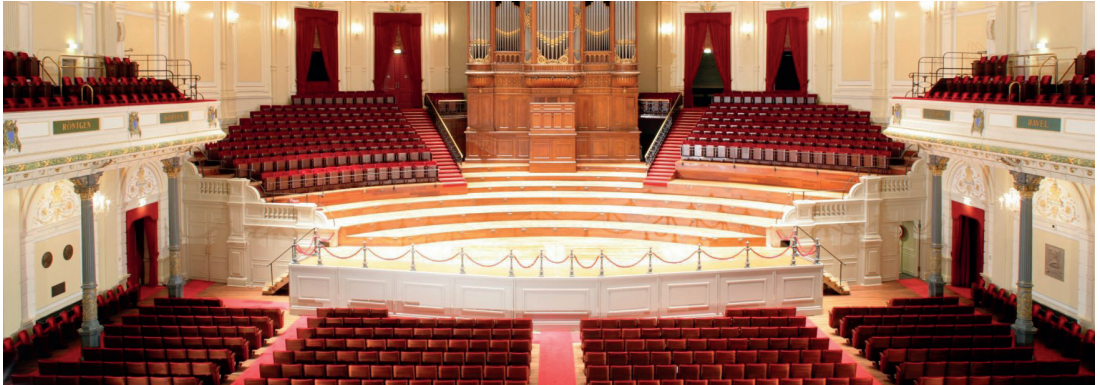
## Stijn: De Hallen

De Hallen in old Amsterdam-West has an indoor food market which is amazing to go to with friends as there are 21 food stands with dishes from Bitterballen to Dim Sum. Besides the amazing food, there is also a movie house which does not only screen blockbusters, but also many arthouse movies! To top it all off, there is a contemporary art exposition where you can rent paintings to have them at your own place!



## Michelle: Amsterdamse Bos

One of my favorite places in Amsterdam is a spot where you can get away from the hustle and bustle of daily life: the Amsterdamse Bos. It is the perfect place to picnic with your friends, play long games of Funkyball or just stroll around and find some nice natural treasures along the way. If you would like to be a bit more adventurous, you can visit the treetop adventure park or rent a canoe. Hungry at the end of the day? You could stop by Café Anno 1890 afterwards and at the same time be amazed by all the signs hanging on their walls!



### **Siebe: Main Concert Hall**

To be honest, there are many locations in Amsterdam that I do not like, since most places are incredibly crowded, smell like weed, and totally disregard any of the traffic rules that apply elsewhere in the Netherlands. Fortunately, there are some exceptions with the main concert hall being my favourite place. The interior not only looks beautiful, but its design also contributes to one of the best acoustics in the world and it is definitely noticeable when you attend a concert. On a more personal note, I experienced concerts that made me interested in classical music (romantic music between 1815-1910) and soundtracks for movies, for which I'm both incredibly grateful.

### **Tim: Paradiso**

As a former church building, Paradiso has become known as the 'pop temple'. With beautiful stained glass windows behind the main stage, two different balconies and a rich history as part of hippy counter-culture, this music venue is one of my favourite spots in Amsterdam. Many famous artists have played here such as Pink Floyd, Nirvana, and Blur (two days before their hit album Parklife dropped!).



### **Myrthe: De Nieuwe Meer**

I love water and activities in and near the water, so surprise surprise, one of my favourite places in (or near) Amsterdam is De Nieuwe Meer. The Nieuwe Meersluis is also the starting point (or endpoint) of sailing boats crossing through Amsterdam. Boats with a mast higher than 6 meters are not allowed to travel through the canals of Amsterdam during the day, so at night they will all float through Amsterdam in a convoy of lights. Since my parents had a sailboat, I have seen this route from the water many times and can say it is quite enchanting!

**Arthur: Flevopark**

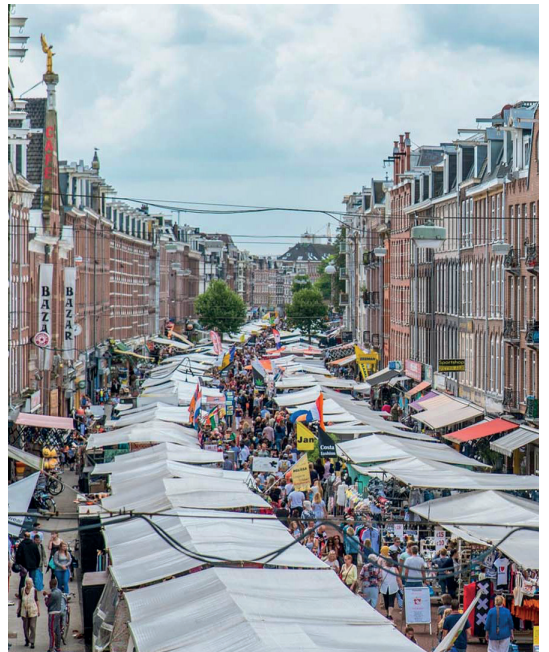
It has to be the Flevopark! I grew up on the Sumatraplantsoen right next to it and used to go there almost every day. It's quiet compared to the other parks in Amsterdam and feels like you're not in the city. You might even spot a fox amongst the beautiful flowers and trees! It's the perfect place to relax.

**Anna May: South side of Rembrandt**

From cutesy bustling café terrasses to lovely parks at seemingly every corner, this is probably the most beautiful and lively city I have and will ever live in. That being said, if I had to choose a favorite spot it would be the south side of Rembrandt, near where I live. Its overgrown, unkempt nature has a refreshing quality to it, especially compared to well-groomed and tidy Vondelpark next door.

**Rianne: De Pijp**

This area has many cute boutiques, which are perfect for shopping for unique items. Besides, there is the Albert Cuypmarkt (a large outdoor daily market). This not only makes De Pijp a very lively area but also provides you with plenty of places to get delicious snacks. Perfect for an afternoon of shopping and snacking!



# What happened to our attention?

Siebe Lekanne Deprez

A quite recent and much hoped-for development is that from 2021, both the UvA and the VU offer a lecture-free week in May. For years, students complained about the fact that they had only a winter and a summer break without reasonable breaks in between, meaning that students were constantly occupied with activities related to university such as reading textbooks, attending lectures, and stressing about deadlines. For me, the lecture-free week was a relief because I was able to drop everything related to the university and decided to read a book – something I had not done for a year – and boy oh boy was it an impactful experience that completely changed my idea about i) how the attention spans of people have changed over the last decades and ii) which factors influence our attention span. The book was of course “Stolen Focus – Why You Can’t Pay Attention” by Johann Hari (Figure 1).

The purpose of this article is not to give a book review, although it is a well-written book, but to get the reader thinking and reflecting about its own attention span and more importantly, realizing which factors influence it. Nowadays, when talking about attention and distractions, technology immediately comes to the mind such as phones and social media. For instance, how often do people check their phones when feeling bored just to see if “anything interesting” has happened or to escape from difficult tasks?

Johann Hari starts with this sense of realization: our attention span seems to be dominated by technology and people resort to these kinds of media by default. He refers to several experts and the documentary ‘The Social Dilemma’ that shows how social media companies (Google, Meta, Twitter etc.) deliberately design

algorithms to keep people invested as much as possible in their platform, since their business model involves time equals revenue.<sup>1</sup> While being the most well-known example, there are actually other, equally substantial factors apart from social media that makes focusing difficult. Unfortunately, analyzing and solving the factors is a major task as they are related to each other, making it thus incorrect to just point to one of the factors and think: *That is it.*

Consider the component ‘sleep’ for example. Hari cites sources that indicate that a sleep-deficit of one hour a day<sup>2</sup> already results in a drunk-like state, being equivalent to 0.05 – 0.10 per mille, which leads to people being less able to focus and to more (deadly) traffic accidents. Estimates show that the number of people suffering sleep deprivation has increased to 20% of the Western population during the last decades.<sup>3</sup>

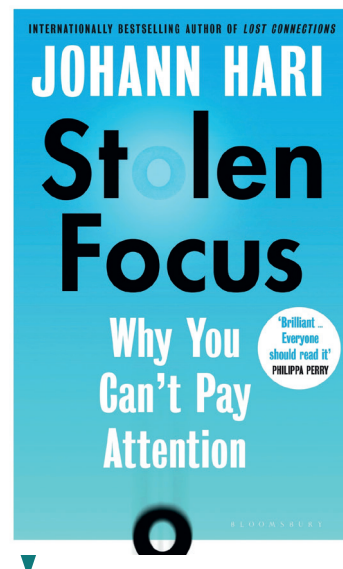


Figure 1. Front cover of Johann Hari's "Stolen Focus" book

Knowing the risks and disadvantages for people's health, one may ask why sleep deprivation is still relevant to this day at all?

Well, a part of the answer involves the increase in mobile phone usage and people watching streaming services at late hours, which by themselves already limit the attention spans of people. Another part of why sleep is less prioritized, is the Western consumption culture wherein every hour spent sleeping means less consuming! Certain businesses and shops would go bankrupt if the typical "night life" perished. Finally, experiencing stress is another contributor to the lack of sleep, being a particularly nasty one since it is described by a positive feedback loop: more stress means less sleep, which then leads to even more stress, and so on. Besides affecting our attention, the three mentioned factors are also related to each other and affect each other to a certain degree. Therefore, the key point is that sleep deprivation influences our ability to concentrate during the day, but the factors that influence how much people sleep, also have an effect on our attention span themselves.

Even more interesting is that Hari tries to untangle this web of influences by differentiating between factors on a personal level, as on an external/systematic level (Figure 2). On a systematic level, examples include i) the cultural obsession with efficiency, giving the feeling that society goes faster and faster with less time to focus, ii) companies that dominate the food supply and provide predominantly easy, sugar-

rich food, giving rise to horrible energy peaks and valleys, and iii) our individualistic culture with the "solve your own problems" mentality. However, these problems are deeply rooted in our society and solutions for them are not easily realized. Fortunately, Hari lists organizations in his book that are actively working on solutions regarding several major problems. There are organizations fighting against the social media companies, thereby highlighting the problem and putting it on political agendas (with success). Other organizations involve raising awareness for (environmental) pollution that could harm and distract humans, or addressing the fact that people are becoming increasingly more stressed because society keeps demanding more and more of their attention.

On a personal level, solutions exist as well. Figure 2 displays some of the aspects that influence your attention span of which some already have been covered. Yet again, it is difficult to identify how much each aspect contributes to the loss of focus since they are related to each other. Finding solutions on an individual scale is, fortunately, easier than on a systemic level and Hari provides a few tools to help gain back your focus, which are listed below.

#### What can you do to gain back your attention?

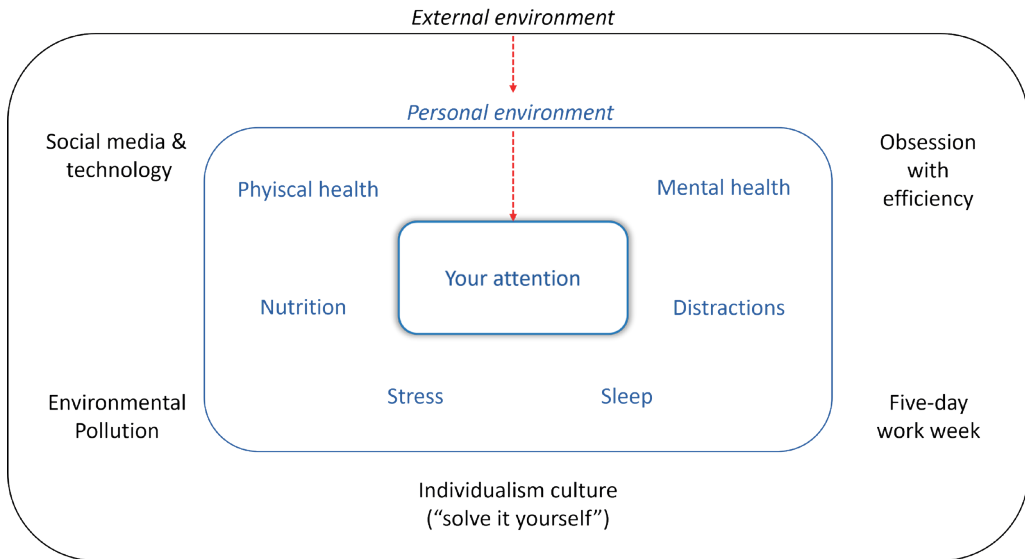
- Switch between different tasks less often (pre-commitment)
- Let your mind wander
- Cut social media for longer time periods
- MORE SLEEP

**1** Their business model is actually more related to advertisements, and gaining and selling as much personal data as possible, which is related to the amount of time people spend on their social media platforms.

**2** The general guideline is to sleep for *at least* 7 hours each day.

**3** a) Stranger, S. *et. al. Sleep*. **2012**, 35 (8), 1173–1181.

b) The 2022 Annual Global Sleep & Snoring Report. RhinoMed



**Figure 2.** Schematic representation of the different factors that influence your attention span. The factors are grouped into personal and external components, and the red arrows indicate that these environments currently negatively influence your ability to focus.

The first one is removing possible distractions from your surroundings. This includes turning off your phone and storing it somewhere out of your reach/sight, preventing you from noticing it. Also, you can decide to turn off the internet for a while to prevent situations such as when you are working on a report, get distracted on social media / YouTube, and realize that you just wasted an hour. The second one is about mind-wandering, which means that you should take breaks or go for a walk (without earplugs) and just let your thoughts flow. It is found that during these moments, spontaneous and creative ideas arise that can very well help you with solving a problem you are struggling with. The third and last ones are quite self-explanatory and can really aid you with having a larger attention span. Thus, despite the fact that you cannot easily change the systematic factors on your own, you can make changes in your own environment to get some of your focus back.

To conclude this piece, I should remark that some chapters in Hari's book are controversial, especially the one about the origin of ADHD. Reviewers regard the book as a collection of interviews and studies that have been selectively chosen to support his view. Hari acknowledges this issue by noting that certain topics are still under heavy debate and that scientists are conducting more research to investigate the topics further (as usual). Nonetheless, I think it is worthwhile to read the book since it gives the reader a different perspective about paying attention, and the underlying mechanisms that seem to exist to prevent you from paying attention. Now, only one question remains: how often did you lose your attention reading this article, and why?

# Chemistry Undercover

*Anna May Inzenhofer*

Have you ever been at a party and met an economist, or a sociologist and started chatting with them, only to realize you know absolutely nothing about how the world outside of chemistry works? Me neither. For this edition of ACiD, a plain-clothed chemist, yours truly, visited two PhD defenses to give you some perspectives outside of the academic world of chemistry.

## **On Inequalities in Well-Being and Human Capital Formation**

This first defense was the work of C.W.A. van de Kraats, an economist at the VU. C.W.A. presents his PhD defense on human capital and how well-being can affect it.

Human capital is a concept used by economists and social scientists to designate personal attributes considered useful in the production process. It encompasses employee knowledge, skills, know-how, good health, and education, to name a few.<sup>1</sup> C.W.A. refers us to the Happiness Curve (**Figure 1**) This U-shaped curve shows a pattern in mental health over a life cycle. Mental health is at its best at younger and older ages and worse during prime ages - a testament to the concept of the 'midlife crisis'.

C.W.A.'s work explores the relationship between well-being and age. Specifically addressing the upturn of the U-shaped curve, he asks the question of why life gets better after 50. Is it wisdom? Positivity? No children? Scientists have not found an explanation, yet.

Using complex statistical analysis, conveniently absent from this article, C.W.A. shows that whether or not you work matters more than any of the other factors (e.g., income, marital status, labor-market status) affecting the U-shaped

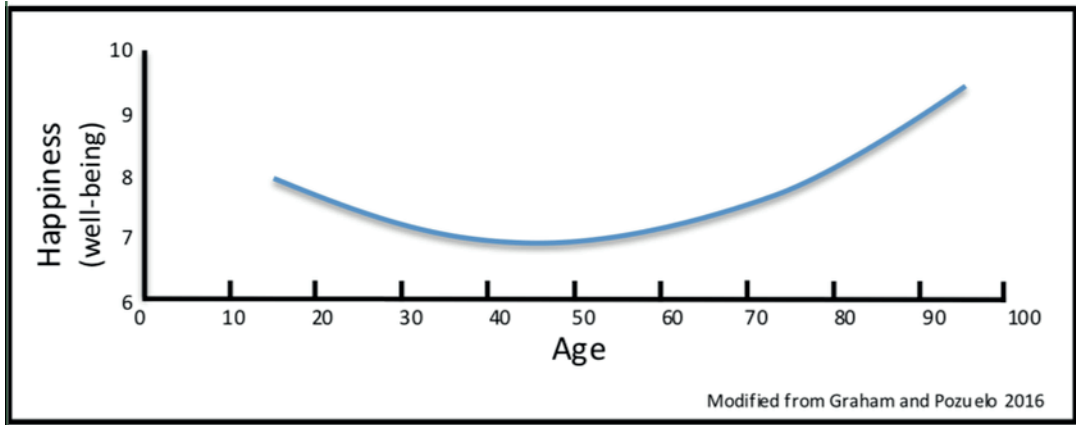
happiness curve. In fact, he found that this U-shaped happiness curve is more pronounced for the unemployed and disabled, whereas the happiness curve takes on a more stagnant linear shape for those with jobs – especially men.

After gathering data from 10 different countries he found that the two happiness curves, one U-shaped (without a job) and one stagnant (with a job), actually intersect at the age of 50. So, on average, those who experience a dip in happiness around midlife catch up to their working peers around age 50. C.W.A. attributes this intersection of curves at 50 to the effect of the social norm of work. We as a society identify strongly with our work, our purpose. Around 50, people start to retire and those who were not working previously are now more 'socially accepted' and thus their mental health gets better.

We return to the initial question – why does life get better at 50? Well, it seems like on average, life really only gets better for those who take a dip in happiness around midlife, most likely due to the social norm of work and its negative effects on well-being for those without a job. For the rest, it looks like this might be as good as it gets.

If you're curious to find out more about this concept, C.W.A. cites 'The Happiness Curve: Why Life Gets Better After Midlife' by Jonathon Rauch, a book I personally plan on gifting my parents.





### Making and unmaking Indonesian Islam

The second defense was the work of M.J. Shatanawi, a sociologist at the UvA, who explores the silence surrounding Indonesian Islam in the Netherlands. As she writes in her thesis, Indonesia was widely known as the country with the largest number of Muslim inhabitants in the world, and yet, when Indonesian art is presented in museums the focus is on Hindu-Buddhist art or other non-Muslim cultural groups.

M.J. begins her defense by showing a picture of an object that used to be a hat, called a “sonka” The owner of the hat, Daeng Pabarang, involved in the resistance movement against Dutch colonial powers, lost his hat on one of his flights from incarceration. The hat was gathered by the army as “spoils of war.” An expression referring to the profits extracted as a result of a war won.

The hat was eventually handed over to the Royal Military Academy museum. What the museum and army did not recognize on the hat were the words “Ya Allah” written 18 times over its edge. This pertains to the colonial framing of Islam that localized it in Middle Eastern and North African communities. There existed only one version of Islam, in the minds of the Dutch, and thus the hat was classified as mere clothes in the museum.

To further her point, M.J. shows a text by a Dutch officer, describing Islamic relics as creative but not Islamic affiliated. Other instances of misrepresentation include classifying relics as pertaining to ‘magic’ and not religion.

By ignoring Islamic influences in Indonesian art, museums continue to honor colonial values that offer little space for multiplicity about Muslim communities. M.J. believes we need more flexible systems of classification that allow a more nuanced interpretation of an object, or multiple interpretations of the same object. She hopes for museums to adopt an approach of careful curating, rather than the systematic collection that happens now.

That concludes our insight into the academic world of an economist and sociologist. Perhaps next time you meet one at a party, you are more interested in the work they do and its implications for the society we too exist in.

1. Goldin, Claudia. "Human Capital" (PDF). In Claude Diebolt; Michael Hauptert (eds.). Handbook of Cliometrics.
2. <https://retireby40.org/how-i-hacked-the-happiness-curve/>



## Interview with Joost de Jong Energy Trader at Northpool

# 'THE ENERGY TRANSITION IS THE THEME OF OUR GENERATION'

When Joost de Jong came into contact with Northpool, he was still a student. "I met the company at the career days at Delft University in 2019. I visited the event again one year later and Trisha - one of my colleagues now - recognised me. 'How did your thesis go?' she said and she remembered the topic I told her about a year before. That made me feel really valued and I decided to try it out at Northpool."

### Many opportunities

Since June 2020 Joost has been working as an energy trader. "I get a huge feeling of opportunity and a bit of restlessness too. The energy market is still developing and although more competitors are entering, I expect volatility to remain high. Especially with the amount of renewables we are placing on the grid."

### From junior to independent trader

After learning the basics of the energy market as a junior, Joost was able to quickly sit in on the shifts and see everything in action. "As a junior trader you will train in our own simulation environment just to get you ready for the real deal. You will start out small just with one or two delivery hours per country. From there on, you expand. Step by step you become more independent until you are able to trade all countries and lead your own shifts. It's a steep learning curve but I think you can go from junior trader to independent trader within a year."

It can be stressful, Joost explains. "You are involved with money making decisions all the time and you can constantly ask yourself: 'Could I have seen this move coming, should I have timed the market differently?'. But you have to realize that the most important thing is consistency. You can't win every hour but if you are consistent you will do better in the long run. Tomorrow is another day, another puzzle, so you can try again."

### Working on the future

As a 24/7 trading company Northpool works in shifts. "We want you to be able to do every type of shift so you will need to see them all regularly. By trading the energy markets we stabilize the grid and are a part of the price formation process. We can literally flow surplus wind power from the UK via underseas cables to a cloudy France where there is less solar generation than expected. It avoids them having to turn off wind turbines and burn extra gas. With more renewable energy to be installed it becomes increasingly challenging to keep the European grid stable and efficient. This energy transition is the theme of our generation and we are just a part of that. That's why working at a company like this really feels like working on the future."

We like to share our knowledge and are always looking for talent. So if you have an analytical mind, superb mathematical instincts and you can't rest until you solve the task: apply!

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