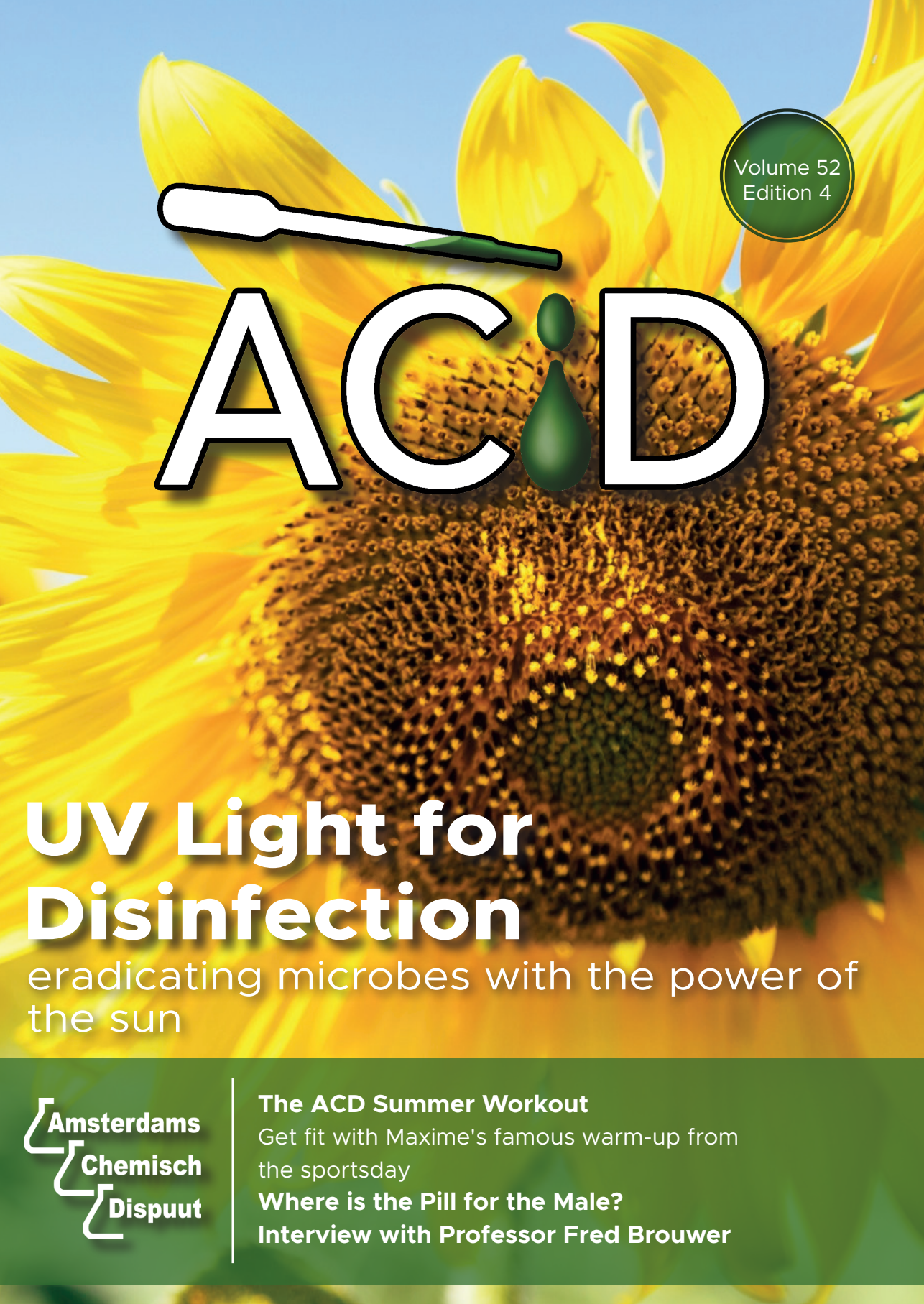

UV Light for Disinfection

eradicating microbes with the power of the sun

Amsterdams Chemisch Dispuut

The ACD Summer Workout
Get fit with Maxime's famous warm-up from the sportsday

Where is the Pill for the Male?
Interview with Professor Fred Brouwer

Colophon

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From the Editor

Dear reader,

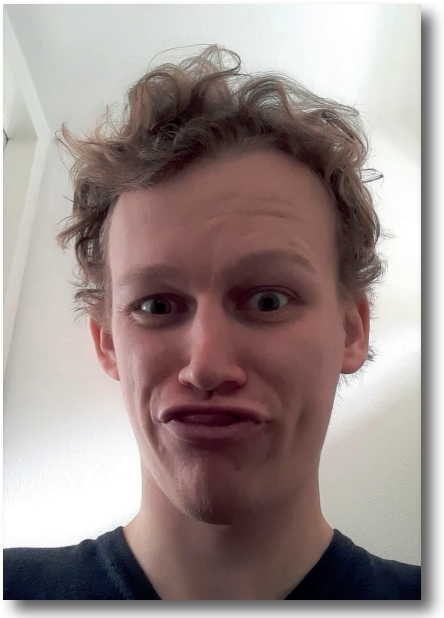
Hopefully all of you have completed your final exams of the year with satisfaction so that you can enjoy a well deserved summer holiday! To still have some more light hearted chemistry over the summer period we compiled some lovely articles that you can read at the beach, in the park, or wherever you may find yourself in the coming weeks. Among these is one about harnessing the power of the sun to disinfect water bottles (which also reminds us all not to forget to wear sunscreen), a summer workout for those last minute summer body touch ups, and an interesting deep dive into the reasons why we as of yet only have a birth control pill for women. Moreover, in this edition we have a beautiful poem written by an actual poet: Atze van Wieren. We hope you have fun reading this fresh edition and more importantly we wish you all a wonderful summer!

On behalf of our entire editing team,

Kind regards,
Tim Lugtenburg

Content

From the Chair



Hello my dearest ACD'ers,

Time flies when you're having fun, or exams, or projects, or vacation... well, you get the gist. I believe that I'm not the only one that wasn't expecting the COVID-19 measures to be relaxed so much and quickly, probably due to the quick level of vaccination and the summer weather. During this time the academic year has also finished, which implies that almost everyone will be able to go on a well-deserved holiday or have some fun in the nightlife of Amsterdam.

During these past few months the ACD has also seen some different activities both online and 'offline'. Together with brother associations at the VU a new collaboration was implemented: Association Battles. For this, we organized an online beer-yoga session followed up by a pub quiz together with VCSVU. The SLA managed to create their own take on the game GeoGuessr with Pin The Point, which they even created their own website for! Additionally, the LEC organized the last lecture of the year where prof. Luuk Visscher passionately told us about supercomputers. Furthermore, the second orientation market was held to let students get some more information on possible projects at the UvA and VU.

We've also got some other great news! On the 15th of June the Election General Assembly was held and the 76th candidate board of the ACD was constituted. They will have the entire summer and the start of September to prepare for an amazing task: filling the giant shoes of their predecessors of the 75th board. I'm only joking of course, the real task will be to let the association feel like home again in the coming year and kickstart a semester with loads of physical activities.

A little taste of what's to come after the summer has been provided by the MAC, ABC and SLA. The MAC created a funkyball tournament at the Flevopark, which was really awesome to play for the first time in over a year. Since the ONCS had to be cancelled once again, the ABC and SLA collaborated to finish the year strongly with their own sports tournament at the end of June. After an intense warm-up, the different teams competed in different sports on the football and volleyball fields at park De Meer. I want to thank all committees and the SLA for organizing so many creative activities during this past study year despite all difficulties.

All that's left for me to say is enjoy the summer! Get some rest, go on vacation, meet friends and when we return in September we will be able to meet in real life!

Love,

Your Chairman
Floris

Het wel en wee van de OC part 4

Sverre Overdijk

Dear reader,

At the moment of writing, we have almost reached the end of the academic year, which means the OC is finishing up on all her annual tasks. Most importantly, this means the new OER-A/B and TER-A/B have been approved for 21|22. Last *Wel en Wee*, I told you about a new proposed rule in the A part making all seminars obligated. We as the OC chemistry spoke up against this rule, and with us almost all other OC's of the FNWI, so this rule will fortunately not be implemented. As for the B part, the most important changes are the inclusion of the new first year courses as well as changes in the pre-master curriculum. We are in both cases extra alert on any issues that might arise within these new courses as well as issues with the scheduling of the courses throughout the year. However, it would really help us as well if you and your fellow students contact us next year as soon as any issues arise. This, of course, also goes for any of the subjects that have been taught in previous years.

Furthermore, a new academic year usually also means the change of a few OC-members. We already saw Dr. Trevor Hamlin leave the committee and Dr. Klaas Giesbertz join in his place. Concerning the student members, we have one vacancy for a master student. If you're interested, please contact us at the email address at the end of this Wel en Wee. As for the bachelor student members, another vacancy will likely arise. If you're interested in joining as a bachelor student, keep your eyes open for any vacancies, as those will be soon communicated.

We also found out that not all course evaluations are fed back to you as a student at the moment, as you probably have experienced. For some of the courses you will receive a small report about the UvA Q, as well as a comment on it from the lecturer, while other courses do not supply any feedback. As the OC, we have no clue what causes this to happen and whether it is a random occurrence, or a decision made by the lecturer. We understand it would be ideal to get some evaluation on what happens with your feedback on the course, so we will figure out why you don't get all of them back correctly.

As for this academic year, this is the last *Wel en Wee* I will write. We will keep updating you next year on all the activities of the OC!

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

UV Light for Disinfection

Eradicating Microbes with the Power of the Sun

Myrthe Zwart

With summer in full swing, the sun has come out to play. Although sunlight is incredibly important for sustaining life, think of vitamin D synthesis or photosynthesis, it is also quite harmful to humans. With skin cancer on the rise, I hope you have slathered on the sunscreen and will continue to do so. UV light is also the arch nemesis of many microbes, such as viruses, bacteria, and molds, and has been used for different applications for quite some years already. Health care facilities, such as hospitals and clinics, make use of UVC for air purification. Moreover, UV light has become more available to the consumer in the past few years, with a surge of sales in handy disinfection wands during the pandemic. LED UVC lamps, made by companies such as Philips, are great for surface disinfection of for example phones (which are dirtier than the average public toilet) or other consumer products.

UV light from the sun itself has also been used for many years in countries that lack modern wastewater treatment facilities. In the rural parts of many countries in Africa and Asia, children take their water bottles filled with contaminated water to school and leave them to disinfect in the sunlight on the roof of the school building. Solar disinfection (SODIS) has been proven effective for inactivation of viruses, bacteria and protozoa that cause diarrhea, a major cause of death in less developed countries. So, UV light knows many applications, but let's dive into the working mechanism behind its antimicrobial action.

Working mechanism

The microbicidal function and efficacy of UV light depend on the wavelength used for application. UVC can directly damage DNA, whereas UVB and UVA are mostly toxic due to Reactive Oxygen Species (ROS) formation.

Surface disinfection and air purification both make use of UVC light, the shortest wavelength of UV light. UVC light is in the range of 100–280

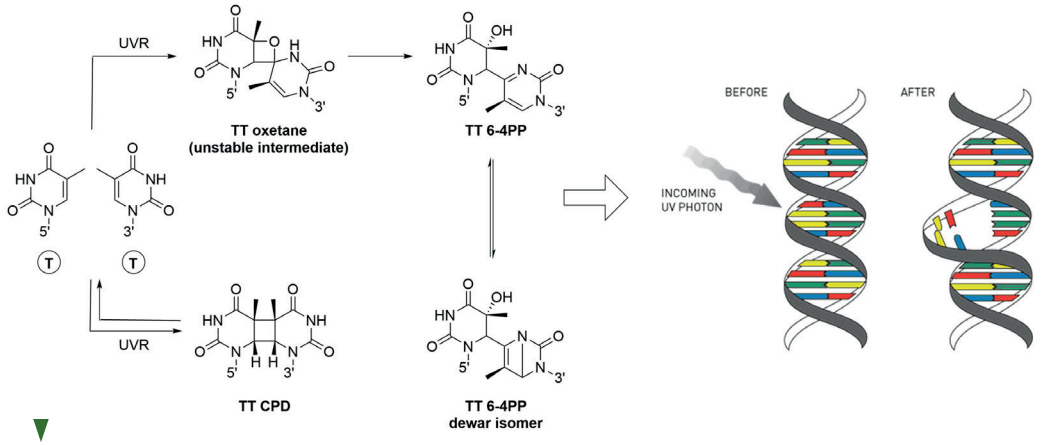


Figure 1. [2+2] cycloaddition of two thymine nucleobases, leading to formation of kinks in the DNA helix.[2]

nm and is primarily toxic due to damage to the DNA of microbes. The purine and pyrimidine nucleobases have a maximum absorption at 260 nm, making them strong UVC absorbers.[1] Induction by UV light results in pyrimidine dimers in the DNA strands, a state in which adjacent pyrimidines become covalently bound. Excitation of the pyrimidine to the singlet excited state is followed by relaxation to the triplet excited state, from which [2+2] cycloaddition results in cyclobutene pyrimidine dimers (CPDs), pyrimidine 6-4 pyrimidone photoproducts (6-4PPs) or their Dewar isomers (Figure 1). T-T and T-C sequences have been found to be more reactive than C-C or C-T sequences and CPDs are more frequent than 6-4PPs. Both pyrimidine dimers result in distortion of the DNA helix and inhibit the progress of DNA polymerase and RNA polymerase II.[2] Direct DNA damage caused by (primarily) UVC light thus inhibits transcription and translation of genes in microbes, eventually leading to cell death. Additional processes such as ROS formation can also contribute to the toxicity of UVC light.

The sunlight used for SODIS mainly consists of UVA radiation (315 – 400 nm), since UVC (and a lot of UVB) is mostly filtered out by the ozone layer. UVA light does not have enough energy to directly damage DNA, but can excite ground state (triplet) oxygen to the reactive excited state (singlet) oxygen, as well as form other types of reactive oxygen species through different pathways, such as the superoxide radical, hydroxyl radical or hydrogen peroxide (Figure 2). Excitation of endogenous photosensitizers, such as porphyrins, flavins, quinones and others, can contribute to ROS formation by energy or electron transfer.[3] Once these ROS are formed, they can damage DNA, oxidize proteins and oxidize poly-unsaturated fatty acids in lipids, in turn damaging cell membranes. Additionally, sunlight also heats up the water and once the water temperature exceeds 45 °C, DNA repair mechanisms become inhibited.

Although sunlight can be our enemy, exactly due to the processes described above, it is also the enemy of many microbes who unfortunately cannot simply put on sunscreen to protect themselves from harmful UV-rays, and as many people may know 'The enemy of my enemy is my friend'. So, thank you sun (and UV lamps) for keeping us safe and healthy from microbes!

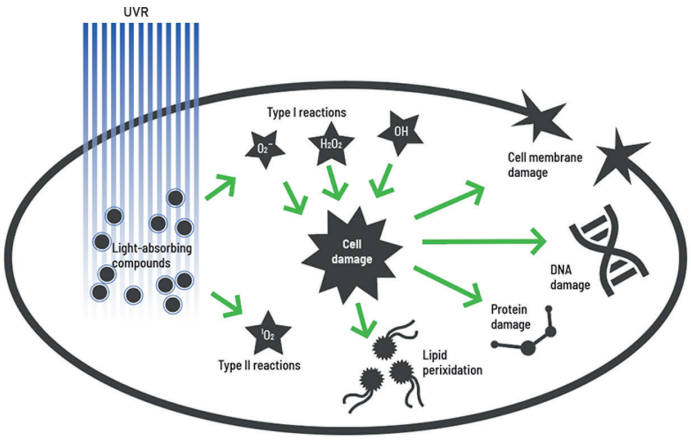


Figure 2. Schematic representation of the formation of ROS in cells and their damaging effects.

1. Rastogi, R. P.; Richa; Kumar, A.; Tyagi, M. B.; Sinha, R. P. Molecular Mechanisms of Ultraviolet Radiation-Induced DNA Damage and Repair. *Journal of Nucleic Acids*. Hindawi Limited 2010, p 32.
2. Sinha, R. P.; Häder, D.-P. UV-Induced DNA Damage and Repair: A Review. **2002**.
3. McGuigan, K. G.; Conroy, R. M.; Mosler, H. J.; du Preez, M.; Ubomba-Jaswa, E.; Fernandez-Ibañez, P. Solar Water Disinfection (SODIS): A Review from Bench-Top to Roof-Top. *Journal of Hazardous Materials*. Elsevier October 15, 2012, pp 29–46.

Bladluis

Het is lang geleden, ziekte en dood
bleven ver van mijn tintelend lijf.
Ik beminde onder hoge pijnbomen
op het strand van Montalto Marina.

Nu, oud, lees ik aan het ontbijt
dat die bomen te gronde gaan, bladluis
scheidt op tak en naald iets kleverigs af:
het wonderwerk der fotosynthese stokt.

Alles leeft van het licht van de zon,
haar fotonen barsten van energie,
willen het delen, moeten het kwijt.
Zonnen te over, onkenbaar hun vermogen.

Aan Toscane's kust gaat men injecteren;
scheikundigen, onze hoop in bange
dagen, schiepen een gif, abamectine,
uit oeroude schimmels verworven.

Ik denk terug aan jonge jaren,
hoe alles open lag, zinderend van lust
en warmte en geen weet van kou
en huiver, van mitsen en van maren.

Atze van Wieren

Atze van Wieren (Harkema, 1943) was tot 2002 loopbaanadviseur aan de Universiteit van Groningen. Op zijn vijftigste ging hij minder werken om meer te kunnen schrijven. Hij won meerdere prijzen, waaronder de SNS-Literatuurprijs 2002 voor een cyclus van zeven gedichten; in veel verzamelbundels is werk van hem opgenomen. In 2006 verscheen bij Uitgeverij IJzer te Utrecht zijn vertaling van de *'Duineser Elegien'* van Rainer Maria Rilke onder de titel *De elegieën van Duino*, waarvan in 2017 een 2e druk verscheen. Bij dezelfde uitgever zag in 2008 zijn poëziebundel *Grondstof* het licht. In 2011 volgde *Bedevaart*; zijn derde bundel *Eeuwig leven* verscheen september 2017. In 2020 verscheen bij Uitgeverij Elikser te Leeuwarden de tweetalige bundel *Swannesang*, die een selectie bevat van zijn gedichten, in het Fries vertaald door de in 2018 overleden meestervertaler Klaas Bruinsma. De volgende bundel *Aan alles voorbij*, wederom bij IJzer, verschijnt in 2021.
Met het Gronings dichterscollectief WP99 realiseerde hij tot nu toe vier uitgaven: *Poëzie op Sokkels, Suiker, Van liefde en koude min en Tussen ijs en adem.*
Atze woont sinds 2016 in de stad Groningen, als Fries om ûtens.

Where is the Pill for the Male?

Siebe Lekanne Deprez

Since the summer vacation has begun for the universities in the Netherlands while also the corona measurements have been loosened, many students have set out to finally meet each other again with suddenly plenty of free time on their hands. And it is about time: people became desperate after one and a half year to return to the "normal" way of living, leading to a phenomenon called "huidhonger" (hungry for social/physical contact). Some newspapers even argue whether this desire for social contact will result in a new "Summer of Love"[1] where there will be a lot of contact both socially, physically *and* sexually.[2] A statement like this about a sudden increase in people having sex always reminds me of one question that I find very interesting: where is the birth control pill for males?

First, let me elaborate why I think it is an important question to ask since it basically illustrates the burden upon females of using birth control. Around our age, most of us do not (yet) want children. So, both males and females are required to use a form of birth control. For females a wide variety of options are available, ranging from different contraception pills to transdermal patches to implanting devices (Table 1).[3] Estimates indicate that around 66% of the female population uses a form of birth control.[7] On the other hand, there is a stunning number of two contraceptives available for males which are condoms and permanent sterilisation (vasectomy).

This could be fine in principle because both sexes

Female birth control		Male birth control	
Type	**Effectiveness**	**Type**	**Effectiveness**
Combined pill	91%	Condom	82%
Diaphragm	88%	Vasectomy	99%
Female condoms	79%	(Withdrawal method)	(78%)
Implant	99.95%		
Injection	99%		
IUD (coil)	99.2%		
IUS (hormonal coil)	99.8%		
Patch	91%		
Progestogen-only pill	87%		
Vaginal ring	91%		
Female sterilisation	99.5%		
Natural family planning	76%		

No birth control: 15% chance of no pregnancy during first year of use

Table 1. Overview of different birth control options for both female and male. Highlighted in red are the most commonly used options. The effectiveness is defined as the chance that a pregnancy does not occur in the first year of use. Furthermore, the effectiveness is based on practical use and not perfect use. The data was taken from Wikipedia "Birth Control" and NHS.[3]

1 Reference to the summer of love in 1967 during which 100.000 Hippies came together in San Francisco.
2 AD: https://www.ad.nl/home/komt-de-summer-of-love-eraan-seks-hebben-met-nieuwe-mensen-kan-stress-ontladen~a5fd7b50/ (accessed 5 July, 2021).
De Volkskrant: https://www.volkskrant.nl/cultuur-media/zeker-weten-die-liefdeszomer-komt-er-desnoods-volgende-herfst-pas~bb72c8b0/ (accessed 5 July, 2021).
3 NHS. Contraception. https://www.nhs.uk/conditions/contraception/ (accessed 6 July, 2021).

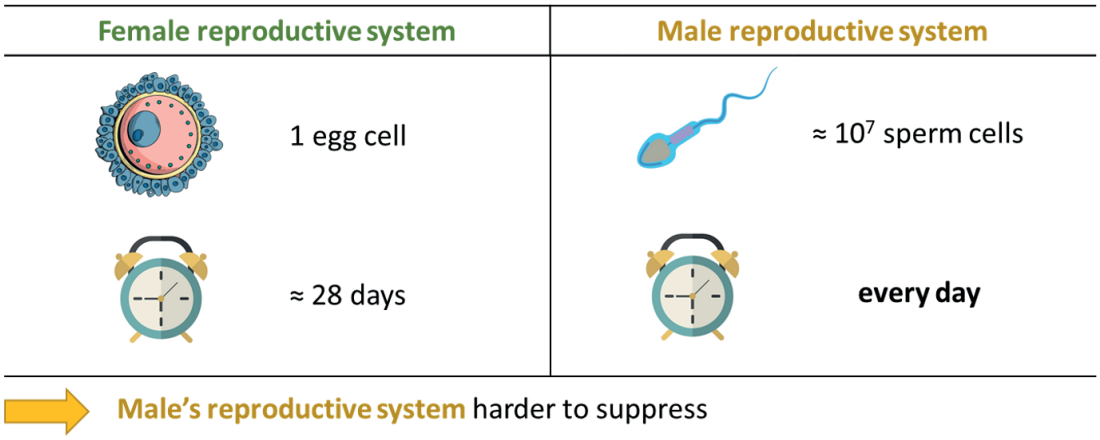


Figure 1. Illustration of the numbers game belonging to the female and male reproductive systems.

occupy a role in preventing unwanted pregnancies, but there are some caveats. One of them is that females have to put more effort in placing/planning contraceptives compared to males, albeit with operational interventions or medical advice. Furthermore, female contraceptives tend to have side-effects that can be severe and life disrupting while males experience far less (severe) side-effects from using birth control. Females are required to basically re-engineer their reproductive cycles to prevent unwanted pregnancies. Therefore, using the pill impacts females considerably more than males and one might wonder whether it wouldn't be much fairer if males could relieve some of the burden that females carry. With that said, what is the status of a birth control pill for the male?

It should not come as a surprise that there is not yet a birth control pill for the male as it would have been featured heavily in the news. One of the primary reasons for this is that the male reproductive system is far more difficult to suppress while obtaining the same effectiveness as can be achieved by suppressing the female reproductive system. For example, females release one egg once every 28 days[4] while males produce tens of millions of sperm cells every day (Figure 1). It comes down to essentially a numbers game where it is easier to prevent one egg from being released than suppressing millions of sperm cells every day. Thus, focussing on the female reproductive system can be considered as a straightforward choice which led to the development of female birth control pills over pills for the male.

Fortunately, efforts have been made and are made to investigate hormonal male contraceptives. Since the 1970s, research studies have investigated the mechanisms involved in the male reproductive system and how to block/influence them. In particular, researchers found that there are a few key components that assist in regulating sperm production. In a normal situation without birth control, there is a constant communication between a male's testicles and the brain where two hormones, luteinizing hormone (LH) and follicle-stimulating hormone (FSH), are crucial

4 This is an average; it can vary between 21 and 40 days and it can even vary for each cycle.
NHS. Periods and fertility in the menstrual cycle. https://www.nhs.uk/conditions/periods/fertility-in-the-menstrual-cycle/ (accessed 6 July, 2021).

in promoting sperm production. In addition, the two hormones are also involved in producing testosterone which is usually associated with physiological functions of males such as increased muscle and bone strength.

In case of birth control by the means of a pill, the communication between the brain and testicles is blocked which leads to LH and FSH being suppressed (Figure 2). As a result, the sperm production is drastically reduced and almost no sperm is present in the semen released during ejaculation, meaning there is no sperm anymore to cause the female to become pregnant. However, one cannot simply suppress LH and FSH production since this would also lead to a reduced testosterone production which causes severe side-effects. Thus, as it stands currently, researchers are trying to develop a male birth control pill containing testosterone and LSH and LH suppressors ("progestin" for the ones that are curious). Note that instead of a pill, other forms of administration such as gels or patches can also be applied and are, in fact, more promising since it was found that a pill works only for 24 hours![5]

Unfortunately, slow progress has been made and commercialization is not on the near horizon. Some studies were halted because of males reporting side-effects like nausea, weight gain, loss of libido and more. Ironically and frustratingly, these effects are also associated with female birth control pills. On the other hand, there is still some good news. Besides the scientific aspect of research, the social aspect is certainly worthwhile to mention, namely that males become increasingly more aware about the burden of their partner and their responsibility of preventing an

5 Yuen, F.; Nguyen, B.T.; Swerdloff, R.S.; Geffen, D.; Wang, C. Continuing the search for a hormonal male contraceptive. *Best. Pract. Res. Clin. Obstet. Gynaecol.* **2020**, *66*, 83–94.

unwanted pregnancy; surveys indicate that 50% of all men would use a male hormonal contraceptive so there is still hope!

In the meantime, I would suggest discussing the male contraceptive matter with your partner (if applicable), friends and family. Not only is it necessary to break the taboo around sexuality as the world becomes more prudish, it is even more important to talk about the burden of females regarding birth control and unwanted pregnancies. Even today, too many abortions are executed as a consequence of unwanted pregnancies. Finally, I would encourage everyone to get to know your reproductive system *and* the one of the opposite sex better since it leads to a better understanding of each other!

Female birth control mechanism	Male birth control mechanism
Normal situation - Egg cell is released and fertilized - Estrogen levels increase, signalling that the female is pregnant **Hormonal birth control** - Pill increases estrogen levels - Body thinks the female is pregnant - No egg cells being released - No pregnancy can occur	**Normal situation** - Testicles signalling to increase LH and FSH levels - LH and FSH promote sperm *and* testosterone production **Hormonal birth control** - Pill keeps LH and FSH levels low - No sperm production - Pill also supplies testosterone for maintaining physiological functions typically associated with males

Figure 2. Summary of the birth control mechanisms for both males and females. For completeness, the female mechanism is also mentioned. It is important to note that there is another hormone involved in the male birth control called GnRH. This hormone is involved in an intermediate step in between the testicles signalling to the brain and producing LH and FSH.

6 Gava, G.; Meriggiola, M.C. Update on male hormonal contraception. *Ther. Adv. Endocrinol Metab.* **2019**, *10*, 1–9.

7 InsideHook. The Real Problem With Male Birth Control. https://www.insidehook.com/article/health-and-fitness/problem-male-birth-control (accessed 6 July, 2021).

8 Pandia Health. Does Male Birth Control Exist? https://www.pandiahealth.com/resources/male-birth-control/ (accessed 6 July, 2021).

Homemade Hummus Wrap

by Tim Lugtenburg

With summer upon us we can start relaxing again and what better way to do that than by looking for a nice spot in the park for a picnic! The Bladcommittee decided to do the same, where we tried out this recipe and can verify that it is perfect for a picnic or something else on the go. At centre stage in this recipe is the hummus, and what I like about it is that it tastes a lot better than supermarket hummus and is relatively easy to make.

Ingredients:

Hummus:

- 2 garlic cloves, halved
- 1 can chickpeas, drained and rinsed
- ½ teaspoon ground cumin
- Salt to taste
- 3 to 4 tbs freshly squeezed lemon juice, to taste
- 2 to 3 tablespoons plain low-fat yogurt, as needed
- 2 tablespoons extra virgin olive oil
- 3 tablespoons sesame tahini

Wrap:

- 1 large flour tortilla or whole wheat wrap
- 2 leaves romaine lettuce, ribs cut away
- ⅛ red pepper, cut into thin strips
- 2 tablespoons cucumber, julienned
- Fresh mint leaves (optional)

Preparation:

1. First put the garlic cloves into your food processor, chop them and scrape them down from the sides. Then, add the rest of the hummus ingredients and blend until you get a smooth paste with a consistency you like.

2. Heat your tortilla per instructions and place two lettuce leaves in the center. Place around 3 tbsp. of hummus and add the red pepper, cucumber and some mint if you like the taste.

3. Fold the bottom edge over the filling, fold in the sides and squeeze it so it remains compact. Place it in a piece of plastic wrap and wrap it tightly. Finally place it in the refrigerator for at least 5 minutes and then it is ready to bring to wherever you'd like! (or eat it immediately of course)

Chemical detail:

Since this recipe does not involve any heat we won't find as many chemical reactions occurring, and I initially struggled to find an interesting chemical detail. So, I decided to focus on a more practical/chemical engineering aspect that we all do in the lab with the help of our cool magnetic stirrers: mixing!

It may seem innocuous at first as we merely want to form a paste of our ingredients so that we can spread it on our wraps, but there is a lot more to it than that. The science of mixing is a highly diverse field of research and you can imagine it becomes more and more relevant at increased reactor volumes.

Since there is so much to talk about, I will merely highlight one small fact: the blade directly hitting your food is only partly responsible for the blending of it. Other important forces that do most of the mixing are cavitation and hydrodynamic forces. Since the hummus of our recipe is very viscous however, these other forces play less of a role and you may notice the mixing takes more of an effort than with more dilute mixtures.

This latter phenomenon, cavitation, is so powerful that it may even break a glass water bottle when you smack the top of it. Due to this, small bubbles at the bottom are formed (the cavities) that subsequently implode with a giant shockwave that can burst the glass.

1. https://cooking.nytimes.com/recipes/1014014-hummus-wrap
2. Daily, J., Pendlebury, J., Langley, K., Hurd, R., Thomson, S., & Truscott, T. (2014). Catastrophic cracking courtesy of quiescent cavitation. *Physics of Fluids, 26*(9), 091107.

The Blad Committee wishes everybody a save and happy summer holiday!

Join the Bladcommittee!

Have you enjoyed every edition of our beloved ACiD and are you full of ideas for the editions of next year? The Bladcommittee is looking for additional members! Working on the ACiD is not only perfect for those that like writing pieces about chemistry or any other fun topics that we can come up with, but is also ideal for those who love interviewing professors, PhD'ers, famous chemists etc. and/or who would love to learn about how to create that wonderful lay-out of ours!

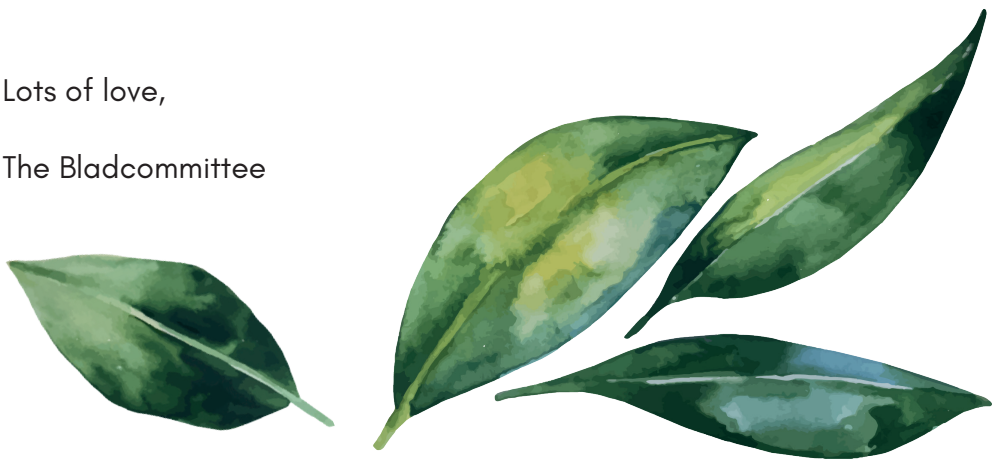
Don't panic, it won't take up much of your time and you won't have to do everything on your own. The Bladcommittee has a meeting/brainstorm session for every edition after which the creative process can begin. If you would rather just focus on learning how to create the most beautiful visual design, we have a seasoned editor in our midst who is willing to teach you everything she knows! You won't be thrown to the wolves, we promise!

Furthermore, you are always welcome to send in a piece you would like to see in our ACiD without even having to join the Bladcommittee! We would love your input.

Are you interested? Send a mail to acdblad@gmail.com

Lots of love,

The Bladcommittee



15 Minutes of Sweat!

Maxime's Famous Sportsday Warm-up

Provided by Maxime Gerber

Ready to boost your fitness level over summer? Maxime's warm-up sure knows how to get up that heart rate and get you on the right fitness track! Start by wearing the right kind of clothes and shoes! Make sure you feel comfy and ready for some exercise. Then, provide yourself with some uptempo music. Music for running, electronic dance music, anything you like. (Or just the top75 des ACDs 😉) If you want, it can be nice to place a timer nearby, but this is definitely not necessary. Okay, here we go!

Start with regular JUMPING JACKS, sideways.
Count to 60 or do them for about 1 minute.

Switch to JUMPING JACKS back & forwards (kind of like shuffling, but jumping)
Make sure you keep your arms straight and stretch them all the way up.
Count to 60 or do them for about 1 minute.

First set of SQUATS
Start with 20, more experienced fanatics can do 30 or 35.
Make sure you do them correctly! Please check a video on do's and don'ts.
You can try different kinds of foot positions for different results (thigh, inner thigh, booty..)

Continue into MIDDLE HIGH KNEES
After 20 seconds add PUNCHES
After 20 seconds PUNCH UPWARD
After 20 seconds, 10 SECONDS HIGH SPEED PUNCHES

Repeat this!
Keep up the MIDDLE HIGH KNEES
After 20 seconds add PUNCHES
After 20 seconds PUNCH UPWARD
After 20 seconds, 10 SECONDS HIGH SPEED PUNCHES

Now the first set of LUNGES
Start with 20, more experienced fanatics can do 30 or 35.
Make sure you do them correctly! Please check a video only on do's and don'ts.

Well done! This was round one! Now we repeat this schedule with small adjustments!

Regular JUMPING JACKS sideways again.
Count to 90 or do them for about 1 minute at a higher pace.

Switch to JUMPING JACKS back & forwards
Count to 90 or do them for about 1 minute at a higher pace.

Second set of SQUATS
Try 25 this time, or for more experienced fanatics try 40.

You are half way! Almost there! Relaxing stretching after this!!

Continue into MIDDLE HIGH KNEES
After 20 seconds add PUNCHES
After 20 seconds PUNCH UPWARD
After 20 seconds, 10 SECONDS HIGH SPEED PUNCHES

We will repeat this TWICE this time!

Keep up the MIDDLE HIGH KNEES
After 20 seconds add PUNCHES
After 20 seconds PUNCH UPWARD
After 20 seconds, 10 SECONDS HIGH SPEED PUNCHES

Final round! Here you go!

Give your everything for the HIGH KNEES
After 20 seconds add PUNCHES
After 20 seconds PUNCH UPWARD
After 20 seconds, 10 SECONDS HIGH SPEED PUNCHES

GREAT JOB!

Now the second set of LUNGES
Try 25 this time, or for more experienced fanatics try 40.

Take a breath, shake off your arms and legs a bit...

STRETCHING TIME!

Put your feet at shoulder width, circle your hips, both ways. Then, hang forward, feel the stretch in your hamstrings

Put your feet a bit wider and lean towards one knee, feel the stretch in your inner thigh, both sides

Feet a little wider, press you hips forward in pulses, continue into leaning forward for the hamstrings again, also in pulses
Follow a rhythm hip, hip, hang, hang, hip, hip, hang, hang....

Now, put your feet as wide as possible, hang forward, bring you hands to the floor and walk forward

Drop you hips and look up, so you can stretch your back.

Now walk back up and shake off your legs a bit.

Now feet together, hang forward
Try moving to the right and to the left side while hanging forward

Place one foot over the other and do the same thing, do this both ways.

Then, find your balance, put your foot near your butt, hold your ankle to stretch the thigh, do this for both sides.

Now we're moving up

Bring your feet at shoulder width again and swing your arms from side to side
Twist with your hips with the movement, make sure you get that back loose

Now you stand still again and start making circles with your arms, while placing your hands on the shoulder of their own side.
Rotate forwards and backwards

Now let go of the shoulders and do the same thing with long arms.

Almost done! Stretch your arms by putting your hand between your shoulder blades and gently push the arm back with your other hand
Also for the other side.....

Now take a long arm, move it horizontally across your chest and use the other arm to lock and gently push it.

SHAKE IT OFF and you are ready for your work-out!

Round 1

Jumping Jacks	60 s
Forward Jumping Jacks	60 s
Squats	20 reps
	30 – 35
Middle High Knees	20 s
+ Punches	20 s
+ Punch Upward	20 s
+ High Speed Punches	20 s
Lunges	20 reps
	30 – 35

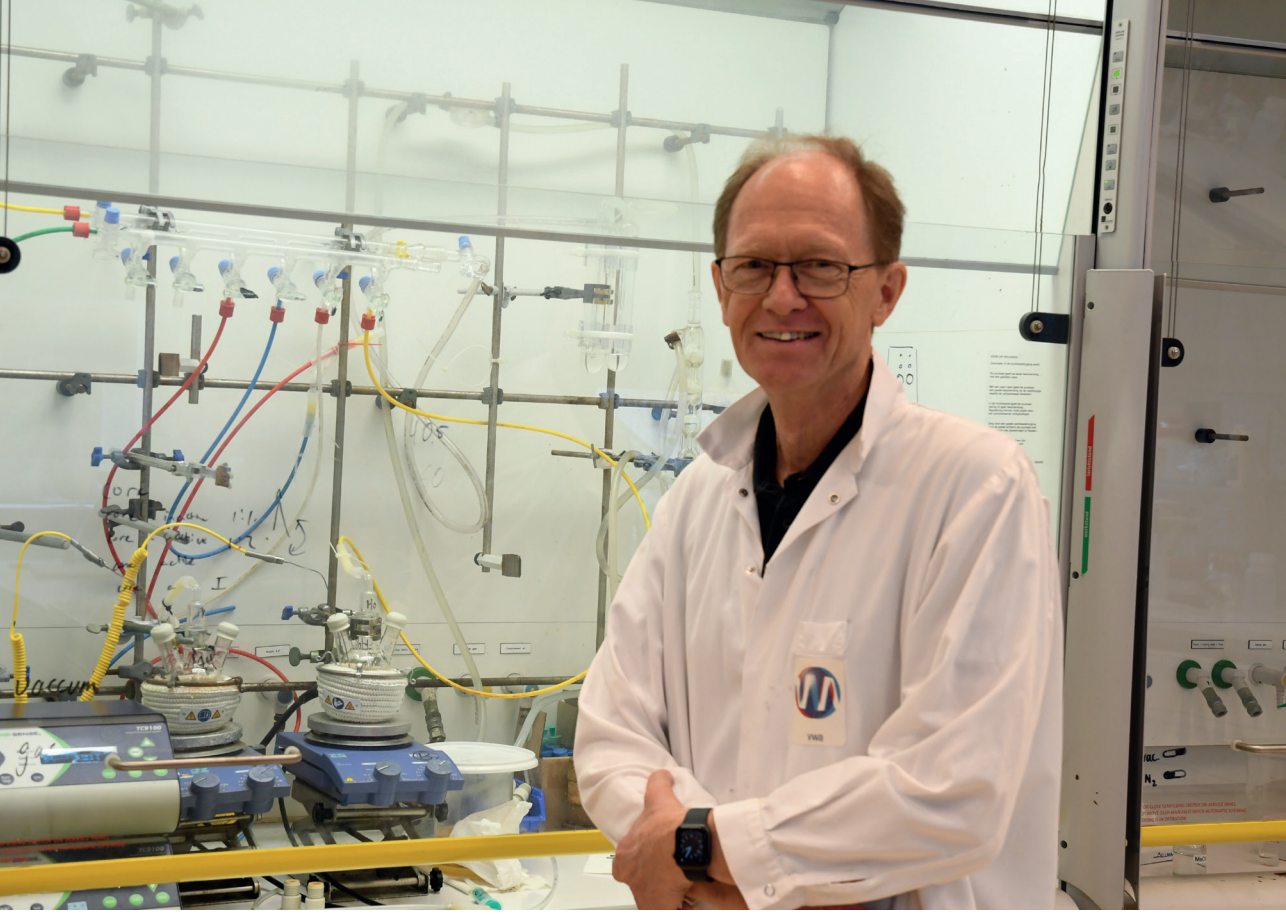
Round 2

Jumping Jacks	60 s
Forward Jumping Jacks	60 s
Squats	25 reps
	40
Middle High Knees	20 s
+ Punches	20 s
+ Punch Upward	20 s
+ High Speed Punches	20 s

× 3

Lunges	25 reps
	40

Beginner and Intermediate Experienced



Interview with Dhr. Prof. dr. A.M. Brouwer

Tim Lugtenburg & Michelle van Dongen

Dhr. Prof. dr. A.M Brouwer, or more commonly known under the ACD'ers as professor Fred Brouwer has been at the UvA for quite some time and most students have probably met him during one of the bachelor's or master's spectroscopy or molecular photochemistry courses. Coming from the University of Leiden with a PhD in Photochemistry and Spectroscopy, Brouwer started his career at the UvA in 1987 as an assistant professor in research related to photoinduced electron transfer, and became an associate professor in 1993 before being granted a professor position in Spectroscopy and Photonic Materials in 2006 with a research focus on rotaxane molecular machines, labels and probes and high energy photons. Since 2014, he has also been a group leader in the Advanced Research Center Nanolithography (ARCNL) where they investigate the chemistry of photolithography at very short wavelengths. Being such an experienced chemist with a CV and research articles of which we as the Bladcommittee could only be in awe, we wanted to get to know him better. Why did he start in chemistry? What made him choose Molecular Photonics? What changes did he notice over the years? We asked it all.

Where it all started...

The first question we asked, of course, is where his passion for our wonderful area started. He answered that, like for most, his interest in chemistry was encouraged by his high school chemistry teacher. In his time, and to his disliking probably still to this day, high school chemistry mostly consisted of doing 'dumb' and easy calculations, but you also had the fun part such as molecules and reactions themselves. Brouwer had no doubt in his mind that he wanted to study Chemistry and so he did. His road to the area of molecular photochemistry was partly based on coincidence, which was the first word he used to describe how he ended up in this area. According to Brouwer, you find your way to your best courses as a student; the ones you can do best. He found inorganic chemistry with ligand field theory too intricate; he liked organic chemistry better, but after a while felt like he had seen most of the reactions; he did like physical chemistry, but believed it to be a bit too mathematical, and so he ended up in physical organic chemistry, an in-between area of organic and physical chemistry. For this reason, he made it his main area of study together with theoretical chemistry. He remarked that calculations we now do on our phone had to be performed in computer centres during his time. Brouwer believes that the area you end up in is encoded in your DNA, accompanied with a passion that does not leave so easily. With excitement in his eyes, he told us about how he always wanted to learn how molecules react, which is according to him the core of chemistry. Vividly, he recalled how he was taught about pericyclic reactions and how the ring could be closed using light and opened again using heat. He found it fascinating how light could create a whole new reaction, and ever since he hasn't been able to let this area of molecular photochemistry go.

Experiences from a seasoned researcher

Having been a researcher for quite some time at both Roeterseiland (Roeters) and Science Park (SP), we asked him about what he had noticed the most from the shift of Roeters to SP and what he has learned over the years. Brouwer mentioned that not only the building has changed during the move, but also the structure of the organisation he works in. During his time on Roeters, he worked in professional groups (organic, inorganic, physical) that fell under a faculty or sub faculty and resided in different buildings. With the move to Science Park, the organisation decreased in size and different groups were placed together in one building and under one organisation (HIMS), making it more orderly, easier to get in contact with different groups, and easier to get to know your fellow colleagues. He has always been in collaboration with physicists for his field, but the move to SP made this contact even more effortless.

We then moved on to what he has learned as a researcher himself over the years, upon which he answered that besides the basic insights, he mainly has learned why chemistry is so difficult. We did not have an answer ourselves to that question straightaway, but we do agree with the one Brouwer provided: chemistry is difficult due to the subtle game of atoms and molecules which have clear playing rules (Boltzmann equation, Schrödinger equation etc.) but no straightforward application adhering to those rules. In chemistry, one looks at a small energy difference relative to the whole system, which makes it difficult to calculate and predict accurately. This makes experiments still crucial for final validation, actually only enlarging the excitement of conducting research.

With his full academic career, we were wondering if he had ever thought of crossing over to industry. Brouwer said that he applied at TNO, Philips and the university, which in the end became the location he stayed at without any regrets and

some courses at this university, such as molecular spectroscopy, he has been teaching for 30 years. He still loves to teach them, since he only focuses on this area of puzzle solving for two months with the consequence that it stays new each time. The way the material is brought to the students has changed, however, according to Brouwer in the sense that it is brought in a more simplified manner. He has learned that it can be difficult for students to absorb the theoretical part and that he should not elaborate too much on things outside the course material in his excitement if he wants students to keep paying attention. A nice quote from his side 'A little bit more is always good', but this should not become too much.

Interests
Reading, travelling (for work)

Book tip from Fred Brouwer
Kafka on the Shore – Haruki Murakami
The Sleepwalkers – Christopher Clark

Role model
He could not think of a name without a possible drawback, but did mention that he has learned a lot from different people. Characteristics of a role model would be someone's hard-working nature, quick wittiness and his ability to catch on to the right subjects.

International experiences

On his CV from ARCNL, one can notice that this professor loves to travel abroad: China, Taiwan, Japan and France to name a few. We asked him about the most important cultural differences he observed there. He answered that he loved to speak to students in Asia, since this was not custom in their country due to the larger hierarchy and distance between students and staff. From his time in China five years ago, he recalled the greater competition in that country for material, money and prestige. Their research culture seemed opportunistic and focused on publishing as fast as possible. Researchers were financially rewarded for publishing articles in journals with a high impact factor (Brouwer is not sure whether this is still the case. He remarked that this kind of pressure is unhealthy and does not encourage original ideas and projects with uncertain outcomes.

For Japan, he said that the scientific culture is more in line with our country and we asked if there was anything that he would like to see back from the Japanese culture into our own Dutch culture. He answered that he would like to get rid of the excessive competition we have in our country. In Japan, there still is funding and respect for good research that will not be published in highly renowned scientific journals. According to Brouwer, there is a bit too much focus on excellence in the Netherlands with the result that many very good researchers get little project funding. He would like to see more room for pioneering work. He is not sure whether he himself actually followed what is in fashion over the years and believes he might also just had luck with the contacts he had and the results he made.

Current research

Having delved into his past, we turned to the present and his current research. The recurring topic in his research and close to his heart is the interaction between light and molecules, for which many directions are possible. His most extreme direction is the research he conducts at ARCNL, where he ionises molecules instead of bringing them to the excited state. Another topic he mentioned is the application of fluorescence in unusual contexts and he remarked that fluorescence is one of his favourite subjects in this field. As an example, he mentioned his research in collaboration with Daniel Bonn to mechanical contacts.

With the help of fluorescent molecules, one can visualize where contact with the surface arises (with the fluorescent molecules emitting light upon pressure) on nanoscale and in this way also learn about static and dynamic friction.

In line with our previous interviews, we asked him what would be the holy grail for his research. He said that his research at ARCNL needs more attention, since this is a completely new area of investigating how chemical reactions work with higher energy photons. It would be interesting to find out everything that is possible with these reactions. For fluorescence, he mentioned the most important characteristics for a fluorescent probe: a small molecule, a molecule that can be adhered anywhere you would like, a molecule that can be both fluorescence dependent as well as independent on its chemical environment, and most importantly a molecule that is extensively photostable. The photostability of a fluorescent probe is often its limiting factor. The application of these fluorescent probes can mostly be found in biology, medical science and even material science according to Brouwer. He also mentioned that a holy grail could be found in the study of photochemical reactions, how nature works with the sun as an energy source. According to him, we use this energy rather primitively through either burning the organic material or acquiring electricity from solar panels. There should be a better way, for example producing liquid fuel through efficient direct chemistry with the help of sunlight.

Take Home Message for ACD'ers

Lastly, we asked him for a take home message for you fellow ACD'ers. He said that the most important thing during your studies is to do what you like, but also don't forget to persevere if you find it tough at first. With each experience, you acquire knowledge and skills that you can take with you to your new adventure. Don't worry too much, it will all work out. Do what you like and try to finish everything to the best extent you can. There are multiple roads possible in this area. We couldn't agree more.

Chemistry vs. Musical Theatre

Siebe Lekanne Deprez

For this last edition of Chemistry vs. ... this academic year we decided to again enrich you with the points of view of a student from a completely different field. Enjoy!

The Musical Theatre student on Chemistry

First of all, what is your name and why do you study Musical Theatre (MT)?
Hi, my name is Florianne (no worries, if you don't speak Dutch, you may call me Flo!). I think I fell in love with musical theatre when I did my first amateur musical as a 9-year-old. As I got older, I became interested in getting more professional training to try to make a career out of it. I really love how we combine three different disciplines – singing, dancing and acting – and use them as one epic art form to tell a story.

What do you think Chemistry entails?
I think chemistry entails a mixture of theory and a more practical side to try to figure out more about how the world works. The theoretical part probably focuses on understanding the world around us with molecules and stuff, while the practical side is more focused on conducting experiments in a proper scientific way.

Who is 'the' Chemistry student?
Not sure if there is just one "chemistry student" because everybody is, of course, different from each other. However, I think chemistry students are mostly curious and precise people, because if you focus on molecular level stuff, you have to consider small but important details.

How do Chemistry students overestimate themselves?
I think chemistry students might overestimate themselves in thinking that their view is the only right way to view the world. I think, when you spend so much time researching the world from a certain point of view, it's easy to become a bit narrow minded and lose sight of other perspectives.

What are Musical Theatre students better at than Chemistry students?
First of all, probably in singing, dancing and acting. On a deeper level, I think MT students are more focused on creativity, creative problem solving and teamwork. We often have to deal with more practical challenges than chemistry students. For example: if you have fifteen people on stage, that all need to go in a certain direction without crashing into each other, and getting all the right set pieces in place for the next scene, you need a bit of creative thinking to make it work artistically without it turning into a big mess. All the while staying true to the story!

What are Chemistry students better at?
I think chemistry students are far more experienced in analytical thinking and more left-brain focused while MT students are more right-brain focused. At my school, I did take a couple of theoretical subjects like entrepreneurship, but even then, it was more focused on understanding for example how to become a successful freelance performer, and less on actual critical thinking.

What do Chemists do all day?
When chemistry students are studying, I think they are either at work in the lab or reading and solving formulas. Outside of their work though, I think that every chemistry student is doing whatever they like, which is probably a wide variety of things.

The Chemistry Student on Musical Theatre

What is your name and why do you study Chemistry?
My name is Bente and I chose chemistry because I was not sure about what I wanted to study. Since chemistry is a broad field of study, I thought that I would get acquainted with different disciplines at the university. Now with one more year to go, the broad aspect of chemistry makes the study very enjoyable for me although it makes deciding what I want to do in the future more difficult, again.

What do you think Musical Theatre entails?
I think musical theatre mostly focuses on dancing, acting and singing, but other aspects could also be important as well like having subjects about how to use lightning and sound, how to write a script and how to craft stage environments (scenography). So, I expect that you learn much more about musicals than solely performing by taking into account what happens behind the scenes.

Who is 'the' Musical Theatre student?
By considering my friends that study at the art school, I would say: creative and expressive, but also exuberant since MT students are not afraid to express themselves. This basically sums up the general MT student.

How do Musical Theatre students overestimate themselves?
In the fact that MT students always try to work towards the best result or performance, but that it is sometimes better to take a break and rest. I think it costs a lot of energy and time to try to stay fit while wanting to show what you're capable of on the stage. At a certain point it becomes too much I would assume. So, in short, MT students overestimate their mental and physical boundaries.

What are Chemistry students better at than Musical Theatre students?
I guess that chemistry students are thinking in more exact terms and are better at problem solving. I mean that it is not solely about being a creative vs exact student, but also about solving problems considering complex systems, puzzling and viewing problems from different perspectives.

What are Musical Theatre students better at?
I believe that MT students are in general more creative and can perform exceptionally well under time pressure during a musical since a lot of things happen behind the scenes in a very brief amount of time and you still need to know your movements (choreography) and your text. Moreover, there lies a large pressure on MT students because they have to perform before audiences. As a result, I would expect that MT students are also very capable of presenting themselves.

What do you think is the major difference and the major similarity between Chemistry and Musical Theatre students?
The biggest difference is how students portray themselves; MT students are probably more expressive while chemistry students are more reserved in general.
The major similarity is that both kinds of student are very precise and pay a great attention to detail. For chemistry students it is important to not make mistakes while solving mathematical equations and they often want to understand reactions down to the smallest details. For MT students, their performance must correspond to what is expected from them, paying attention to many aspects including the lighting and their facial expressions.

What do Musical Theatre students do all day?
Practice, practice and practice.

Smaakmatrix

Inspired by the Parool