

INAUGURAL LECTURE
SEPTEMBER 23, 2022

An abstract graphic on the left side of the page. It consists of a series of curved lines that originate from a horizontal line at the top left and fan out downwards and to the right. The lines are primarily black, with some blue lines interspersed, particularly towards the top and bottom edges of the fan. The lines are of varying lengths and thicknesses, creating a sense of movement and depth. At the bottom left, a dotted line extends from the main graphic towards the bottom left corner of the page.

CLEARER FROM AFAR:
VIEWS ON NATURE
& SOCIETY

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September 2022

CLEARER FROM AFAR: VIEWS ON NATURE & SOCIETY

Dear rector, dean, colleagues, students, family, and friends. Welcome to my inaugural lecture in this small theatre. Perhaps an unusual location for a formal academic address. The choice for this location here today, will become clearer soon.

PREFACE

Clearer. This is the main theme for today. A clearer understanding of the world, by taking a step back, to get a good overview, and to observe patterns. While scientists and other thinkers have been describing their world throughout history, having an 'overview' of the world became extremely tangible with space explorations. For the first time humans viewed the Earth from afar. Astronauts looking at the Earth saw our planet 'as one entity'. Without borders or boundaries. Something that we, living on the surface of planet Earth, can find hard to grasp. Our maps – our depiction of Earth from above- mostly show borders and boundaries. Many astronauts experienced the 'overview effect' as the overwhelming realisation that we on planet Earth are all connected¹. Not only with people, but with all life. Only 24 people have travelled far enough to see the entire Earth in this iconic way (Fig. 1). To see Earth like this, with your own eyes, you would need to travel 45 000 km up, which is approximately 10 times further than the orbit of the International Space Station.

This is not going to be a plea for sending more humans into space. In this inaugural speech, I want to stress why it is crucial to take a step back to understand the interrelations of all on Earth, and especially that of humans and all other life.

¹ Space philosopher and author Frank White coined the term the overview effect in a book of the same name, published in 1987. <https://www.nasa.gov/johnson/HWHAP/the-overview-effect>



*Fig. 1 The iconic photograph of the Earth was taken on Dec. 7, 1972, by the crew of Apollo 17 spacecraft.
Image Credit: NASA.*

NATURE AND PEOPLE: CONNECTIONS

The two-way interaction between humans and nature is what my Chair is all about. My research and education aim to capture how nature impacts people -by providing us crucial living conditions- and how people impact nature; what impact do our decisions have?

This interdependency is an important theme, because in our modern lives, we tend to forget the impact nature has on us. We virtuously report on the economic status, trade and income, as indicators of a flourishing society². The amount of nature, with all its benefits to people, is not systematically reported, or acted upon³. Something I want to change with this Chair. With this Chair I aim to put nature on the map, to guide the way we make decisions.

And those decisions by us matter. We as human species are doing a tremendous job in shaping Earth. In fact, no other force on Earth is currently having more impact on our surroundings than us, people (Steffen et al. 2011). By shaping the Earth, we have been able to produce sufficient food

² <https://datatopics.worldbank.org/world-development-indicators/>

³ <https://seea.un.org/content/indicators-and-natural-capital-accounting>

for billions, guide waterflows, built safe places to live (Steffen et al. 2015). As humankind we live longer and healthier than ever before (Whitmee et al. 2015). But, when shaping the Earth, we have mostly optimised for one objective, like food or money, without really taking into account the increasing pressure on our land resources, as well as the long-term costs and inequalities of these decisions (e.g. UNCCD 2017, Ceddia 2020).

Before I continue, let me clarify a few terms. Nature and with that I mean all ecosystems around us, from wilderness to urban parks, contain all kinds of elements and processes that influence our well-being. Ecosystems provide us products like food, a healthy living environment, places we enjoy being, and they underpin many economic activities. These contributions from nature to our wellbeing are commonly referred to as *ecosystem services*.

But nature as life-supporter is under pressure. Many of us have heard the numbers; that extent of nature decreases by 4% every 10 years. And an estimated 1 million plant and animal species, are threatened with extinction (IPBES 2019). That is 1 out of 8. This loss of nature is often due to the choices we humans make, in which nature often draws the short straw. And that is bad news for nature, but certainly also for us, because we need nature. We see that 3.2 billion people, one third of the global population, are currently negatively affected by the degradation of nature. And with the current trends, 700 million of the 4 billion people living in drylands could be forced to migrate by 2050 (IPBES 2018).

So, people and nature influence each other, they form what we call a social-ecological system. And to see and understand that system, you need to take a step back, to get the overview. I don't only identify species. I zoom out to see what these species, for example these *Calluna vulgaris* and the heathland ecosystem they form, mean to humans. So, when I look at nature from that perspective, I see a natural air conditioner, fruit-tree pollination service, a place to relax, a place to identify with (Fig. 2). The concept of ecosystem services helps us to describe human-nature relations in a systematic and anthropocentric way. Some compare this concept to agriculture, in which, instead of managing fields to get the benefits of one species: the foodcrop, with ecosystems services the attention goes to all benefits from different species coming from the entire landscape.



Fig. 2. Heather plants with labels of the ecosystem services this species, and the heathland systems it forms, provide.

These ecosystem services vary from place to place -not every piece of nature contributes equally to all people-, and nature and its benefits change over time. Now, this is what my Chair⁴ is about, I investigate and teach: "Spatial dynamics" -how things change- "of ecosystem services" -those beneficial interactions with nature-. A topic that can only be addressed by combining views from ecology, agronomy, social science, and spatial information science.

To illustrate my field of research I will take you to landscapes where we specifically look at how, where and when people interact with their living surroundings. For these examples I will take you abroad. The Faculty where I work -the Faculty of Geo-information Science and Earth Observation⁵, is one of the seven international capacity building institutes⁶ linked to the

⁴ <https://people.utwente.nl/l.l.willemen>

⁵ <https://www.itc.nl/>

⁶ <https://sailinstitutes.nl/>

knowledge-sharing-mission of the Ministry of Foreign Affairs in the Netherlands (BHOS 2018). Therefore, the majority of our work links to the themes and the partner countries of this Ministry, including food security, and Ethiopia. More about that now.

CLEARER FOR AFAR: SPACE

As I explained, nature through ecosystem services, underpins our wellbeing and livelihoods. So, something that is extremely relevant to preserve or improve, as human-made alternatives are often not at hand. But ecosystem services are not always directly visible. For example, we cannot directly see cooling. So, how do we know where those services are? The ecosystem services are obviously not the same everywhere. The type of species, but also the size and shape of the ecosystem, and access barriers define what is provided and can be enjoyed. Besides that, some of these ecosystem services will spread over the landscape from where they were generated, like cooling effect of vegetation. While for other benefits, like enjoying nature, you need to be at that location. Let's have a look at how we measure and map ecosystem services.

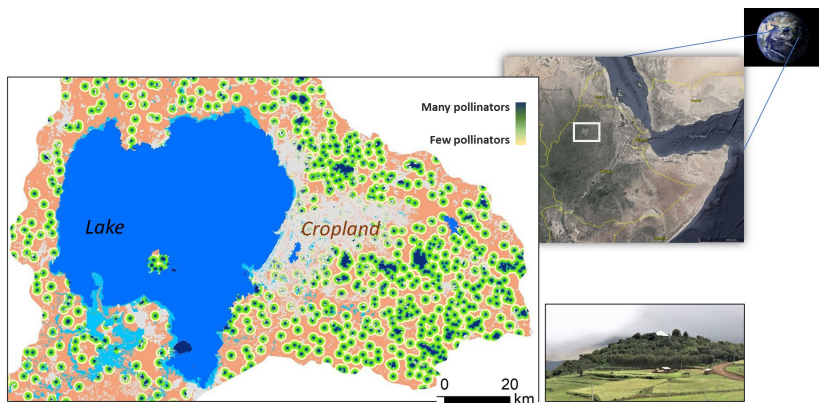
In the tropical highlands of northern Ethiopia, you find unique landscapes (Fig. 3). Scattered over this agricultural area, thousands of small 'islands' of dense old Afromontane forests patches can be found. These are church forests. While the rest of the landscape was turned into agricultural fields and settlements, Ethiopian church forests have been preserved for centuries by local communities because of their cultural and religious importance.

The people living in this region largely depend on agriculture. Besides cereals, people grow vegetables, pulses, fruit trees and coffee crops for both their nutritional and market values. These crops need pollinators, or better said, the farmers need pollinators to reduce the risk of harvest losses and thereby their food and livelihood security. Without pollinators a decrease in yield of up to 75% would take place (Garibaldi et al. 2011). Our question was, where do farmers benefit from these church forests?

A team of field scientists and students lead by PhD researcher Tegegne Molla Sitotaw visited a large number of these church forests, and made

an inventory of the trees and pollinator nests (Sitotaw et al. 2022). To understand the spatial patterns of this pollination service, we needed to zoom out. So the team visited the surrounding crop fields in the flowering period.

They found a clear pattern. Within 1.5 km, the closer to the church forests the more pollinators on the crops were counted, especially in the mango and coffee fields. The relations we found through statistical modelling supported our hypothesis that the church forests do not only have ecological or spiritual benefits, but they also support the production of crops in the surroundings. Besides that, the larger, older and more divers these forests were, the more pollinators in the surrounding fields were found (Sitotaw et al. 2022).



Sources: T. Molla Sitotaw, Google Earth

Fig. 3 Patterns in space: crop pollination in an Ethiopian landscape.

What does this example illustrate for research and education in this scientific domain? First: to understand the value of one site, you need to include the surroundings, and second: it shows that social and ecological values cannot be looked at in isolation. Going back to the overview effect, that idea of seeing the world as one system without boundaries. This is an example of that. While we are used to making maps by drawing boundaries of a forest or land ownership, this is not useful information for decision

making in which the interaction between nature and people is key. For example, for policies to create resilient food systems. Many benefits from nature do not stop at the boundary of a forest, the same as nitrogen or carbon emissions do not stop at the sites where it is produced. My field of research should respond to this notion with better systematic observations and modelling methods that can capture at how ecosystem services move within a landscape, or over the globe. I am excited to contribute to this by testing and developing spatial methods and maps to share new insights in the linkages in space and between systems. Not alone, but through collaboration with others. For example, through jointly tackling the data challenges of finding, collecting, integrating, and analysing the right information over these gradients, but also by connecting to other disciplines in which movement and behaviour are studied and modelled.

CLEARER FOR AFAR: TIME

As we know, everything changes continuously. So also the connections between people and nature. How to keep track of change? Most of the changes are driven by decisions we take. Policymaking for instance is typically all about change. For example, national and international actions for sustainable development that aim to improve the state of nature and its benefits. Or policies that are about avoiding change, such as actions to halt the decline in biodiversity. Policies and actions⁷ I as system-expert am pleased to contribute to, or to reflect on their intended changes.

Change. Again a word for which you need to zoom out to make it clear. To be able to see increases or decreases you need to have an overview. This time not by looking at a larger area, but by looking backward and forward in time. Now, when talking about changes in nature and its contributions to people, is that compared to yesterday, the start of the growing season, the industrial revolution, or compared to moment at which Homo Sapiens entered the world? That reference point is key and often heavily discussed in policy processes. And that is logical, as it defines our perception of nature degradation and its causes. And similarly, policy and

⁷ <https://agendanatuurinclusief.nl/>; <https://www.decadeonrestoration.org/>; <https://ipbes.net/>; <https://sdgs.un.org/goals>

action to restore nature are guided by an endpoint, the goal is to increase nature, but by when and to what state (IPBES 2018).

To keep track of changes in ecosystem services we use several monitoring and measuring techniques. The key requirements of these methods are: 1) Being able to observe more than once, and 2) making sure that the differences we see are an actual change, not an error or natural variation. Some changes are very easy to detect, if you clear-cut a forest that change is pretty obvious and the points in time for comparison are easily picked, just before and after the cut. Some change-processes, however, go very slow, and for them to be noticeable, observations are needed that can detect these small changes over a long period of time. This is the case in regrowth of vegetation, for example in nature restoration projects.

To illustrate this, I will take you to South Africa, the Baviaanskloof a dryland area valued for its agriculture, endemic plant and animal species, and tourism (Fig. 2). Decades of overgrazing heavily degraded this area. To turn the tide, communities, together with the NGOs, Grounded, Living Land and Commonland, implemented several interventions to restore this landscape. To reverse the degradation process here, areas were revegetated with native shrubs, livestock was removed, and farmers moved from to a-low-impact agriculture. The goal was that these activities should lead to an increase in ecosystem services, and as such increasing the wellbeing of people in the area and beyond. Did it? PhD researcher Trinidad del Río, together with colleagues and students investigated ways to answer this question.

So here we needed to look for small changes over many years. Now, where to get the data? At the moment, over a hundred satellites are in orbit to observe parts the Earth. The images these satellites take, and the information they collect is not only frequent -every day, week or month-, we also consider them standardized: they are always taken in the same way, so good for change-detection, and they are available for pretty much all land areas around the globe. The satellites we use, capture the 'visible' and 'invisible' electromagnetic reflectance from the surface of Earth. Specific reflectance values can be related to ecosystem properties, something Trinidad del Río and students did by measuring ecosystem services in the field and linking them to the values in the satellite images. Once we

established that link, we can then say something about the changes in ecosystem service using satellite images for different moments in time. And link those to restoration sites. Trinidad del Rio used images from up to 30 years back to capture changes (del Río-Mena et al. 2021). She created a tool in which we quantified change for all locations with restoration activities, compared to areas without these interventions. With her analyses she could for the first time make clear what areas improved due to restoration, how much and why.

Satellite imagery to monitor ecosystem service change is an emerging field and key an element of my education and research. Specifically, the testing of information coming from satellites sensors in combination with other information sources, to see what we can capture and what we are missing. For this, I work with remote sensing specialists, restoration practitioners, and build on the experiences from monitoring essential indicators for biodiversity. Stepping back, getting the overview, and looking at changes helps us to make evidence-based statements about degradation, but also, the effect of restoration activities.

That question of how human actions can improve nature with its ecosystem services has my specific attention. While I enjoy the fundamental puzzle of figuring out how things work, I like to focus on obtaining knowledge that can help us further as a society. Instead on merely highlighting problems, I see a need in focusing on possible solutions. By monitoring over time, we can learn what intended solutions work, where and when. This evidence-based learning is one of the foundations for the UN Decade for Ecological Restoration, that started last year. Through restoration monitoring and systems-modelling, my Chair aims to continue to learn from practitioners and support them in making choices, to efficiently use resources and to make investments in nature transparent. And, as such contributing to more resilient and sustainable societies. To address this interdisciplinary topic even better in our education, we started a new collaboration with the Vrije Universiteit in Amsterdam exploring how we can jointly teach about 'spatial sustainability' goals.

While satellite remote sensing provides us with standardized, objective, and transparent methods, its advantage is at the same time its shortcoming. From a distance you don't see the social values, behaviour, who has access

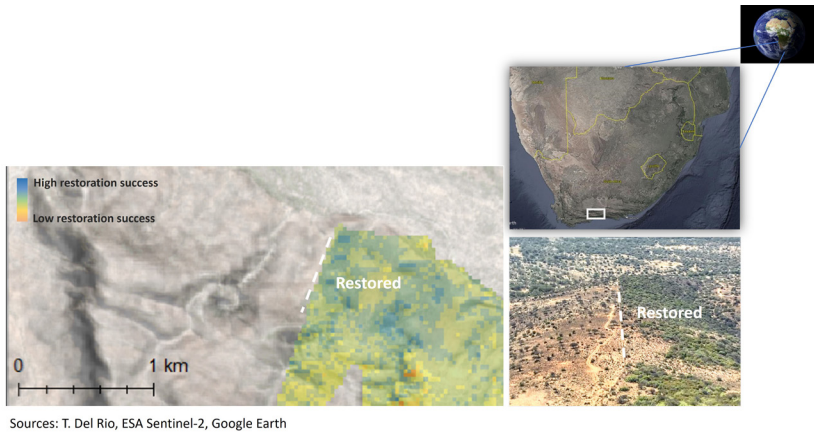


Fig. 4 Patterns in time: nature restoration in a South African landscape

to what, and what is really happening on the ground.

The project in Suriname you were introduced to through my invitation and crowdfunding initiative⁸, is aiming to do that differently (Fig. 5). Here we don't only measure changes through sensors mounted on satellites, we work with residents who are our eyes on the ground and observe changes through surveys, social media sports apps, and small sensors. Thanks to teaming up with citizens we can for example now clearly show temperature differences related to green space and its change during the day. This work in Paramaribo is part of the larger Geo-Citizen Science initiative⁹ here at the University of Twente, in which tools, and approaches are explored to better work with non-scientists in answering questions related to wiser management of our surroundings. I also look forward to new upcoming collaborations in which we will try to better capture the diversity of people and equity issues in access to natural resources. Of course, each monitoring method has their pros and cons. What is key is, getting the bigger picture, from a distance if you wish, as long as you are aware of what is happening on the ground, to place observations into context.

⁸ <https://www.groenparamaribo.org/>

⁹ https://www.itc.nl/research/open-science/citizen_science/



Fig. 5 Patterns by people: citizen science in Suriname.

CLEARER FROM AFAR: DISTANCING.

So, in research and education I look at systems, how things are connected and to see patterns in space and time. And I am sure you noticed that for this we don't work and teach in a laboratory. The system I look at is our living environment, our decision making and makers. All of you are part of that system, you have a stake. And as you are part of that system, it is only logical that I share my findings and work with you. Also here the 'overview effect' comes in, there are no clear borders where science ends and society starts.

The famous German playwright Bertolt Brecht is the founder of Epic theatre. Epic or Brechtian theatre was introduced as a radical new style of theatre to engage the audience and let them reflect on what they see. All to have an impact. For this, Brecht used a theory called the *Verfremdungseffekt*, a distancing or defamiliarisation technique. An important part of this theatre style was the technique of breaking the 'fourth wall', the imaginary wall between the actors, on stage, and the audience. In this style of theatre, actors would not just play their roles in a story. They would step out of their role, to directly address the audience, to explain what happened, and to keep the audience actively thinking, awake, with clarity of mind, and feeling socially engaged.

I see an important parallel with my work here. I believe academics should also break down that fourth wall. So directly address the people in society, such as citizens and policymakers, give them explainers, let them reflect. The choice for holding my inaugural speech in this theatre today symbolises this (Fig 6).



Fig. 6 Theatre and academia.

First of all, in Brechtian Academia, academics are able to switch to the role of narrator. They have learned to tell their story. A skill that doesn't have to come overnight; for this, academics need time, training and practice. In Brechtian Academia meaningful interaction with society is something that all students learn, and is a recognised part of the job of academic staff, supported and celebrated.

Second. A Brechtian style uses distancing techniques to engage society. It lets the audience observe and plants questions and problems in heads. It inspires the audience to think and is not shying away from sparking uncomfortable thoughts. This style aims at having an audience that would say *"I'd never have thought of it, that's not the way, that's extraordinary, it has got to stop"* (Brecht 1930 ¹⁰). So aiming for an audience that is

observing, reflecting, and calling for action. This means that in Brechtian Academia, academics have interactions and communication with society not for the sake of it. But for the sake of generating actionable thoughts. Participatory approaches, stakeholder engagement, citizens science and Open Science principles are our tools to design, execute and share research to make impact.

Next. Brecht and the Epic theatre style want the audience to see all. The audience is given a montage of all parts of a story, for them to study objectively, and in which they should recognise social realities. The audience is presented with solved problems and unsolved ones, in series and often juxtaposed. Brechtian Academia therefore openly shares research. Protocols, data, codes, like that on ecosystem services, are currently still scattered, poorly documented and hardly re-used. To make a montage for us and others to use, research outcomes are made FAIR: Findable, Accessible, Interoperable and Re-usable. In that way, our research outcomes become *“not a mirror with which to reflect reality, but a hammer to shape it”* (Brecht, 1924 ¹⁰).

Then, technology. Popular in this theatre style are tools to add layers and labels to the reality that is depicted, to clarify things and help the audience to observe and analyse the message you want to convey. Brechtian Academia uses signposts, apps providing information on ecosystem service while walking in a park or on campus (Try this! ¹¹), turns data into graphs, uses visuals and text projections during a speech. It uses meaningful technology, not just high-tech technology.

And lastly, visibility. Everyone and everything involved in a Brecht theatre production is in sight. The technicians and actors are all on stage. This to convey in the most objective and transparent way how, and that, a production was made. Science is teamwork, and that needs to be shown, recognised, and celebrated (Fig. 7.).

¹⁰ Cited from: Brecht, B., M. Silberman, S. Giles, P. S. Giles, and M. Silberman. 2014. Brecht On Theatre. Bloomsbury Publishing, London, UK

¹¹ Phone-GPS-based tour with examples for this inaugural address: <https://actionbound.com/bound/livinglab>

BRECHTIAN ACADEMIA:

1. Be a narrator
2. Engage your audience
3. Report openly on all pieces
4. Use technology for clarity
5. Make the whole team visible

Fig. 7 Five characteristics of Brechtian Academia.

Brecht's Epic theatre theory cannot be fully transposed to academia. There are some elements I left out. One of them being a very typical implementation of the *Verfremdungseffekt*: during a conversation actors would suddenly burst into a dance or a song, to confuse and shake up the audience for a second, and then continue with the story. This is one of the elements I haven't found a parallel for, yet. A surprise tweak to a message can be memorable, but I would discourage scientists to do this through musical elements. While not a perfect parallel, I hope to see more and more Brechtian Academia. I will use and promote these five Brechtian distancing techniques, to make sure our science lands in society. These distancing techniques are nowadays also common pillars of communication and collaboration. In implementing this, I will use the nationwide science communication initiative I have been a part of, use the momentum of the Recognition and Reward and Open Science developments, and build on the foundations of our faculty's expertise on making impact.

CLEARER FROM AFAR: ACADEMIA

“OK, so what you have seen so far in this address is me talking about why and how I will be devoting my time as a professor to understand how people and nature influence each other. With those Brechtian distancing techniques, I made clear how I plan to create a positive societal impact through teamwork. And especially in that first part I talked a lot about patterns, and next I will be talking -a bit uncomfortable- about breaking patterns.”

Patterns I see when stepping back and looking at the context of our research and teaching.

The university system is heavily discussed. Worrying reports on work pressure¹², social safety¹³, biased representation¹⁴, colonial power relations¹⁵, and the distrust in science¹⁶, are out there. In those discussions people mainly criticise ‘The Academic System’ and talk less so about individuals. And The System is hard to change. Is it? Now, I completely consider myself an element of the system, I am responsible for my behaviour, I am not flawless, I can change, and I don’t have wait for the System to change.

This awareness challenges me to continuously reflect on my role and actions as an academic. To my fellow system-actors here: help me doing this. Think along with me, as I will be doing that with you. Always with respect, as peers, coming from a drive to improve together, step by step, fully aware that win-win situations are rare, and the ‘right way’ forward might not always be obvious.

There is one theme I would like to address now which we all have a role to play, that is that of diversity in university systems. Honestly, it took me some time to see the blind spot that academic organisations have if it comes to

¹² To name a few: <https://www.nlarbeidsinspectie.nl/publicaties/rapporten/2021/07/08/woinactie> ,

¹³ www.knaw.nl/socialeveiligheid,

¹⁴ <https://open.overheid.nl/documenten/r0nl-3d4db279-2786-44c8-a1af-5337604eebfd/pdf>,

¹⁵ <https://nias.knaw.nl/insights/decolonising-the-academy-the-curriculum-and-the-history-of-decolonisation/>,

¹⁶ [https://www.universiteitenvannederland.nl/files/documenten/Nieuwsberichten/V/SNU%20Handreiking%20Aanpak%20bedreiging%20wetenschappers%20\(Web\).pdf](https://www.universiteitenvannederland.nl/files/documenten/Nieuwsberichten/V/SNU%20Handreiking%20Aanpak%20bedreiging%20wetenschappers%20(Web).pdf),

being open and diverse. I think for me that had to do with that as a young, or younger, researcher, the expectations and tasks were less related to status and gender. However, the remnants of the patriarchal times in academia are still visible and noticeable. The male-dominated views and structures are for sure changing, but still there. What bothers me most about that presence, is the image that we are still projecting on our students, and especially to those who come from realities in which women are not seen as equal participants of society, let alone active in the workforce and in leadership positions. We must do a better job in showing that the Netherlands stands for diverse representation of genders in all positions. That that is nothing but logical.

So, we cannot have university documents that for the 'sake of simplicity' were written in the 'he' form. We cannot portray an image in which students by default write "Dear Sir" when addressing a professor they have not met before. We cannot be a university that only counts the number of positions taken by women and other underrepresented groups, without having an eye for the context, for the system in which they work. What do they need to thrive? Our universities cannot assume that society is equally open to all academics trying to make connections and have impact outside of the university walls. If you are not white, male, heterosexual you probably have to be more creative on how you present yourself and do your work. If you are such an academic, you unfortunately have the highest chances to be unsafe, a target for criticism, and to be judged on looks and not competence. Our university system needs to acknowledge these differences, mitigate barriers where possible, and recognise achievements that were obtained by academics without a race or gender advantage, regardless of these barriers.

I am glad that this university is seriously working on this theme for its 2030 Strategy, and that many initiatives started by students and staff are emerging to create a more inclusive and connected university. All initiatives I wholeheartedly support. I call out to the advantaged groups to speak up more, and to actively contribute to this change. Personally, I hope I can break patterns by taking responsibility, be cautious about power relations, and by building teams that are inclusive and safe. I am aware that all this takes time and can be very prone to responses like "yeah diverse representation is important, but incentives are seen as unfair". Here is another lesson from the theatre world. A simple rule to avoid blocking a

conversation and keep thinking ahead. *Aim to construct sentences using “and” and not “but”*¹⁷. Let’s try. “A diverse representation is important, and incentives need to come with clear communication of benefits”. Works uh.

BE CLOSE

Today’s inaugural address marks a very special occasion.

I have only come this far thanks to people close to me. People I have learned with, lived with, explored with, talked with, dreamt with. People with whom climbed up, went further and faster; and I mean that literally. That is you. And I thank you for that.

I want to thank people that have given me space to grow. My PhD supervisors, Peter, Lars, Rik, and Tom. My former colleagues at Bioversity International, Wageningen University, the Joint Research Centre, and Cornell University. My colleagues at NRS, ITC and other faculties. I want to thank the many students I worked with over the years. The PhD candidates who have given me their trust to mentor them. Thank you Dolf and the Ecosystem Services Partnership. Thanks IPBES co-warriors. Thank you project partners and kind crowdfunders. Thank you teachers. A special thanks to my Wageningen buddies for doing a lot of this apart-together. Thanks Nina, for truly connecting.

Close to me are also the people I grew up with, my brother and sister. The excitement for learning and sharing knowledge runs in my family. We come from a family full of teachers. That’s to say, male teachers, my dad and uncles. My mother and aunts, as many women of their generation, had to put professional ambitions and curiosity aside as teenagers, studying was not for them. The words my parents proclaimed when I was young “our kids are allowed to become anything they want” did not strike me as special back then; of course I would become an astronaut, a farmer, a rainforest-activist. But their words reflected change. Perhaps unconsciously, I took them seriously and pursued some their dreams of once exploring cultures and knowledge, to go to university, to travel the world. Tegen mijn ouders kan ik volmondig en *ingetogen* zeggen: ik had me geen beter pad

¹⁷ After Frank Kupper during a KNAW Gewaardeerd! meeting

kunnen indenken in het worden wie ik ben. And then to Roel. Exploring this world in its entirety with you, is the best. With you I don't see borders, limits, or impossibilities, knowing you've got my back.

EPILOGUE

We are indeed one system, a system in which the health of nature and people's wellbeing are closely connected, where academia forms one system with society in which we learn from each other, and where we are all members of a university system in which we need to connect to break patterns. With the right tools we make these systems work.

In 2015 NASA launched the Deep Space Climate Observatory DSCOVR. For the first time we have now a satellite positioned between the Sun and Earth, that sends us almost real-time pictures of the entire Earth (Fig. 8) ¹⁸. So experiencing the 'overview effect' is not only for those 24 space explorers, it is not just for system- researchers like me. You can all go to the worldwide web at any time, to have a view at our interconnected Earth.

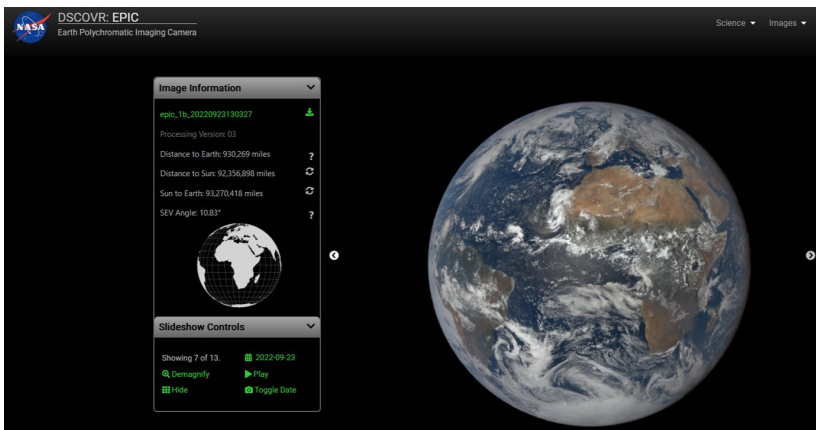


Fig. 8 From afar: almost real-time images of the Earth by NASA's DSCOVR.

¹⁸ <https://epic.gsfc.nasa.gov/>

Now, I hope these past 45 min made you feel observant and engaged. I hope that you take with you the idea that by taking a step back, you can feel closer to your surroundings. And act. I invite you to take one of these plants with you to grow close to you. Make a change. Because, as Brecht would say ¹⁹, *"How could a good ending be arranged? Could one change people? Can the world be changed?" "It is up to us to write the happy ending of a play, as there must, there must, there's got to be a way"*.

Ik heb gezegd.

[Voice over]: Zei ik daar nou net, beter géén muziek?! ²⁰

¹⁹ From the Epilogue of Brecht's Good Woman of Setzuan, the revised English version by Eric Bentley.

²⁰ Wende, De Wereld beweegt:

<https://open.spotify.com/track/2oCLfhBEvQBpq5feN8xJDZ?si=37105d741dfc4a14>

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