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Are they out there? Searching for the invisible neighbours of our Galaxy

Science for all

PhDnet's Equal **Opportunity** Group

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A Hubble composite image showing the ring of dark matter in the galaxy cluster CL 0024+17.

The authors of the image are NASA, ESA, M.J. Jee and H. Ford (Johns Hopkins University)

http://hubblesite.org/newscenter/archive/releases/2007/17/image/a/

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A cknowledging the strength in unity and communication, the Offspring group has designed a platform where ideas can be expressed and experiences shared. Not only does Offspring produce an annual newsletter but also fosters the frequent publication of articles on our website.

The Offspring group aims to help Max Planck PhDs communicate across Germany. We encourage young scientists to share their outcomes, to teach and learn from each other, and to support one another in their daily endeavors. After all, we love what we do and we put all our energy into projects we believe in.

Apart from that, Offspring aims to capture the ongoing activities of the PhDnet and Max Planck Society (MPS). For more than a decade, the PhDnet has been working towards obtaining better working conditions for students within and outside the MPS by representing their interests. There have been several successful outcomes, the most noteworthy being the materialization of the Fair-Pay petition. This is not the end, however, as the journey continues towards the betterment of our scientific community. Further, this requires constant communication, dialogue, and motivation amongst PhDs, and most importantly, the participation of everyone belonging directly and indirectly to the Max Planck community.

We believe there are no such "big" problems or "small" achievements. For us, the growing and evolving doctors and daily trials of success and frustration are our daily bread. Certainly, it is fair to share this daily bread with other members of our PhD family.

Sincerely yours,

The Offspring Group

The Offspring | Issue 1

In conversation with **Professor Marja Timmermans**

BY MAYANK CHUGH



PROF. MARJA TIMMERMANS is an Alexander von Humboldt Professor and a distinguished plant geneticist at the Centre for Plant Molecular Biology (ZMBP), University of Tübingen. She moved to ZMBP in 2015 from Cold Spring Harbor Laboratory, New York where she has spent more than 17 years in understanding the process of stem cell differentiation and maintenance in plants using her expertise in molecular genetics. She has valuably contributed to the field with her highly acclaimed discoveries about leaf patterning and the underlying molecular mechanisms. Currently, her group focuses on small RNAs as the mobile instructive signals during plant development and shoot stem cell homeostasis .

Prof. Marja Timmermans is currently a faculty member at the International Max Planck Research School 'From Molecules to Organisms' at the Max Planck Institute of Developmental Biology, Tübingen.

What motivated you to be a scientist?

I am a scientist but originally I had other interests. As a kid, I was excited and fascinated by detectives. I always saw myself as a criminal investigator trying to solve a quest. In a way now, it makes sense. Doing science is also about applying logic, skills, and deductive reasoning to solve problems; they are just of a different nature. This is what drives me in science.

If you were not a scientist, you would be ...

(SMILES)

I guess still a police detective.

What are you working on?

Pattern formation during development. I am interested in understanding how a single fertilized egg creates a myriad of cell types and coherent structures, reproducibly. The basic criterion for these processes is communication amongst cells in the growing organism. We are trying to understand the mechanism underlying this communication.

My laboratory is addressing this problem in plants. Plants are fascinating. They are different from animals in part because they have a solid cell wall surrounding every cell that keeps them fixed in place. This becomes highly intriguing during development where cell-cell communication is indispensable. So, how do plant cells during development generate well-specified structures such as leaves, roots, flowers, etc.? The beauty of these cellulose-enclosed cells is that they are connected to each other via special channels called 'Plasmodesmata'. Small molecules known as microRNAs, we discovered, are signals that navigate through these channels and help in the specification and differentiation of distinct cell and tissue types. This cross-communication provides particular coordinates to each cell, which helps them to define their positions relative to each other and to decide what fate they should adopt.

You can compare this process to a GPS, which communicates to you the coordinates of one object

"Doing science is also about applying logic, skills, and deductive reasoning to solve problems"

with respect to others. Similarly, cells in a developing plant converse with others and turn on and off their genes. In this manner, small groups of cells have a relative identity to each other and grow with subtle variations. Sure, this is a gradual process. That is development!

What does your average day involve?

Well, it depends. However, a big chunk of my day goes into thinking about science, talking about it with my lab. The rest of the day involves studying what other scientists are doing, writing and reviewing grants or papers

You have moved from CSHL (New York) to ZMBP (Germany) recently. Why, and would you like to compare these two places?

CSHL and ZMBP are clearly different places. The vibes are completely different, but both have their pros and cons.

"What excites me here is the many opportunities to pick up something that is exciting and is basic science research."

Where do you see this field heading in the next decade or so?

We have gained a substantial understanding of plant development during the last decades, but we still have to go miles ahead in order to get detailed insights. Armies of dedicated people have discovered mutants and others have cloned them. We have information about what the gene products are and, to an extent, what their functions are. Currently we are transitioning into the mechanistic aspects of the gene products. For example, we are aware of transcription factors and other gene products, but we have negligible information about how these individual players come together and drive and influence the cell. I would see the field harbouring insights into the quantitative measurements in such experiments and taking the science to another level of sophistication and integration.

Tell us something about you that might surprise us.

(LAUGHS)

I was a good basketball player as a teenager. I had played basketball at an international level.

Do you have a role model or a scientific hero?

Yes. I highly admire and respect Barbara McClintock. She was a remarkable and very insightful person. She had almost an absolute and a clear vision of the whole plant, an understanding of how plants grow and develop. Barbara discovered transposons or stretches of DNA that jump across the genome and understood them as controlling elements long before genes were known. I have met her and she was a very friendly person. A level of brilliance! One of the few unshared Nobel Prize winners. The reason I choose to come here is that the science funding in the U.S. has moved to an applied angle and has become unrealistically tight. It has less room for fundamental research and has incremental cycles. What excites me here is the many opportunities to pick up something that is exciting and is basic science research.

What advice would you give to PhDs or younger scientists?

First, I would encourage students to think hard about what really excites them in biology or any other field. It is important to identify the problem or the question that fascinates them and for which they are passionate to work. Once finalised, figure out the best way to approach that problem.

Second, I would dare them to trust their guts and express their ideas and opinions. It is sad that there are so many smart and intuitive people around but they are afraid to chase their ideas.

For more information about Prof. Marja Timmermans and her research, please visit her webpage http:// www.zmbp.uni-tuebingen.de/dev-genetics/ timmermans.html

Interviewing Tina Persson

A professional career and business coach

BY RENEE HARTIG

Tina Persson was interviewed as one of the members of the Max Planck Alumni Association (MPAA). The Offspring group wanted to present an insight look at one of the many paths taken by Max Planck alumni after leaving Max Planck.

Persson has since moved on from scientific research to a career focused on attracting talent and preparing potential employees for their dream jobs. Based out of Stockholm, this Swedish native is using her skills to help others build their own. Persson is also a freelancer at Karolinska Institute where she provides support and counsel for the institute's career development program. Persson's expertise in career development ranges from coaching to recruiting. The social media specialist started her own company, My HeadHunter & CareerCoach, which allows her to meet and work with academics, from all career stages, to manage their image and land their dream job.

Persson completed her doctorate in organic chemistry at Lund University, where she focused her work on the synthetic production of nucleotides and their activity against HIV and

Hepatitis B. After Lund, she travelled to Goettingen for a postdoc position at the Max Planck Institute for Experimental Medicine. In Goettingen she studied the biological and chemical properties of RNA, which later provided an excellent foundation to support her career as a senior researcher both in the German city of Lûbeck and also back in Sweden.

Why did you decide to do a postdoc at the Max Planck Institute in Göttingen?

I moved to Germany for the people, and I was looking to have an adventure. I wanted to learn the language and gain freedom as a postdoc. Four years in Germany was enough to become fluent in the language, which is one that I can still use to this day.

My research shows that you were given the title of Talent Attraction, at least by the EuroScience Open Forum in Manchester this year. Is this one of your official titles or just one that could be used to describe a career coach and professional recruiter?

I think that Talent Attraction sounds a lot better than recruitment, as a word - it is a mixture of employee branding and recruitment - companies looking to attract the right person, need the right branding, even to brand yourself as a person. By understanding

companies, you see the value-based considerations in hiring. You need to communicate yourself. At the moment I am focused on helping the employees, but still support companies as well.

When did you start your company, My HeadHunter & CareerCoach? What were your motivations and/or ambitions to begin the company?

I was in the recruitment business for 8 years before I left for a full-time position at the Karolinska Institute as a Career Advisor. It was not until after that I began my company, about one-and-a-half years ago. There was never a good time to start the company, but if I didn't do it then, I would have never done it.

Define HeadHunter

HeadHunter is someone who seeks people for a company. I did that once and was working off LinkedIn, sourcing for people, but after seeing how industries don't understand PhDs, I decided to spin the term. Now, I focus on helping people HeadHunt their own dream job.

My research also shows that you own a start-up company in the biotechnology field. Could you tell us how it felt to invest into a start-up while providing further details on the start-up itself?

The start-up company is called Aptahem ab, and what I invested was not really monetary but rather 20 years of scientific research. The company regulates a patent of in vitro RNA selection, a method I developed at the MPI and brought to Sweden where I conducted the research with a group of my own. The company is now publicly traded; I hold a share of the stocks. I could not have done it all on my own. Now I left the company to the experts for maintaining regulations and the Phase I trials that may come out of my research.

What does it take to earn the distinction of social medial specialist?

You have to choose the right channels for branding your image. For example, I am not blogging, but I am publishing podcasts about PhD life. I prefer oral over written mediums. More scientists should do social media and networking outside of their comfort zone, thus outside of academia. Usually, they have an entirely academic network.

What is your opinion of the newly-formed Max Planck Alumni Association (MPAA)?

The MPAA has a huge networking potential. It is important the alumni themselves actually take part in such an association, because it will help with knowledge transfer across the generations from all parts of the globe.

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Breaking the enigma beyond conventions

BY ALFREDO MARI, ANJA HOLZ, CORNÉ SWART, GAYATHRI JEYASANKAR, ILYA KOMAROV, KRZYSZT-OF BAJDZIENKO, LEA KREMER, MICHELLE ERWIG, VINODH ILANGOVAN

Scientific Event Group 2016, Max Planck PhDnet.

All innovations and technical advancements that are achieved by the human species since our appearance on this planet have been made possible only because of our unique ability to communicate our experiences collected through the exploration of ideas and imagination. An interdisciplinary conference for early career researchers serves the same purpose, i.e., to broaden the horizon of understanding across conventional disciplinary boundaries. Organising such a conference is a great endeavour in terms of human working hours and mental acuity; hence, it is an immense collaborative exercise. Subsequently, the incentives of such an effort are that the organisers can facilitate the dissemination of new ideas to their peers and influence the future of science. This purpose was deeply ingrained in the philosophy of the "Visions in Science" conference series.

The organising committee of "Visions in Science 2016" was officially commissioned at the PhDnet General Meeting 2015 in Göttingen, reflecting the outlook of previous organisers and the scientific event group. It is anecdotal that in 1948, the Max Planck Society for the Advancement of Science e.V was founded in Göttingen under the president-ship of Otto Hahn, and our visibility in science and outreach is attributes to the values imbibed from such visionary characters. This meeting enabled our team to brainstorm ideas for the theme of the conference "Break the Enigma". In a superficial and literal sense, the theme of our conference might appear as a congregation of cryptographist, but the purpose of this theme was twofold: firstly to drive away the conventional association with enigma; and secondly, to initiate a discourse on solving the enigmas of our day-to-day life. Enigmas have fascinated humankind since its birth on this planet. Some of them have been solved, some others remain mysteries. As researchers, even though belonging to different fields, we tackle new challenges every day that often encompasses questions which are easy to pinpoint but hard to resolve. In this conference, we made it our goal to invite leading speakers who dealt and struggled with enigmas, and in some cases succeeded using simplicity to unravel complexity. Another part of breaking the enigma was to provide a platform of various career options for junior researchers and doctoral candidates. Hence, a major part of our task was to organise the Max Planck Career

Fair for the second time, involving companies that would potentially employ skilled doctoral candidates.

We were fortunate enough to organize the conference at Harnack–Haus, which is not only an attractive location in Berlin, but also the conference venue of the Max Planck Society. Harnack–Haus has served as a forum for scientific and cultural excellence historically and remains a place where the most demanding problems of the time can be tackled. Thus, our thematic values of the conference were in line with the ideologies that Harnack–Haus has nurtured in the past. We are very thankful to the staff at Harnack–Haus for taking care of the intricate management during our event in a wonderful way.

Efficient functioning of our group completely relied on the distribution of the workload from the very first day of our meeting. Individual ingenuity complimented with democratic, egalitarian decisions helped us to accomplish the designing of our conference logo, content of the webpage, contacting of potential speakers and sponsors, production of a teaser video, build-up of our presence in social media and outreach to our audiences-just to name a few intense responsibilities. All our team members volunteered for tasks that they already had expertise on or wanted to acquire such skills. We were in the best position to plan nine months ahead of time for a three-day event. Exploiting this advantage, we were able to convene weekly online to propose new ideas and track progress. These meetings helped us to understand the most important aspect of organizing a conference: there is no undo button leaving us to provide the best possible at any given time. These meetings formed an integral part of our weekly business to the extent that we even miss it after the conference is over.

As organisers, we thought best from the perspective of the participants, speakers and sponsors to have a balance of shared values, which attributed to a pleasant functioning. We also constantly evaluated the demand for our interdisciplinary spirit and included diversity of different kinds, such as discipline, demographics, gender, etc., among the participants as well as speakers, working thematically with the goals of the PhDnet Steering Group. Martin Grund, Spokesperson of PhDnet 2016 and the Steering Group, helped us at many levels. The Web Group worked with us on timely assignments, making it possible for us to convey our brainchild to the world via the internet. Together, we carefully drafted a budget plan for the conference that was approved by the General Administration of Max Planck Society. Additionally, we were supported by the revenue generated from sponsorships of various companies (e.g. McKinsey, Bayer, BearingPoint and Fl000 just to name a few). We had to collect a moderate conference fee in order to cover expenses, e.g. for lease costs, quality food and refreshment throughout the conference. As another advantage, our dynamic team was gifted with the advice and mentorship of the previous organizers, including Prateek Mahalwar, Spokesperson of the PhDnet in 2015.

It was a very instructive experience to get into contact with various companies from diverse fields and to learn about their organization. We could develop our networking skills and train our resilience because it can take several calls to various people until you get a final answer. After all, the correspondence with our industrial contacts was very fruitful – this has been vital to the successful execution of the conference and especially the career fair. We are grateful for a smooth cooperation and want to thank all the companies for joining the Max Planck Career Fair 2016. Some already announced their interest in the next fair so we can start to look forward to September 2017! We worked in collaboration with Doo GmbH to obtain a professional solution for participant registration. We are thankful to Deutsche Bahn for successfully providing event tickets at a special price, which was helpful for most of our participants traveling to and from different locations within Germany.

Organizing a conference is really rewarding despite being very labor intensive, it pays off both scientifically and socially. The organizers as well as the participants take home a sense of value from the experience. Throughout the process of working together for this conference, the team broke different enigmas and learnt how to be open to diverse opinions and yet work on a big unifying goal.

NeNa 2016

BY RENEE HARTIG

On a cool September day, a handful of young neuroscientists gathered in Tübingen to kick-off the start to another NeNa conference (in German, Neurowissenschaftliche Nachwuchskonferenz). Like the year before, and the year before that, we congregated at the central train station and boarded a coach bus to Schramberg, a quaint little town in the Black Forest of Southwestern Germany.

Unlike the previous years, however, we held the conference at the end of September, the last Monday through Wednesday to be exact. Perhaps it wasn't the best time, as a lot was already going on in Tübingen that week. But, despite all that, we had a final turn-out of 30 participants, with two participants from Oxford and Lisbon. Whether we will choose the same dates for next year remains to be seen, but we always try to work around the big and popular Society for Neuroscience Conference in the States as well as other event happenings in the community.

One might not realize this, but there is a lot of thought that goes into planning a conference. One thinks not just about the optimal date, but also finding a speaker, coordinating an agreeable topic, not to mention the logistical details such as whether the venue is accommodating and the food is satisfying. Granted it is difficult to have everything your way, but for NeNa, we strive to make it best we can. We found Schramberg to be a comfortable venue, even with the lack of stable WLAN, it just reminds you that you are in the middle of the forest and should probably focus on socializing and discussing science. The food is generally good too. My advice: remember to savour some for later when you have the midnight munchies.

I find NeNa to always be an enjoyable experience not just because of the social interaction with amazing, intelligent and open-minded individuals, but also because of the scientific presentations that stimulate intriguing discussions. I'm always impressed by the quality of science conducted by my peers. For instance, we have Pablo Grassi who has attended NeNa for the past two years in a row. Last year Grassi won the award for best poster, and this year it was also a hard choice to make considering his organized layout and visual data representation of dynamic bistable Gestalt perception. However, this year the award ended up in the hands of one of our non-Tübingen researchers, Juan Carlos Mendez, who came all the way from Oxford to present his work on the temporal categorization in the supplementary motor area of the macaque.

Like Mendez, we had another attendee coming from aboard, Scott Rennie, from the Champalimaud Neuroscience Programme in Lisbon. Rennie actually took home the prize for the best talk as his videos of rats working together to achieve high rewards in the Stag Hunt game captivated us all. Surely, the conference organizers had a tough time selecting who most exceeded the criteria for best poster and talk! In addition to the insightful presentations, we had a couple of group workshops. The first one was combined with a short hike into the Black Forest, where we also had an impromptu photo shoot. Thanks to Florian Sandhäger who brought his sweet digital SLR camera! After returning from our hike, we found a nice spot on the grounds to break down into pairs and work on our personal development. Mara Thomas led the development workshop and helped us to assess what qualities we valued most in a job and what our strengths and weaknesses might tell us about ourselves. Everyone there certainly enjoyed learning more about themselves, nothing like a little psychological evaluation for and by neuroscientists.

Later in the day, we had another workshop on reference management systems, which was organized by Pooja Viswanathan. She explained her thoughtful approach to organizing hundreds of papers across different devices without any cost expenditures. Viswanathan explained how she uses Mendeley, Dropbox and ReadCube to get the best organization, synchronization and aggregation of material. Personally, I was impressed at the methodology she employed to achieve such aims. I was totally unaware of some of the features of these programs, such as Mendeley's capability to watch folders for new uploads. In the case of continuously adding papers to your Dropbox, Mendeley can then automatically update your sources from the Dropbox directory. ReadCube was also a reader she presented, which has sufficient tools to assist with the exploration of supplementary material and in-text citations. Perhaps you may want to try some of these techniques yourself? Viswanathan has also written an article about this topic for the Tübingen Neuromag and can be found at neuromag.wordpress.com

Overall, whether it was the continuous stream of coffee or the brilliant science, I was in relatively high spirits for the entire conference duration. It's true that not everything went smoothly, such as the cancellation of our plenary speaker, Professor Robert Desimone (MIT), but we were able to bring in a great scientist and psychiatrist from Heidelberg University, Dr. Wolfgang Kelsh, who was able to answer all of our questions in a discussion that was quite broad and very much entertaining. He really had an answer for it all - whether we were discussing the modern-day use of electroshock therapy, the prescription of medication to alter the mental state, or whether smoking marijuana may lead to schizophrenia. I laud his scope of knowledge, and thanks to him

our discussion was all the more fruitful.

Naturally, we will continue to work on making NeNa a fun and entertaining learning experience. The organizing team is already taking suggestions for next year's keynote speaker, and we are considering other dynamics to increase the diversity of the activities offered to participants. There has already been talk of having live music and more group activities throughout the day. I am certainly, looking forward to it and calling on any interested persons to register for next year (we do support travel for those outside of Tübingen)!

Website: www.neuroschool-tuebingen-nena.de/

This article is also published in Tübingen's Neuromag

17th Conference of Junior Neuroscientists of Tübingen

NeNa 2016

Neuroscience & Law

Keynote Speaker:



26 to 28 September 2016 Schwarzwald (Black Forest), Schramberg

Contact and Registration www.neuroschool-tuebingen-nena.de





A journey decoded

BY MAYANK CHUGH

Have you ever noticed a cyclopic army of sunflowers gawking at you while you drove on the highway? I have. Many many many times! I have vivid memories of asking my non-sciencey finance and business dominated family members about sunflower faces transfixed to the east. Sure, the answers I got then might boggle you or perhaps remind you of your own childhood – ice creams or storybooks.

Time passed and once again, during a bachelor's course in plant development, I posed the same question to my professor. However, this time I was presented with an insightful, scientifically accurate and satiating answer. I learned that these east-facing, gorgeous yellow-brown flowers are actually mature plants, while the developing young sunflower plants not only face east, but also follow the sun throughout the day, a phenomenon called solar tracking or heliotropism. During the day, the stem or shoot of the young plant orients itself so that the developing head can follow the sun from east to the west. While during the night, sunflower heads reverse gears and travel eastward to greet the sun at dawn. What information or nutrients might the sun bestow upon these developing heads has been a riddle for plant biologists for decades. Moreover, why the maturity-attained plants simply fix themselves eastward and quit tracking is an intriguing and still open question.

A few studies conducted in this realm suggest that sun

tracking helps the plant grow differentially. One of the established and highly relied mechanisms of the plant's east-west journey is lateral transport of the plant hormone auxin from the irradiated side to the shaded side1. Such translocation of the hormone leads to differential activation and expression of auxinregulated genes. Another mechanism that might help the plant to undertake solar tracking is the directional light perception. The basis of this mechanism is phototropism phenomenon founded by Sir Charles Darwin. Right after seed germination, the persistent blue light in the electromagnetic spectrum stimulates the young sunflower hypocotyls that results in their permanent bending or generation of a curvature as a phototropic response². The day tracking might be an outcome of stimulation of the mechanism(s) underlying the generation of such curvature. One other mechanism to explain solar tracking is light-dependent osmotic pressure-change in the cells. This involves light induced reversible transport of ions across the cell membrane that might swell or shrink the cells, which might help the shoot to orient the developing head in the direction of the sun. This mechanism already prevails in other heliotropic plants, which are blessed with a specialised osmotic motor called Pulvinus. However, it could explain even the nocturnal return of the plant; the sunflower is devoid of such an apparatus^{1, 2}.

I thought that I was satisfied by the information communicated to me until this August, when Benjamin and his colleagues from the University of California, Davis, and University of Virginia, revisited those chests and provided beautiful mechanistic insights into the process of solar tracking by sunflowers, and demonstrated their questionable biological significance³.

Atamian and colleagues followed a classical botanical approach and tied the shoot of the tracking young plants in order to immobilise them or deliberately turn their faces westward at dawn. This led to a decrease in the photosynthetic activity of these plants, measured in terms of dry biomass and leaf area. This might not be a surprise, but it does suggest that solar tracking promotes growth. They dug deep into the mechanism for tracking and discovered different growth rates of the stems at the east and the west side of the plant. The east side of the shoot grows faster during the day as compared to the west side, enabling the plant apex to move gradually from east to the west side during the day and opposite happens during night time thereby returning the heads to the east in anticipation of dawn.

Could there be an involvement of the circadian rhythms in sunflowers – the inbuilt molecular clocks fitted into the various members of the biological kingdom including humans? Or an hourglass-like timing mechanism that could explain the nocturnal reorientation? Atamian and colleagues conducted classical tests, which demonstrate that the phenomenon of heliotropism is under circadian control. They grew plants in the laboratory over a 30 hour day-night cycle instead of a normal 24 hour day-night cycles and found the tracking pattern under 30 hour cycle is erratic and suggests uncoordinated growth governed by environmental cues and circadian rhythm.

How electrifying is the realisation that plants such as sunflowers are under the command of their internal clock and their growth heavily depends on it? Excitingly, this is quite similar to the circadian rhythmicity and homeostatic processes that regulate our sleep-wake cycle, thus contributing to our behaviour and brain function⁴.

Before straying, let me also update you with another marvelous question that Benjamin, Atamian and others have addressed in the same study. They have figured out why the mature sunflower faces always bloom towards the east. When the heads are focused towards the east during morning, it helps in warming the flower surface to a temperature best suited to attract more pollinators as compared to the non-east or side-turned faces. This bequeaths an ecological advantage to these evolutionary carved sunflowers by increasing their reproductive performance.

Once again, the developmental biologist in me is stupefied with the similarity in a myriad of tools and gears that nature has equipped its organisms. Next time, I am passing a field of these sun-seeking discs, I shall wonder how many other species and organisms are hiding a different yet similar captivating tale of the development and maintenance of life.

Article figure - "The Sunflower Clock" from Magnes, sive de arte Magnetica by Athanasius Kircher (Rome, 1941).

Athanasius Kircher was a German Jesuit scholar and polymath who believed that sunflower trace the path of the sun throughout the day. This work published in 1643, aims to inform the masses the time of the day.

^{1.} Vandenbrink et al., 2014. Turning heads: The biology of solar tracking in sunflower. *Plant Science*. 224.

^{2.} Holland et al., 2009. Understanding phototropism: from Darwin to today. *Journal of Experimental Botany*. Vol 60.

^{3.} Atamian et al., 2016. Circadian regulation of sunflower heliotropism, floral orientation, and pollination visits. *Science*. Vol 353.

^{4.} Dijk et al., 2009. Light, Sleep, and Circadian Rhythms: Together Again. *PLoS Biology*.

Building sustainable early career scientist networks: PhDnet and YESS

BY LEONARD BORCHERT AND SEBASTIAN SONNTAG

Since 2003, PhDnet has been working to improve interdisciplinary cooperation, optimise doctoral education and scientific exchange, and to strengthen academic solidarity between a broad range of scientific disciplines. It still remains a challenge to bring together young scientists from different scientific and cultural backgrounds to foster exchange and facilitate cooperation. Individual interests, various approaches to science in different cultures, and the pressure that comes from having to finish a doctoral thesis in a short time often outweigh people's interests in engaging in cross-disciplinary dialogue and coordination. However, this kind of cooperation can have significant impact on the dav-to-day life of a PhD candidate, as proven by PhDnet's many successes (e.g. the almost complete



A group of early career scientists attending an Earth System Science Frontiers Workshop at the Deutscher Wetterdienst in Offenbach, December 2015. Image courtesy of the YESS Community Facebook page (https://www.facebook.com/yesscommunity0/)

switch from stipends to contracts for candidates). What are suitable approaches for bringing together young scientists with different interests, then? Why does PhDnet work? And are there other networks of young scientists to communicate with and learn from?

Founded in Hamburg in 2010 as a cooperation between Northern German Earth system science graduate schools (the IMPRS on Earth System Modelling, among others), the Young Earth System Scientists (YESS) community faced similar issues to PhDnet. Grounded on the belief that the challenges of a sustainable Earth require an understanding of the full system of natural and human processes, the aim of YESS is to coordinate young Earth system scientists from all disciplines and regions in a "bottom up" way to create a sustainable network for future generations of Earth system researchers1. This type of interdisciplinarity goes beyond classical subject, institutional, and geographical boundaries.

Because of their shared interest in the Earth system, the group of people involved in YESS is much more

confined than in PhDnet; yet YESS faces similar challenges to PhDnet in terms of bridging topic boundaries to foster cooperation. Disciplines range from meteorology to oceanography, from biology to economy and social sciences. In the last several years, YESS has grown into a global network of early career scientists in the Earth sciences with some 750 members². An online forum for exchange between members has helped YESS to keep track of participants from numerous cultural and scientific backgrounds, and to keep members interested. Online activities also include active Facebook and Twitter accounts that inform about topic-related issues, and since 2016, a system of an officially-elected executive committee and regional (continental) representatives. The organisation of conferences as well as meet-ups at larger events helps define common interests of the members, keeping up their motivation.

A common topic to all Earth system research is uncertainty. The global system is too complex to directly measure and fully understand everything, and the human dimension adds an additional layer of

YOUNG EARTH SYSTEM SCIENTISTS community



uncertainty to the picture. For the first Interdisciplinary Conference of Young Earth System Scientists (ICYESS) in 2013, the organisers chose "uncertainty" as the core topic – this was a problem all participants could identify with, no matter the scientific or cultural background. The use of common issues as a platform for interdisciplinary and cultural dialogue proved very efficient³. Since then, YESS has been officially endorsed by the World Climate Research Programme (WRCP) and the World Weather Research Programme (WWRP), and supported by the Global Atmosphere Watch (GAW), the research programmes of the World Meteorological Organisation (WMO) and the UN specialised agency for Weather, Water, and Climate. Moreover, YESS recently published a white paper on future frontiers of Earth system sciences from an early career scientist's perspective⁴.

In terms of interdisciplinarity and interests, PhDnet aims toward similar goals and faces similar issues as YESS. Interestingly, most of them were addressed in the same way: 1) common interests are used as a platform for dialogue, leading to the formation of the Visions in Science conference and career fair; 2) endorsement of the MPG was aimed for and reached to better represent members' interests; 3) The Offspring and the newsletter are used to keep members up to speed; 4) an official steering committee includes section representatives to keep track of individual issues. The combination of providing a common ground for discussion, coordinated steering, official endorsement, intense onand offline coordination, and informing members seems a good approach to build sustainable and successful early career scientist networks that can actually make a change.

- 1. Rauser, Schemann, and Sonntag. 2015. Sustainable Early Career Networks. *Nature Geoscience*. 8: 745-746.
- 2. Castonguay and Lee. 2016. The Young Earth System Scientists (YESS) Community. *WMO Bulletin*. 65(1): 38-40.
- 3. Rauser, Schmidt, Sonntag, and Susser. 2014. ICYESS2013 Uncertainty as an Example of Interdisciplinary Language Problems. *Bulletin of the American Meteorological Society*. ES 106-108.
- 4. Rauser et al., 2016. Earth System Science Frontiers an ECS Perspective. *Bulletin of the American Meteorological Society*. doi:10.1175/BAMS-D-16-0025.1 (in press)



In 2016, more than 100 early career scientists attended an Early Career Scientists symposium.

Pro-Test Deutschland

A grassroots organization spreading awareness of animal research

BY RENEE HARTIG

Pro-Test Deutschland e.V. started out as a small grassroots organization, fueled by the disinclination of scientists to speak openly about the use of animals in research. There was a particular reluctance of the scientific community to engage with the general public, whether because of poor communication strategies or fear of rebuke by anti-animal research organizations. The founders of Pro-Test Deutschland were entirely willing to speak about animal research and earn a public face in the debate.

Before 'coming out' about animal research to the public, I thought my personal safety might be jeopardized by expressing my own opinions. You heard it all before, that crazy anti-animal rights group planting a bomb underneath someone's car, well, what if that turned out to be your car one day? I guess anything is possible. Admittedly, I have seen protesters demonstrating outside of my workplace and outside the homes of renowned scientists. Nevertheless, I think that in this day in age, protest organizations are getting smarter with their strategies, understanding that violent actions may actually ricochet and do more harm than good for all parties involved. When the opposition is peaceful and poses thoughtful questions, rather than smear campaigns, the politics of this controversial debate become less violent and more thoughtful about finding a middle ground that both parties may agree on.

Going public for the cause, I found that hardly were people ever violent, only in some cases verbal exchanges were less than pleasant. Never had I witnessed, after all the times I've gone out to speak about animal research, a reaction that I did not understand. There will always be someone strongly positioned against animal research, and it is highly improbable that anything you could say would change their mind, but that is the point where we can agree to disagree. Sometimes that's an effective strategy. Honestly, Pro-Test Deutschland was not started to change the positions of animal rights activists, rather the group was initiated to provide factual and credible information to a public that has been receiving polarized information for a very long time.

"Pro-Test Deutschland lends its voice to science. We supply information for everyone to help understand the role of animal experiments in research. By offering clarification on many scientific, ethical, legal, social, and psychological aspects of animal research, we provide a common platform to all those who wish to stand up for science."

Personally, I would have had a really hard time speaking about animal research if it were not for two things afforded by Pro-Test. The first being education; the second being solidarity. After we co-founded Pro-Test Deutschland, the tools for public reasoning and speaking about such a controversial topic were suddenly in my hands.

Next spring, it will have been two years since we started this organization, and I am already amazed by its success. We are only limited by our manpower and financial resources, but the foundation and principles we have established are priceless. Pro-Test Deutschland is building on something big, a movement where more and more scientists, politicians, and even the general public are addressing animal research in a way that enables reasonable and logical discourse.

Science is breaking tremendous ground, policies are continuously being renewed, and more people are speaking out with the facts – this is a monumental time. As one of the initiators of Pro-Test Deutschland in Tübingen, I am so pleased to see the movement expand across Germany. From Berlin to Freiburg to Leipzig to Berlin, we are spreading our voice, and this is one trend that is not about to fade out. For those who would like to join us can simply reach out over the web or email.

Website: pro-test-deutschland.de Email: info@pro-test-deutschland.de Twitter: @ProTestDE

As said best by the organization's Mission Statement:

Have you ever felt discriminated against? Discrimination in science is real

PhDnet's Equal Opportunity (EO) Group

BY PHDNET'S EQUAL OPPORTUNITY (EO) GROUP

Did you know that in 1897 Max Planck wrote that women's engagement in the intellectual field is contrary to nature?¹ It is beyond question that things have changed since then, but how much really? Remember last year, when Nobel laureate Tim Hunt lamented in public over the trouble "girls" cause in labs with all their crying and falling in love.² Discrimination still takes place in the scientific community today, everyday.

At the beginning of 2015, the number of **women** in the Max Planck Society (MPS) was 43%. The only field where women outnumbered men was administration (more than 67%). When it comes to positions of employed scientists, the female share was around 30%, although there was gender balance at the student assistant level. Finally, MPI director and scientific member positions were held by only 11% of women.³ The

statistics from Max Planck Institutes (MPIs) reflect the general trend in science: there is gender parity at the beginning of the scientific career, but women are perishing while climbing up the ladder.

But, gender imbalance is just one aspect of inequality present at the MPIs as well as in society as a whole. What about scientists with a **chronic disease**, with **physical or psychological challenges**? And do students and scientists feel that they can be open about their **gender identity** and **sexual orientation** at work?

Max Planck PhDnet's Equal Opportunity Group

To address these issues, we established the Equal Opportunity (EO) Group within the Max Planck PhDnet, consisting of PhD candidates from various MPIs in Germany. We want to raise awareness for and



act against all forms of discrimination, such as those based on *gender, sexual orientation, health status, nationality, cultural background, social background, external appearance, language, and religion.*

Complementing existing EO structures within the MPS

At nearly every MPI there is an EO officer, who is also involved with family and childcare services, requiring local and long-term organisation. So how are we different from the EO officers and what do we add? We are PhD students spread around the country, and thus, do not act locally and are less institutionalised. We aim to complement existing infrastructures, ensuring that **researchers at the PhD level are heard** and that their concerns are recognised. Furthermore, we want to address inequalities beyond the classic gender issue. For example, little attention has been paid to people identifying as LGBTQIA+⁴ within the MPS. Although different groups have specific needs, we understand equal opportunities as something that should simply apply to any– and everyone.

Our group's flexible and non-hierarchical structure ensures that **we do not have to represent one ideology** or be of one mind in every situation. *We want to make the spirit and reality of our generation visible in all their facets.*

How can we make a difference?

For starters, we want to **circulate information** and articles concerning equal opportunities and discrimination among our PhD colleagues via social media and the PhDnet. We aim to understand the diversity, or lack thereof, within MPS, **stimulate discussions**, tell stories of unequal opportunities and **give minorities a voice**.

We also plan to organise **workshops** to raise awareness, realise inner prejudices, and to proactively prevent implicit discrimination at work. We do not want to point fingers, but together try to **become more conscious** about our behaviour and act up on it. Last but not least, we want to serve as a first and accessible **contact point** for PhD colleagues who feel discriminated against, who have questions or would like to connect with others in a similar situation. *Our goal is to have an* open and respectful working environment for nextgeneration scientists within the MPS.

Diversity as a chance

The equal opportunity topic often comes with negative connotations, focusing on the existing **problems**. Our approach is to emphasize the **opportunity** in equal opportunities and to recognise the chance for all of us to learn from each other. We think the MPS, or the international research community, as a whole, representing a hub of diverse and inspiring people, is a great place to have this debate and to get serious about equality. *We strongly believe science has a lot to gain from diversity.*

Want to get involved, tell your story, or just get in touch?

We welcome any form of contribution: whether you have concrete ideas, need support, want to share your experience or are simply curious, you can contact us via *equal.opportunity@phdnet.de*

- 1. http://archive.org/stream/dieakademischef02kircgoog#page/n278/ mode/2up
- 2. http://www.theguardian.com/uk-news/2015/jun/10/nobel-scientist -tim-hunt-female-scientists-cause- trouble-for-men-in-labs
- 3. http://www.mpg.de/9268834/jahresbericht-2014.pdf
- 4. Lesbian, Gay, Bisexual, Transgender or Transsexual, Queer or Questioning, Intersex, Asexual, and Ally

Searching for the invisible neighbours of our Galaxy

How the surprisingly low number of Milky Way satellites can tell us something about the properties of the dark matter particle

SPECIAL CONTRIBUTOR MATUS RYBAK

The standard cosmological model emerged in the late 1990s as a consensus of predictions of theoretical physics, supercomputer simulations and observations. One of its main features is the cold dark matter: a new, very weakly interacting particle; However, although it is predicted to account for about 85% of the mass of the Universe – and despite a massive effort – the dark matter particle has eluded detection so far.

According to this model, soon after the Big Bang, the gravitational pull of small density fluctuations of otherwise almost uniformly distributed matter caused it to collapse into clumps composed both of atoms and dark matter. These clumps then collided and merged together to form progressively bigger galaxies.

Given a set of starting conditions, this process can be simulated by supercomputers. Indeed, these so-called cosmological simulations have been a powerful tool for testing models of the Universe for over two decades. One feature common to many different simulations was that each galaxy is surrounded by thousands of satellites – clumps that survived the merging process which formed the main galaxy – each with a mass of a few million to hundreds of million Suns.

And yet observations do not provide evidence that this large population of satellites really exists.

Fig 1—Dark matter density maps from a cosmological simulation show satellites around a Milky-Way-like galaxy in a Cold Dark Matter universe (left) and a Warm Dark Matter (right), while the main galaxy and larger satellites survive in the Warm Dark Matter case, smaller satellites are wiped out .



Are they out there, but dark?

In the late 1990s, when this "missing satellites" problem became widely recognized, there were only a handful of Milky Way satellites known – faint, dispersed associations of a few thousand stars. As a vast majority of predicted satellites would be even fainter, requiring very sensitive observations to be detected, a concentrated effort has been made to observe starlight from very faint satellites. This effort (These efforts?) is led mainly by two large collaborations: the Sloan Digital Sky Survey (SDSS) and the Dark Energy Survey (DES). For example, the DES team discovered 20 faint satellites after surveying one-eighth of the sky, somewhat reducing the disagreement between the theory and observations.



Moving to lower satellite masses, those satellites that do not have enough stars to be detectable by starlight can still contain large amounts of gas. Several such gas-rich objects around the Milky Way were discovered. However, in spite of these efforts, the number of satellites discovered around the Milky Way is still at least several times lower than that predicted by simulations.

Are they not there: Is the Dark Matter cold enough?

A more worrying prospect – or a more exciting one – is that these dark satellites do not exist to start with and that the cold dark matter model must be reconsidered. So what actually is "cold dark matter"? Here, "cold" refers to the kinetic energy of dark matter

Fig 2—A) A simulation of gaps in a stream due to interactions with dark satellites under different conditions, axis scale in kiloparsecs. Image from Yoon et al., 2010 (http:// iopscience.iop.org/article/10.1088/0004-637X/731/1/58/pdf). Used with permission. B) Stellar stream Palomar 5 with two tails and a central globular cluster.

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which causes them to move randomly and slowly diffuse – a process similar to a drop of ink diffusing in a glass of water. Warm particles diffuse more, while cold particles stay close to their starting positions. In a "warm" dark matter universe, small satellites would be wiped out due to diffusion, but large galaxies would be largely unaffected (Fig. 2). There are already some constraints on the dark matter models: if dark matter was "hot" (e.g. neutrinos) the distribution of galaxies would look very differently from the observed ones. Still, a large range of warm dark matter models is still compatible with observations.

As most satellites are too light to hold onto any gas or stars for too long, they consist almost exclusively of dark matter and are thus invisible to us. To properly distinguish between the cold and warm dark matter scenarios, it is necessary to constrain the number of these very light, completely dark objects with a typical mass of about a million Suns – at least a factor of 50 lower than the least massive satellites discovered so far.

Feeling the invisible: gaps in stellar streams, light bent by dark satellites

When a small galaxy or a cluster of stars orbits our Galaxy, some of its stars are stripped from it, forming a long tail in the sky. If a satellite passes by, orbits of stars in the tail would be perturbed, creating a "kink" such as in Fig. 2. So far, no such perturbations have been



Figs 3—In this Hubble Space Telescope image, a blue background galaxy is lensed by a foreground yellowish galaxy, G1, which has three visible satellites, G2 to G4. The lensing effect creates a characteristic ring pattern with a perturbation around G4. Note that even if G4 were dark, the perturbation would be still there. detected with a high enough confidence. However, big hopes are placed on the GAIA satellite launched in December 2013, which is expected to discover additional streams as well as any potential kinks in them.

One can also look beyond our own Galaxy and extend the search to satellites of distant galaxies. Although these satellites are too far to be seen directly – because of their considerable mass – they can act as gravitational lenses, bending a light passing by them. If the background source, the main galaxy and one or several of its satellites, are aligned in a particular configuration, the bending of the light due to the mass of the satellite can be detected, revealing the otherwise hidden object (Fig. 3). Only a few have been detected in this way using Earth-based telescopes and the *Hubble Space Telescope*, but as both the number of systems investigated and the data quality has increased considerably, the number of satellites is expected to be significantly constrained by 2020.

The hope is that by the end of this decade, a combination of detections of dark satellites from the gravitational lensing, stellar streams, and direct observations of very faint satellites in our own neighbourhood will distinguish between the competing models of cold and warm dark matter. We might still not know the identity of the dark matter particle, but knowing whether it is "cold" or "warm" will be another valuable piece in the puzzle.

- 1. Lovell et al., 2013. The properties of warm dark matter haloes (http://arxiv.org/abs/1308.1399)
- 2. SDSS press release: http://www.sdss2.org/ newsreleases/20020603.pal5.html
- 3. Yoon et al., 2010. Clumpy Streams from Clumpy Halos: Detecting Missing Satellites with Cold Stellar Structures (http://iopscience.iop.org/article/10.1088/0004-637X/731/1/58/pdf)
- Vegetti et al., 2010. Quantifying dwarf satellites through gravitational imaging: the case of SDSS J120602.09+514229.5 (http:// mnras.oxfordjournals.org/content/407/1/225.full.pdf)

MATUS RYBAK is a researcher working towards his PhD at the Max Planck Institute for Astrophysics in Garching. He specializes in using large networks of radio telescopes and gravitational lensing to look into the insides of very distant galaxies. Originally from Slovakia, Matus studied and worked in Scotland and Canada before joining the MPG.

Meet the editorial team

Yorick Peterse is a Ph.D. researcher at the Max Planck Institute for Psychiatry in Munich. Yorick is the Biological and Medical Section Representative in the PhDnet Steering Group 2016.

"As the contact person for the Offspring Group within the Steering Group, I hope to work together with the editorial team to revive Offspring as a digital blog."





Renee Hartig is a second year Ph.D. researcher at the Max Planck Institute for Biological Cybernetics and Centre for Integrative Neuroscience in Tübingen. Hartig, originally from New York, moved to Germany in 2013 to complete a Master Degree in Neural & Behavioural Sciences at the Graduate Training Centre of Neuroscience at Tuebingen University. She works in the Functional and Comparative Neuroanatomy Laboratory of Dr. Henry Evrard studying visceral and interoceptive sensory processing in primates. She spends her personal time wisely by traveling, blogging, teaching, and organizing events to promote public awareness of various neuroscience-related topics.

Mayank Chugh is a third year Ph.D. researcher at the Center for Plant Molecular Biology (ZMBP), University of Tübingen. Mayank joined his doctorate as an International Max Planck Research Fellow at Max Planck for Developmental Biology, Tübingen. Mayank is interested in developmental genetics and during his Ph.D., he is expanding this fondness to single-molecule biophysics to paint an interdisciplinary picture of developmental phenomena and processes. When not in lab., he is photographing, travelling, reading, partying, or cooking and baking in his kitchen.



"I believe in science communication and I feel privileged to be a part of the offspring group to bring together my love for writing and passion for science communication."



Vivienne Groner is a third year Ph.D. researcher in Earth System Science at the Max Planck Institute for Meteorology in Hamburg. Vivienne uses her educational background in biology to study the role of plant diversity for climate-vegetation system stability at the example of the "green Sahara" using the Max Planck Earth system model MPI-ESM. In her spare time, Vivienne likes travelling, movies, festivals or just escaping into nature.

"When people ask me what Earth System Science is good for, my answer is usually that I want to save the planet. Starting small, I hope that we can make at least your life a bit more fun with this year's edition of the Offspring magazine and arouse your curiosity for what's going on beyond you own nose." Leonard Borchert is a second year Ph.D. Candidate and one of those ominous stipend holders at the Max Planck Institute for Meteorology and the Institute of Oceanography at the University of Hamburg. Bridging disciplines from oceanography over meteorology to economy, he studies the value of a robust monitoring of variability of the Gulf Stream on European Societies using computational decadal forecast models.

"When I am not at the office I can usually be found on either my couch or the balcony (depending on the season), reading. My work at The Offspring is therefore dedicated to bringing two of my favorite activities together to create something meaningful. Also, my other hobbies don't blend with science very well."





Matthew HK Cheng is a Ph.D. researcher at the Interfaculty Institute for Biochemistry at Universität Tübingen, and a student in the International Max Planck Research School. Driven by his love for RNA biology, he is currently studying the potential for an RNA-binding protein to influence the aggregation of polyglutamine-expanded proteins involved in neurodegenerative diseases such as Huntington disease. Aside from science, Matthew is likely found exploring the visual arts, playing music or on an ice-hockey rink.

"The Offspring combines several things I enjoy: scientific discourse, print design, and great people. I look forward to contributing to the Offspring."

Come join us!

The Offspring is the official magazine of the Max Planck PhDnet published annually since 2005. The magazine is designed to communicate the network's activities and to provide relevant information to PhD students at all Max Plank institutes. Furthermore, it should constitute a platform for PhD students that reflects their interests and can therefore be distinguished from other Max Planck print products.

We strongly encourage you to actively participate in the Offspring magazine by submitting your own articles. This is a fantastic way of make your science visible so take the chance to share your research with the public, nourishing the PhDnet with ideas,



information, relevant articles and pictures - everything that you regard as valuable information for PhD students of the Max Planck Society. We are looking forward to receiving your input!

If you want to get hands on experience on the Editorial Board, we are always happy to incorporate new members. Therefore, if you have any ideas concerning the Offspring or would like to join our work group, don't hesitate to contact us at offspring@phdnet.de

For more information, please visit http://www.phdnet.mpg.de/cms/workgroups/offspring-group/



Horizontal

- 2. PhD student in French?
- 3. Who is currently the president of the MPG?
- 4. How many sections has the MPG?
- 7. Which natural constant did Max Planck introduce?
- 9. Where is information for MPG students collected?
- 11. PhD student in Spanish?
- 13. Necessity begets ...
- 14. What does PhD stand for?
- **18.** Who is the legitimate representation of the MPG PhD students?
- 23. What is the favorite drink of a PhD student?
- 24. Who is the woman of the MPG logo?
- 26. Business before ...
- 27. Haste makes ...
- 28. PhD student in German?
- 29. It all started with a big ...

Vertical

1. Where was Max Planck born?

5. Which working group raise awareness for and act against all forms of discrimination?

- 6. What is the Scientific Event of PhDnet?
- 8. An ... a day ;-)

10. How many working groups are currently active in PhDnet?

- 12. Never change a ... system
- 15. Where was the first General meeting?
- **16.** ... is the best medicine.

17. What is the best grade for a dissertation in Germany?

- **19.** ... in, ... out.
- 20. What is the name of the PhDnet Magazine?
- 21. Whats the most important quality of a PhD student?22. In which category did Max Planck receive a Nobel price?

25. In for a penny, in for a ...