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offspring

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Dear reader,

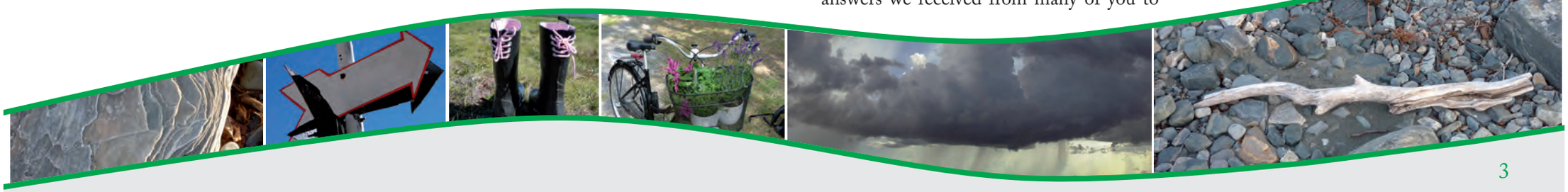
We all spent lots of (life) time on our PhD projects – they not only constitute part of our current life, but also influence our future. Pondering our 'daily activities', we wondered about the meaning of life in general. How do we understand this term?

This issue of the Offspring is dedicated to our factual existence, to the reason for our being on earth, and to the way we actually manage our time here. Life has a myriad of different aspects – or, dazzling facets – which need to be considered from various perspectives. As you read this issue, you'll travel a journey from how existing life forms evolve into non-existing ones, to how legal regulation divides the human lifecycle and finally, to physicists' study of 'something analogous' to life. Additionally, we'll present a short summary of the IMPRS symposium on "New frontiers in science", which covered the role of science in society. This aspect on the relationship between science and society also forms part of the argument of why even lawyers are a living species.

Finally, we're pleased to publish the answers we received from many of you to our questions 'What is life?' and 'How do you see life in 10 years?'. Enjoy these amazing contributions which are distributed all over this issue (in the grey boxes)! As all of them were fantastic, it was very hard to choose a winner, but in the end we have decided to give the price to Flavia Vischi Winck. You can read her definition of life on page 12.

As usual, we also have some 'serious' information regarding the PhDnet, which in some way is also connected to life. For example, the Work Life Balance group presents results from their survey on how institutes support PhD students with kids. Of course, you will also read about the activities of the other workgroups and past and future PhDnet events that make the PhD life more interesting. After having spent some time of your life reading this issue, we invite you to take active part in the PhDnet in one way or another: MPI students' organic body needs participants to stay alive!

Your editorial board



New Steering Group on Deck

Raoul Axinte, Luam Mengler, Tyko Dirksmeyer, Ulrike Böhm

Ahoy from the bridge, everyone! Last November, the previous Steering Group introduced us to the secrets of seapersonship in the Max Planck Society, and ever since we officially assumed the helm on January 1st this year, we have been working to keep the strings together and pull on some of them in order to successfully maneuver the PhDnet through 2011.

We met with a number of officials at Max Planck Headquarters in February and plotted a course for our term of office: we settled on 'Work-Life Balance' as the overall theme of the year, in line with many of the issues from the last General Meeting that the other working groups are taking on. We view this very broadly and include not only our current conditions, but also the relationship between our present stage of life/work as PhD students and the afterlife (and 'afterwork') in the real world beyond graduation. To this end, we are collaborating with the MPS on a series of events where alumni share their experiences from various walks of life.

Another major goal of ours is to consolidate the network, that is, to strengthen the ties between the individual nodes - you! Let us know what's on your mind? If you are a PhD representative, you may have already received a call from one of us (or still expect one) to discuss matters relevant to you at your institute. Another fabulous tool for everyone to exchange ideas and keep in touch is maxNet (see link on page 35), the MPS's social networking platform, and we strongly encourage you to use it for everything you can. Want to share information about procedures at your institute with newcomers, or ask around for the best software to manage bibliographical references? Want to create a poll to determine the destination for your next departmental outing? Want to find out who is working on similar topics at other institutes, or what comic is most popular with your colleagues? maxNet can help you with all of these. And if you find something it can't do yet, drop the developers a line and suggest improvements!

One area where you can bring maxNet communication infrastructure to bear on our lives is by contributing to the Best Practice Guide. The MPS is currently working on a guide on best practice in doctoral education, covering issues such as supervision, selection of a thesis topic, remuneration, etc. It is to be adopted for MPS-wide implementation this fall. The PhDnet has submitted a draft on what we think is important from a PhD student's perspective, and this has featured prominently in the deliberations so far. Do you have more ideas, comments or concerns? Share them on the maxNet discussion board, then we can channel them into the relevant committees!

Plenty of things are going on at any one time, and you are always welcome to get involved! Just browse around maxNet, contact a working group of your choice, or write to spokesperson@phdnet.de (or see our individual contact data on page 35). As for us, we are currently digesting our meeting with the MPS's secretary-general in July (see picture on the left, more about this in due course), catching up with other PhD student networks, and throttling up for the PhDnet's General Meeting in October, where we hope to see many of you. Until then: Have a productive as well as enjoyable time - make sure to keep your Work-Life Balance in mind.

Full speed ahead!

Your Steering Group 2011
Ulrike, Luam, Tyko and Raoul
(on pictures from left to right, see also our contact data on page 35)

Meeting of the Steering Group with the Secretary General Dr. Ludwig Kronthaler and his deputy Rüdiger Willems at the headquarter in Munich this summer (from left to right: Raoul Axinte, Dr. Ludwig Kronthaler, Julia Kasselt (Financial Officer of the PhDnet), Ulrike Böhm, Rüdiger Willems)

Secretary Group

Sophia Rudorf

The Secretary Group handles and distributes information that is related to the PhDnet or relevant to PhD students in general. When we started, we first had a look at the PhDnet wiki, which has become a rather unsorted collection of texts on various topics over the past years. We categorized the wiki pages: Now it is easier to get an overview of the existing information and to find specific information. The next step is to revise some of the texts and to migrate them to the newly built PhDnet webpage or to the corresponding maxNet pages to make them available to a broader readership.

For 2011, we decided to concentrate this ‚editorial' work on the topics: ‚Stipends vs. Contracts' and ‚Work Life Balance'. Within the PhDnet, there is an ongoing debate on the advantages and disadvantages of stipends in comparison to PhD contracts. We hope to support not only prospective, but also current, Max Planck PhDs by providing comprehensive information on this topic. Furthermore, Viola Priesemann, our Work Life Balance officer, collected examples and suggestions about how the MPIs can aid parents to combine work with their family life. We expect to get all information online by the end of July.

Besides the PhDnet wiki, the webpage and maxNet, there is the PhDnet mailing list that PhD Representatives can use to send and receive information within the PhDnet (see page 35 for how to subscribe to this list). To maintain this information flow, the Secretary Group continuously updates the list of PhD Representatives and manages the mailing list. And last but not least, we are happy to get in contact with you and answer every question about the PhDnet that you might have!

In short, life is making the best of a really bad job. So, in a way, I guess John Lennon was right too.
Alexander Arsov, Medical Theoretical Center

Life is a struggle. Continuous and compelling. With yourself and the all the forces that distract and obstruct. Hardly ever boring but often tedious. A glimpse of insight in between. In ten years hopefully permanent.
Alexander Steppke, MPI for Chemical Physics of Solids

Seminar Group

Johanna Acevedo-García

On behalf of the PhDnet seminar group we would like to remind you of the great opportunity to organize a soft-skill seminar for non-IMPRS students at our MPI. Thanks to the effort of the previous Seminar group, we have increased the budget to 28.000€, which on average can cover 14 seminars per year distributed among all the MPIs. During the first half of this year we already had soft-skill seminars at the MPIs in Frankfurt, Cologne, Göttingen, Stuttgart and Garching.

Are you and your colleagues interested in organizing a soft-skill seminar at your MPI?

Try to find out which seminar would bring the most benefit to the students in your institute or team up with another nearby MPI and organize a joint seminar. Write an email to the Seminar Group contact person (Johanna Acevedo-Garcia, see page 35) and tell us what kind of seminar you have in mind. We will guide you during the process and provide you with all the information and documents you need to fill in.

The PhDnet Seminar Group will contact the trainer. However, it is also fine if you organize a trainer yourself. Write a brief proposal with the specific soft-skill seminar needed at your institute and consult your managing director. Make sure you will receive local funding to pay the speaker's accomodation and travel costs. You have to arrange the accommodation, book a suitable room for the seminar and handle the registration of your students. The next step is to note the costs for the seminar (trainer, travel costs, accommodation) in the form the PhD Seminar Group will send to you. It is essential for our financial officer Julia Kasselt (see contact on page 35 as well) to receive the complete form 6 weeks before the seminar will take place. A copy of the financial officer's approval should be sent to the Seminar Group contact. Most importantly, once the soft-skill seminar has taken place, the copies of the evaluation should be sent to Dr. Anke Soemer in the Headquarters in Munich and to the Seminar Group contact for our records and catalogue of trainers.

We are looking forward to hearing from you!

Web Group

Michael Krüger

The web group is responsible for maintaining the PhDnet website and wiki. Currently our small team is creating a new PhDnet website with improved design and background technology (see link on page 35). More importantly, the new website will contain useful information for prospective and current PhD students. This includes, for example, the question of stipends vs. contracts and the insurance situation of stipend holders – both topics have caused much confusion and misinformation in the past. All relevant information is scattered over the PhDnet wiki at the moment and already partially out of date. The Secretary Group is currently gathering the information and writing summaries about those topics.

Aaron Lindner and his team published the new communication platform of the Max Planck Society, the maxNet (see link on page 35). This platform, based on ResearchGate, is inspired by Facebook and enables scientific exchange, networking and communication. We strongly encourage you to join maxNet and to invite your colleagues to the platform! The PhDnet is also in the process of extending the network communication to the maxNet, we would like to slowly move away from the old wiki.

If you are interested in our work, need help or want to give feedback, just contact us! (see our mail address on page 35)

Life is different. Colorful. Sensible. Responsive. Flexible. It is competition. Pursuit of reaching new horizons, crossing borders. Life is not capable of conceiving the reason for its own being. Still it does not pause to develop towards some indescribable state of perfection. Perfection in the sense of complete harmony with its environment, peace, transcendence. This ultimate goal life is reaching after a long journey of divergence and differentiation. It does so to develop and to improve. To discover the most complex and fulfilling condition of existence.

Daniel Meyer, MPI for Neurobiology

Work-Life Balance in the MPS

Viola Priesemann

Starting from last year's General Meeting, a part of the Secretary Group decided to focus on the topic of work-life balance for PhD students in the MPS (and in science in general) Contact persons for this topic are Viola Priesemann and Jan Jikeli (see page 35). This 'Work-Life Group' has asked PhDnet members: 'What kind of support is provided by your MPI to students with kids?' Responses ranged from 'generous family allowances' to 'Your institute is providing for kids?! Almost nothing is provided by mine!'

In fact, all MPIs can support students with children: They may offer flexible working hours, subsidize two weeks of childcare per year or a room or garden for kids to play in. The MPIKG in Golm, an excellent example of possible services, provides caregivers for 15 children, three years old or younger, next door to the institute. They also have 27 places reserved at a nearby kindergarten.

The fees for childcare at a MPI-affiliated kinderkrippe or kindergarten range from 20€ to almost 400€ per month. MPIs in the new Bundesländer tend to provide more facilities at lower cost, as well as more creative solutions to the work-life balance problem.

Each individual should talk with his/her MPI director to ask about support for students with kids. Ask about financial support by way of *Familien-, Kinder-, und Kinderbetreuungszuschlag* (allowance for family, children, and childcare) or 'part-time fellowships' for stipend holders (50% of the normal working time and payment), who need to take care of their kids. For this case, the duration of the fellowship is adjusted so that the total working time adds up to the usual three years. We also suggest referring to specific examples provided here and on our wiki page, when inquiring about possibilities.

See the following pages to see what your peers had to say about their experience! Many thanks to all who contributed!

Life is a process that requires constant battle to be successful.
Ulrich Herget, MPI for Medical Research

Our institute pays two weeks of child care per year for kids younger than 13 years.

Our MPI has a child care facility for 20 kids within the area of the institute. Child care expenses are subsidized during conferences.

Here at the MPI, we have an outdoor playground with slide, swing etc, and an indoor 'Kinderzimmer' is in planning, because the particular room has to be renovated first, but this is already scheduled. Both projects are partly covered by a 'L'oreal women in science fellowship'.

It would be cool to have more child assistance from the institute, especially because there are so many people with small children!

I can work from home when it is necessary.

MPI members have the chance to easily get access to a kindergarden place or a 'Krippenplatz'(for those younger than 3 years old) in one of three sites close to the institute. A maximum of 204 Euros per months and child will be paid by the institute as a subsidy to the day care fees.

I never knew there would be a possibility such as „my institute pays for two weeks of child care each year" and I do not think that our institute here has a Kinderzimmer. Therefore, I cannot give you any examples. As a matter of fact, I myself have two kids who are both born when I work at the MPI. However, I have NEVER heard anything from anyone about any benefits that I could have as a member of MPS! The only thing I think I know was about some babysitting services that I once read a long time ago from a small MPS brochure. It was mainly for those mothers who work at the MPI.

Our institute has a children's room with a diaper changing station (which also provides diapers), a bed for children, a comfortable chair for mothers who are breast-feeding, a table for children and two computer-equipped desks for adults, and toys.

We have flexible working hours, a baby office, and child care (normal, holidays, during conferences and as backup).

At our institute, children can take part in interesting studies.

Our institute has collaboration with the university: The MPI partly finances the construction of the Krippe and Kindergarden, and will have 40 slots reserved. In addition, it negotiated that kids on from 3 months are accepted.

I helped to initiate ~3,5 years ago a daycare for institute kids. It took ~1/2 year, started with 3 kids in the guest house, now they have 15 kids in flats nearby. A new kindergarden in build close to the MPI, it's supposed to have extended opening hours.

Our institute does provide child care, but it is more expensive than the public child care.

I have not encountered any difficulties with parental leave (Elternzeit).

My institute reserves (but not pays) several places in a kindergarten close by, but these places are mainly occupied with the kids from people working in the administration of my institute. For a PhD student it is nearly impossible to get in.

There is a kindergarden at the site of our institute, where one could leave their kids in the morning, go with them for lunch and pick them up in the evening. I think the supervision of the kids is from 07:00 or 07:30 in the morning until 18:00.

In our institute, there has been done quite a lot:
We have MPG-supported Childcare Service close to the institute, where MPI-coworker's children can get in easier with shorter waiting periods. Also we now have two diaper changing tables in the men's and women's restroom. Here children are always welcome to the coffee-kitchens, someone is always on break to look after them for a short time on a voluntary basis.

I can work flexible hours.

My postdoctoral fellowship at the MPI included a generous family allowance.

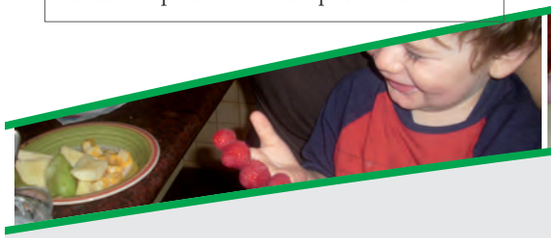
There is a familien service company working for the institute that is, between others, supposed to help you finding child care. I used this service but it didn't help at all.

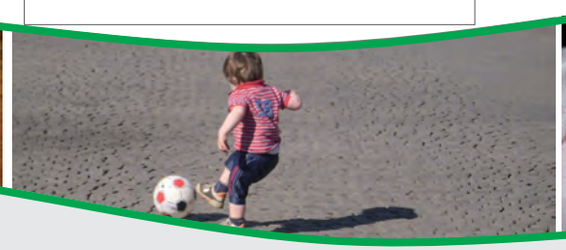
Despite I decided to look for a Kindergarten when the regular application period had already ended, the staff at the MPI did their best to help me find childcare for my daughter.

In my institute there are workshops for older kids, but that is just once a week (and there are many exceptions) and for a couple of hours. That is a good idea and the kids seem to like it: it has the problem of being just some hours once a week, and not being adapted for small babies.

The MPI is organizing one month (20 days) stay at a Kindergarden near to the institute. This is a very nice feature as it allows one to choose the dates. They also have a link to a family service provider, who can give advice on how to find child care (which however is no guarantee to find any).

Many seminars start late in the afternoon (5pm or 6pm), while most child care facilities close latest at 6pm. That makes it impossible to participate in the seminars without organizing someone to get the kids from kindergarden.





Minerva-FemmeNet

The MPS mentoring program for female (junior) scientists

Anke Hübenthal

One individual can make a big difference: What started on the initiative of a single employee at the MPI for Biophysics in 2001 has grown into the official mentoring program of the Max Planck Society. Minerva-FemmeNet is offering support to all female (junior) scientists of the MPS, from graduate to top qualified scientist, by providing them with role models (mentors) and the chance to benefit from the experiences of other female scientists. The mentors are or have been working at one of the MPIs and are willing to share their experiences in academia or industry and/or how to successfully balance professional and family life with a younger female scientist. Mentees and mentors can also attend training sessions on topics like, 'Research Funding & Career Development', which are organized on a regular basis, and meet with other members at 'Stammtisch' meetings in Berlin, Freiburg, as well as in the Rhine-Main and the greater Leipzig areas.

The mentoring program was institutionalized by the MPS in 2009 in order to increase the proportion of women in science and management where they are still significantly underrepresented: although female students and graduates outnumber their male counterparts, their proportion decreases down to 18% among grade A academic staff (e.g. full professors) in the European Union; in industry, the situation is similar. Therefore, although the focus of the program is on academia, it is also open to female scientists who are interested in a career in a science-related area, in e.g. industry or administration.

Everyone who is interested in additional information, please have a look at www.minerva-femmenet.mpg.de or send a message to the program coordinator, Anke Hübenthal (huebenthal@rg.mpg.de).

Life is the materialization of everything you can´t see plus positrons.
Flavia Vischi Winck, MPI of Molecular Plant Physiology
(**OUR SURVEY WINNER**)

Serendipity in Science 2011

Karsten Dittrich

The 6th interdisciplinary scientific event of the PhDnet took place in June (24-26) this year at the MPI for Computer Science in Saarbrücken. The 12 participants listened to manifold talks about serendipitous findings. Keynote speeches were given by Kurt Mehlhorn (Saarbrücken), Danièle Bourcier (Paris) and Menko Victor 'Pek'van Andel (Groningen). Furthermore, Pek held a master-class and an introduction to the field of serendipity. This introduction began with a fairy tale, wonderfully performed by Sadettin Kirmiziyüz. Additionally, the participants prepared interesting talks. The topics ranged from uncertainties in the smallest scales, as described by Heisenberg, to the largest scales, the big bang. The interdisciplinary character was reflected in the titles. 'Algorithmic bites' and 'Voting Systems', as well as 'Serendipity in the RNA world' and 'The Science of law', were discussed in detail, sometimes also outside the lecture hall.

However, the aim of this event was not just a workshop with different talks and scientific discussions. Moreover, it was also meant to bring people of different sciences together. This was done with a barbeque on Friday evening. The local tradition of a "Schwenker" was followed by using a grill that was freely hanging and swinging (German: 'schwenken'; hence the name) on top of the fireplace. Saturday afternoon, not only the participants, but also Pek, had fun with climbing tours in the local 'Abenteuerpark Saar'.

To conclude, the 6th interdisciplinary scientific event in Saarbrücken was interesting as well as fun, and most importantly, successful.

Life is a thousand dancing molecules, that didn't want to stop partying and so they founded a club with an aggressive expansion- & franchise strategy that has been quite successful.

Johannes Zedelius, MPI for Marine Microbiology





New Frontiers in Science

Leah Sharp

The third annual IMPRS Interdisciplinary Symposium 'New Frontiers in Science' 2010 took place in Munich last November. The symposium started as an attempt at improving communication between the students of the IMPRS of Advanced Photon Science in Garching and the IMPRS for Molecular and Cellular Life Sciences in Martinsried. Its most recent incarnation included organizers from the IMPRS for the Science of Light in Erlangen, and was open not only to PhD students in the greater Munich area, but to the general public as well. The two-day symposium brought together cutting-edge researchers, while also dedicating some time to the theme 'Science in Society'.

Prof. Harry Collins (Cardiff School of Social Sciences, Cardiff University) first introduced ideas about how the public understands science, and Prof. Ernst-Peter Fischer (History of Science Department, University of Constance) and Prof. Ana María Cetto (International Atomic Energy Agency, Vienna) further explored this topic. The latter pair's dueling talks, 'The public misunderstanding of science?' and 'The scientists' misunderstanding of the public?', respectively, served as a poignant introduction to a heated panel discussion about the role of science in society. Questions about how best to communicate controversial research to the general public were discussed, as well as the differences and similarities between religious and scientific explanations of the world.

A total of 17 guest speakers came from near [e.g. Prof. Helmut Rechenberg and Prof. Siegfried Bethke (MPI of Physics)], far [e.g. Prof. Wolfgang Ketterle (MIT)], and inbetween [e.g. Prof. Thomas Walther (TU Darmstadt), Profs. Philip Russell and Gerd Leuchs (MPI for the Science of Light, Erlangen)], to present topics ranging from nucleic acids and ultracold atoms, to biodiversity and sustainable energy. For example, Prof. Martin Heisenberg (Department of Genetics and Neurobiology, University of Würzburg) riveted the audience with his talk about the brains of flies, including a video of flies learning how to navigate across a crevasse. His own fascination with the subject was thrillingly palpable.

Other special highlights, in this author's opinion, included Prof. Ferenc Krausz (MPI of Quantum Optics) and Prof. Günther Hasinger (MPI for Plasma Physics). The former engaged the audience with his explanation of how vision is directly linked to the motion of electrons. Prof. Hasinger, on the other hand, explained what the global future of energy production will (and should) look like: Traditional sources, like coal and oil, the controversial nuclear, and of course renewables, like wind and solar, will all be included in a healthy energy palette.

A supplementary tour of the Deutsches Museum for interested students and speakers was held the day after the symposium. After a guided tour of the New Technologies section of the museum, Prof. Aaron Bernstein (Center for Health and the Global Environment, Harvard Medical School) led participants on a spontaneous tour through the section corresponding to his expertise, pharmacy. This presented the opportunity for scientists of a variety of backgrounds to engage a true expert in dialogue about common misconceptions. Since even scientists hold misconceptions in disciplines outside of their expertise, the New Frontiers in Science symposium serves as a splendid opportunity for improved interdisciplinary scientific discourse.

Counter-intuitively to what some of it will make of this someday, it pushes through a state of perfect bluntness, life, refining and maturing to the awareness that life is, by definition, bound not to grasp itself. However, life, like a drunk chef's preaching to its main course, while puzzled by the peculiar happenings in the toilet, is what happened while life failed to realize that life really just is what's awaiting to grow on life and eat life when life's dead. It's become God's last haven and somewhat the 2nd law of thermodynamics' discomfort. Who knows whether the next ten years (make it a hundred or never) will prove that life and even humans are just another natural process. That would profoundly change the way we perceive Mankind's footprint.
David de Sousa Seixas, MPI for Physics

Dear Max Planck Researcher,

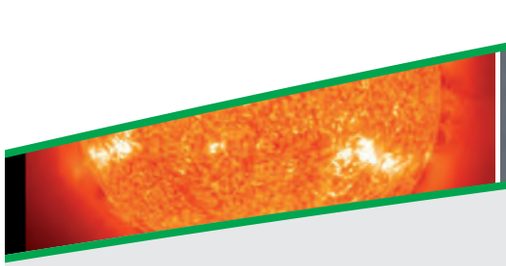
- Have you ever imagined how your research is related to other disciplines?
- Do you wonder about the beauty of the macrocosmos and the microcosmos?
- Are you excited to know what is beyond interdisciplinarity and transdisciplinarity?

If you are a curious scientist you should participate in the:

IMPRS Interdisciplinary Symposium 2012
"*New Frontiers in Science*"

As a tradition, there will be stimulating presentations, panel discussions and guided tours of the German Museum with outstanding leading personalities and scientists, including Nobel Laureates. The program aims to cover transdisciplinary topics ranging from cutting-edge research in natural sciences such as physics, chemistry, biology, and medicine, to overlapping areas in the social sciences, like education, sociology, and economy. Moreover, a cultural program, including concerts and visits to important historical sites, will also be included, as usual. Last but not least, a Science Slam (http://www.scienceslam.org/) session will take place, in which any young scientist informally presents his/her research in 10 minutes and is evaluated by a jury to possibly win prizes.

The event will take place in **2012** in **Munich, Germany,**
so stay tuned to our website:
www.imprs-interdisciplinary-symposium.com



Work Life Balance in Science?!

If you are interested in the answer and maybe want to help answer it, then:

WELCOME to the next PhDnet Meeting!

We want to discuss with you and with representatives of science organizations on how to live a scientist's life

Curious? See you in
Bonn from October 26th- 28th 2011

For more information go to:

http://phdnet.mpg.de/

https://maxnet.mpg.de/group/Annual_Meeting_PhDnet/

‚Piled Higher and Deeper' by Jorge Cham www.phdcomics.com

The charm of life: from past to future

Matteo Allegretti

The majority of scientists agree that unicellular organisms, originating between 3.5 and 3.8 billions years ago, are the most ancient living forms. The pathway that brought about life is nevertheless a big mystery, and it is easy to imagine it being full of trials. The origin is is that inorganic matter unterwent a chemical evolution in the contingent environmental conditions subjected to the laws of chemistry and physics.

Each living being consists of the same inanimate matter that surprisingly is 'alive' thanks to organization of the basic constituents, in particular from the interplay between self-organization and emergence.

This concept of emergence is widespread in many natural phenomena. In short, emergence is the birth of new properties from the interactions of simple components. These properties are not present in (and are often unpredictable from) the qualities of these basic components, but are nevertheless evident at higher hierarchical levels. The specific properties of water, the most common example, are not present in hydrogen or in oxygen atoms; proteins also have amazing properties that are not found in their constituent amino acids.

Three particular features can then be assigned to a living entity: self-maintenance, self-reproduction and the ability to evolve. The concept of "autopoiesis" (from the Greek: self-production, or the invariance of processes and organization inside the cell despite the fact that all the chemical components are replaced) is useful at this point for defining life at the cellular level.

Spatial delimitation is fundamental in autopoiesis; but, although all chemical processes occur inside the boundary, the cell always maintains its own identity (homeostasis). The components inside the cell, in fact, organize themselves in a network of processes that (re-?)produce themselves, then in turn realize the network of processes (self-maintenance).

The cell is then a dissipative, open system, and metabolism is the link between the organization of the living thing and its external environment, which feeds the cell with chemical precursors and accepts expelled by-products. The system and the environment change together in a congruent way, and induce adaptations in each other. This cognitive adaptive interaction with the medium is another fundamental feature of a living autopoietic entity.

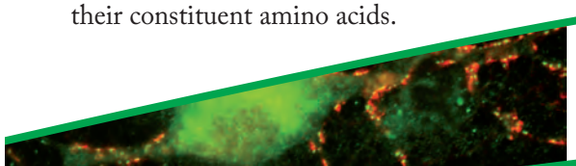
Since even the simplest bacteria consist of hundreds of inter-connected metabolic pathways, scientists are trying to reduce such complexity by constructing cell-models, which are able to mimic some essential processes; this is called 'minimal cell'. There are two main approaches to the minimal cell: bottom-up and top-down. The former approach suggests making complex biological functions and structures starting from simple pre-biotic molecules. At present, this research field has many open questions, not least of which pertains to the origin of complex macromolecules (long nucleic acids and protein chains with catalytic activity).

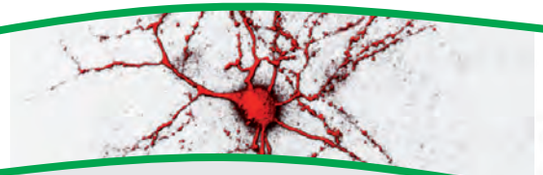
The second approach (top-down) is based on the reduction of complexity. This implies the elimination of all the unnecessary components from modern living cells. An experimental strategy is the simplification of existing prokaryotes by knocking down useless genes, but it is also possible to synthesize de novo a minimal set of genes.

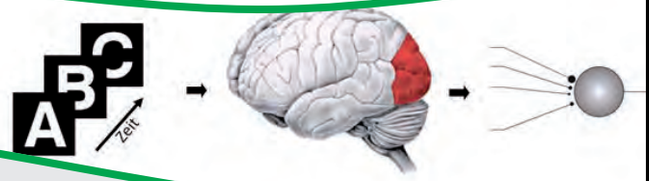
In addition, the use of lipid vesicles as cell models to host biological reactions, and advances in all areas of computational biology (using both deterministic and stochastic approaches) help to simulate the cellular behavior in a variety of common situations.

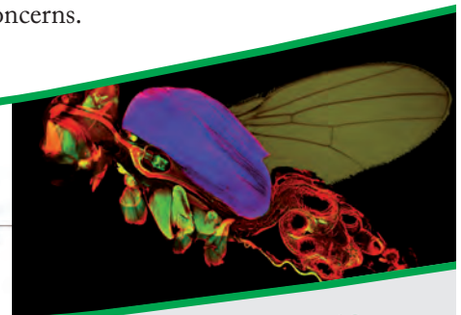
Finally, it is easy to imagine that there is much interest in these studies, not only scientific, but also bioethical and economical. This field is a part of the frontier of "synthetic biology". This term is used to indicate the research field, in which existing life forms are modified with an engineering approach towards novel, non-existing life forms. In essence, synthetic biology will enable the design of biological systems with enormous potential in medicine and other applicative fields, like bio-fuels.

Of course, it can happen that economic pressures could overcome the scientific, ethical and ecological concerns. Therefore, the consequences of these new entities, created by humans, require serious reflection and debate in order to keep pace with all these concerns.









Do Physicists Study Life?

Leah Sharp

Defining life is a problem that arises in many walks of life. From the philosophical, to the religious, to the political, it is a debate that rages everywhere. Biologists define life as a process comprised of seven pillars: PICERAS[1](program, improvisation, compartmentalization, energy, regeneration, adaptability, and seclusion). From my studies of energy transport through photosynthetic molecules, I present these pillars through the goggles of a physical scientist and attempt to answer the question: Do physicists study life? Although I personally (and theoretically) study a singular aspect of a living system, I will attempt to broaden my description to include the quests of my peers and take care to include experimentalists. Despite the evident discontinuities between biology and physics, consider Erwin Schrödinger's profound words: 'We must … not be discouraged by the difficulty of interpreting life by the ordinary laws of physics.'[2]

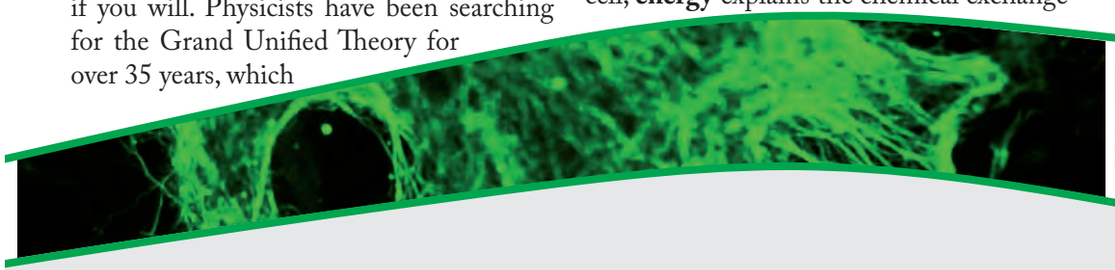
The first pillar of life is a **program**, or in relation to life that we know on earth, DNA. This is something that defines both the ingredients of the living thing and the kinetic reactions that it undergoes, a blueprint, if you will. Physicists have been searching for the Grand Unified Theory for over 35 years, which would describe all of the elementary particles that make up the universe, as well as their interactions. Given enough computing power to model all of the particles in our universe, physicists could not only predict the fate of the solar system as it orbits the Sun, but also explain the mysteries of the Big Bang.

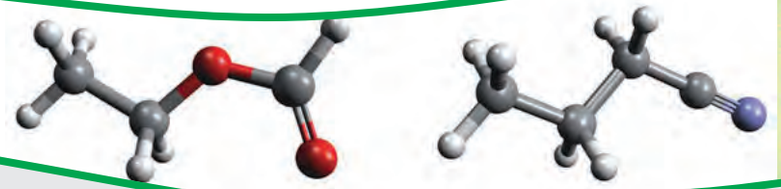
Seclusion requires, for example, that enzymes work only on the particular molecules for which they were designed. With all of the molecules floating around in the cytoplasm of a cell, life would be quite unstable if the Golgi apparatus bumped into the endoplasmic reticulum and exchanged some proteins. Physical laws are likewise specifically directed. One would not use Newton's laws of gravitation to describe current in a wire; nor would the Standard Model, which describes all elementary particles and the fundamental forces of nature, be used to predict the viscosity of oxygen gas through a heated tube.

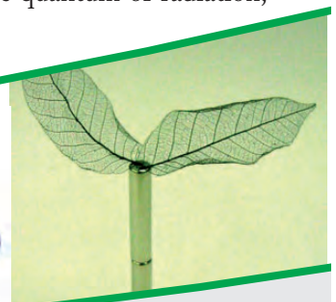
While **compartmentalization** requires all living things be confined to a limited volume, from a large body to an individual cell, **energy** explains the chemical exchange that a living thing experiences with its environment. Likewise, nearly all processes modeled by the theoretical physicist are broken down into a system about which we want to garner more information, and its environment, which is too complicated to treat at the same level of accuracy as the small system. So we make approximations to simplify the effects of the environment, until we reach results that are consistent with experimental results.

Adaptability and **improvisation** explain how living things respond to their environment. At the species level, adaptability is reflected in mutations in DNA that lead to offspring that may or may not be naturally selected to continue to propagate the species, in regards to the slowly changing (perhaps globally warming) environment. On the other hand, improvisation describes an individual's natural reaction to external stimuli: we shiver when we are cold; we feel pain when we touch a hot pan; we develop calluses on our feet when we run barefoot. These two pillars are both widespread in physical systems. Take, for example, a tube of oxygen gas subjected to an external magnetic field (oxygen molecules are known to behave like mini bar magnets). Before the magnetic field is turned on, the oxygen molecules are oriented in completely random directions. With the field turned on, however, they will begin to align themselves in the direction of the external field. We can consider that each molecule is improvising to the external field, or the gas as a whole is adapting to the new environment.

The last the pillar, **regeneration**, is quite literal: The exchanging of chemicals and energy with the environment eventually wears out living things. First, we regenerate cells when we can: our hair grows, skin cells are reproduced, etc. As the aging process continues, life has developed a startling mechanism for continuing life: it starts over (e.g. cell division in E. coli, birth in Homo sapiens). Regeneration is perhaps the hardest concept to find in physics. One analogy presents itself, however, in quantum field theory: pair production. In pair production, a single quantum of radiation,







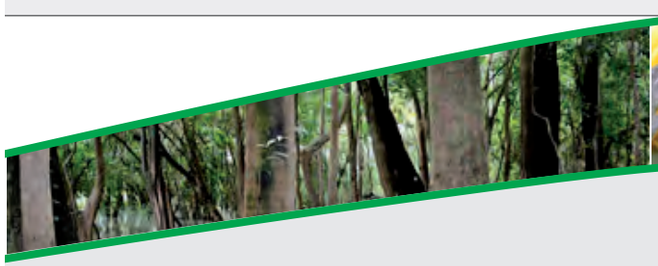
more commonly known as a photon, can spontaneously convert to an electron and its antiparticle, the positron. The positron is identical to an electron in every way, except that it has an equal in magnitude, yet positive, charge. The difference between reproduction and pair production is that in reproduction both the parent and the offspring exist simultaneously, whereas in pair production, the electron and positron are created at the expense of the photon.

And now to return to the original question, do physicists study life? Although in many cases, we probe the minute details of processes necessary for living things, the systems that we probe are, in general, not living; only by analogy do physical systems reproduce. This brings up a second question, where is the line between biology and physics? The next step is to determine whether or not the line between biology and physics is an absolute or moving target, depending on what is studied, whose typology is employed, and how the study is conducted.

[1] Daniel E. Koshland Jr. "The Seven Pillars of Life." Science 295 2215 (2002).

[2] Schrödinger, Erwin. "What is Life?" Cambridge University Press, UK, 1944. Interested parties are pointed to Schrödinger's analysis (in English or German, "Was ist Leben?") of the relationship between physics, chemistry, and biology. While this article attempts to interpret the biological definition of life from a physicist's perspective, Schrödinger delves deeper into the question of how physical laws govern life as we know it.

Life is a certain amount of energy which we have every day (emotional, physical and chemical). Thus the daily life consists in converting this energy into another form by interactions with our surroundings (humans, nature, technology). We receive and send out energy in the shape of ‚impulses' of different kinds. The ability to outsource and organize these is essential in our information society. Our thirst for information and the increasing mobility thanks to technology will strengthen the global network, increase cultural exchange. Consequently human emphathy will develop and cross the national borders. Economy and ethics will go hand in hand. Sustainability, health, culture and the awareness of life as a circle will become the borders of our thoughts and actions.
Julia Schneider, MPI of Colloids and Interfaces



Life and Living in Automobile Societies - from a Legal and Historical Perspective

Helmut Landerer

What is life or what role do legal age-norms have, or rather have they had, in our lives? The so-called institutional life course, which divides life into the three phases of education, professional life and retirement, has emerged since the end of the 18th century.[1] What is the impact of law on the formation of rigid age norms and the division of the human life course into different phases?

A new approach is the investigation of the coherence of age, life and road traffic: At the beginning of the 21st century, road traffic and mobility are important elements of everyday life. From a historical perspective, we can argue that law had a bearing on promoting the car – turning it from an object of luxury into a transport vehicle for the masses. In an Automobile Society, which can be found in most industrialised countries since the Second World War, road traffic is important for everyday life, for the institutional life course and a crucial part of the legal system deals with it. One of the results of legal age-limits is the creation of an 'automobile life course' which is not visible at first glance. But it strongly influences our lives and the usage of transportation for the majority of society. This PhD Project is concentrating on Germany, yet an 'automobile life course' exists also in other countries.

Age groups especially touched by traffic regulation are children and young adults. The protection of children in traffic became an important aim of many jurisdictions; e.g. the use of special infant safety seats is now mandatory in many countries. Yet within the 20th century, children have been banned from traditional playground on streets. They are educated in traffic rules and regulations and therefore socialised to cars in kindergarten and primary school.

Regarding road traffic, youth have to be protected against themselves on the one hand; and society has to be protected from the immaturity of young persons on the other. Youth have a specific role in road traffic: Between restriction and interdiction, influenced by traffic safety education programs, young persons ride bikes, then apply for motorcycle licences, until they can get the desired driving licence for auto-

Advertisement of a driving school in Mannheim c. 1980, source: TECHNOSEUM, collection: Hunold

mobiles. Statistics have shown that drivers under the age of 25, especially young males, are the most dangerous. Instead of raising age limits, the rights entailed in the driving licence were limited step by step in the last 25 years, e.g. by instituting a probation period. As experience has shown, accompanied driving momentously reduces the risk for new drivers. In fact, today's young people drive cars earlier than ever before.

However, their licences are much more restricted compared to the ones applied before the mid-1980s.

Yet mobility by car is also important for older people (after reaching retirement at age of 60-65 years). Headlines regarding accidents of older drivers periodically lead to disputes about a maximum age limit for car drivers. In some countries, licence holders have to pass a health check after reaching a certain maximum age limit. In Germany, for instance, there is no maximum age limit for driving a car due to the law against age discrimination. Nevertheless, the disputes in society about revoking old people's licences show that driving a car emerged to a kind of basic right: the legal permission entails the freedom to choose and drive motorized vehicles.

In retrospect, the rise of the personal vehicle for transportation required a large system of a special infrastructure: Motorways, petrol stations, car dealers, garages, auto liability insurances, driving schools, and Emergency Medical Services all had to be developed. A new legal system arose, consisting of traffic rules and road traffic acts[2], criminal law, traffic police, special taxation laws, driving licences and age-specific norms, etc. Ensuring independence, road traffic and automobiles still dominate everyday life – for all age groups, even when the access to means of public transport and airports is meanwhile a more important factor.

[1] The Independent Max Planck Research Group 'Age and Law' at the Max Planck Institute for European Legal History in Frankfurt is examining the impact of law on the formation of rigid age norms and the division of the human life course. According to the influence of law, jurisdiction and administration on the formation of age-specific norms the life course is analysed in various doctoral theses. See http://www.rg.mpg.de/en/forschung/lebensalter/

[2] In Germany, the legislative process of ordinances and acts is different. Many traffic regulations are 'legally defined' by ordinances: E. g. traffic code (StVO) and Road Traffic Licensing Regulations (StVZO, meanwhile replaced by other ordinances) are ordinances based on the road traffic act.

And then she screamed. Her naked body smeared with blood, still blind, she screamed as if she knew, which other horrors were to come – it went like a chill to my bones. Her mother half-unconscious of pain, her father pale as death and feeling no more than helpless. It was a moment never to forget, and most would call this moment ‚wonderful'. At six eighteen, March 13, my daughter was born and I was feeling, literally, like the happiest person in the world.

About three hours later on the same day, her mother was declared dead. She is no more. Words, even thoughts, are insufficient to explain her being gone – let alone the closeness of life and death, giving birth.

My daughter just turned four. She looks more like her mother – luckily – and hardly a day passes without me wondering, who she is, who her mother was or what is actually happening. It is life happening, for sure.

Stefan Bohn, MPI for Biochemics





How do you see life in 10 years?

And here are the answers to the second question of our survey:

I use a flux capacitor.
Ulrich Herget, MPI for Medical Research

Life has been around since 4 billion years - just enough time to turn dirt into PhD students. In 10 years dirt will still be dirt, but we will not be PhD students anymore (I hope). So enjoy the dance while you can.

Johannes Zedelius, MPI for Marine Microbiology

In 10 years, everything can happen beyond our expectation and imagination.
In 10 years, more and more lives will come to world and of course many our friends around us will say goodbye forever even though we are not ready to receive.

Lei Wang, MPI for Terrestrial Microbiology

Sorry but I am not able to answer how I see the life in 10 years. Experience showed me that more often that we would like unpredictable dust storms change completely the previous concept about what will happen in the life. So simply just live.

Rubén García Martín, Medical Theoretical Center

The final goal life is seeking after is debatable. I see the goal of life in its pursuit of total harmony and a state of transcendence. Considered from this point of view, and if we assume that mankind indeed represents the highest level of existence, life might proceed on its path: the increasing globalization will foster the integration of different economic, political and cultural views, producing new values which are more moderate and less extreme. Knowledge will spread over the world to a new extent by the ever increasing worldwide web and by the gain of information offered from growing and freely accessible data bases. Finally, a new organizational level of life will be reached - being more balanced and enriched in harmony.

Daniel Meyer, MPI of Neurobiology

(A forthcoming) 'Doctor's Diary'[1]

Honor makes the world go round: German Jurists desperately seeking for a title

Lea Heimbeck

Dear Diary: 'And what are you doing?' is probably THE question I particularly don't want to hear at parties or at my hairdresser's any more. It's thankless enough to admit to being a lawyer, but to admit writing a dissertation in law transforms me into a sort of pariah: Either the others immediately assume that I cheat anyway or people start giving helpful advice, like adding at least some footnotes to my text. Yet, although this general suspicion hits all PhD students in law especially hard – thanks to some prominent law graduates – there seems to be a broad mistake in the professional system which facilitates, or maybe even necessitates, cheating in legal dissertations.

When I recently tried to enter the US, the Immigration Control Officer asked me about my profession in Germany. I replied that I was working on my PhD in law, he asked me if I were serious, and why, for God's sake, I was doing that instead of working as a lawyer. This episode emphasizes a major speciality in the German legal education and its impact on the legal profession. The existence, the quantity and the quality of the title 'Doctor of Law' differ in many countries: In countries like Italy or the US, legal graduates only obtain a PhD when they want to work in academia (Italians use the term 'legal dissertation' for their master thesis, which everyone has to write, only 10-15 % start a PhD). Likewise in Germany, only between 10 and 20 % of each year's legal graduates start a dissertation. (Usually it will take years to finish it, if they finish at all.)

So why do Germans do this? Graduates who want to pursue an academic career need this qualification. Apart from that, the title is not necessary to get a job in the field: judges, public prosecutors and attorneys do not need this qualification. Yet, paradoxically enough, there are some parts of the legal profession where job applicants (or lawyers in general) unofficially need the title, top jobs in big law firms or companies, for example; you don't even need to send your application documents if you want to earn big money in Frankfurt, Munich or elsewhere. At the same time, these law

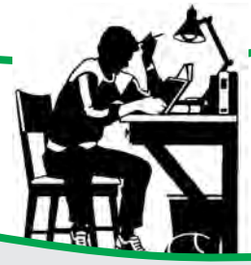
firms expect PhD students to finish their dissertations within one, at the most one and a half, years – otherwise they're 'not able to work efficiently'. Thus, both law firms and companies, as well as law graduates, are only interested in the title 'Dr. iur.', a 'real' scientific qualification (meaning to work thoroughly on an innovative issue) is absolutely superfluous.

Yet what is it that gives a magic flavour to this title? Societal recognition and prestige. And what is the value of these aims (apart from having the title on your ID)? Money: Lawyers with a PhD will earn much more than their colleagues without these magic titles, as will their law firms.

When writing a dissertation – regardless in which field – scientific standards have to be applied: full stop. Yet it is also important to have in mind that standards differ in different disciplines, at different times and in different places. Yet this does not mean that some researchers are generally working more scientifically than others. A natural scientist's statement that researchers in the humanities aren't doing 'real' scientific research, because we only read other people's works, is not only rude, but ignorant. Defaming other disciplines doesn't help anyone. On the contrary: We – as researchers – need to unite: Standards are different because they're necessarily influenced by their surrounding circumstances, namely from the particular discipline and their representatives, but we need to trust each other that there are adequate standards, that they are sufficient and that they are (generally) applied.

What would be the alternative to such trust (not simply blind trust, but a dialogue open to criticism and negotiation)? The introduction of common standards? This would not be possible across disciplines, anyway. Yet the question remains whether this would be possible and desirable within a discipline. Having the freedom to break rules can always develop (legal) systems and adapt them to new, modern demands. On the other hand, trust will obviously only exist when some standards are set. Thus, I would promote non-legally binding recommendations as to how and what to quote, and to make not only these recommendations, but especially their application, transparent.

How would such transparency be achieved? Of course, some sort of institutionalization – introducing examination committees so that each dissertation has to be checked by independent academics – would be possible; yet, the simple knowledge of transparency might already influence each PhD student's academic behaviour. Thus, only when a common mens rea regarding plagiarism within the general academic community will develop, which will then jump over to the 'normal' society, they will also trust academia in applying high standards and in working thoroughly. – right now it seems that scientists (compared to the rest of society) are in an ivory tower somewhere out in the universe. Yet when we will come down, together, from our tower, I might admit – at least after the second glass of wine – that I write a dissertation in law. . . And then I'll admit it not only to you, my caro diario[2].



[1] This title was designed on the basis of the title of a famous German-Austrian medical drama called 'Doctor's Diary'. This series has been shown since 2007. The impulse to create a title for this article including the term 'doctor' was given by my supervisor during a talk at around 5:15 pm on May 12, 2011. Yet, it was me who came up with this TV series and the idea to use its title. However, the part 'a forthcoming' in this title was added by my supervisor. – Do you feel this reference is adequate?

[2] This is the title of a another movie. But who cares?

Probably life is simple and we don't get it.
My girlfriend says: ‚Life is the meaning of life'.
She says it with ease.
Korbinian Freier, MPI for Meteorology

Life is a cup of wine, only the person who tastes it can really understand its taste. Life is like a running river, there is no short stop and break, some times there is a little peace, however, it does not stop. It consists of many branches and also has many crossovers connected with other rivers. When a terminus comes, it also means life is over. Life like a movie, it consists of a series of peaks and troughs. Life is a hope, which drives everyone to strive for their dreams.
Lei Wang, MPI for Terrestrial Microbiology

Good and bad scientific conduct...

Henrik Hartmann

The recent past has stirred up the German academic community and the public. Several PhD titles have been retracted from people of public interest, mainly politicians, for reasons of plagiarism. While the focus was primarily on the social sciences lately, the natural sciences have also not been spared by scandals in the past.

Maybe you remember Jan Hendrik Schön. This German 'wunderkind' rose to fame in the early 2000s with a series of apparent scientific breakthroughs in semiconductor physics. In 2002, he published at an average pace of one paper per week (!) in high-ranking scientific journals and published 17 papers in Science and Nature (!!). However, his findings could not be replicated by other scientists and further investigations showed that both his methods and data contained anomalies. A formal investigation by his former employer, the Bell Laboratories, led to 24 allegations of misconduct. He had falsified and fabricated data, deliberately deleted raw data files and had discarded or damaged his experimental documentation and samples. In the aftermath of the investigation, Jan Hendrik Schön lost his job, was stripped off his scientific awards and most of his papers were retracted.

To avoid misconduct, the Max Planck Society has set itself to the highest standards of scientific practice. These are nicely summarized in a brief booklet titled 'Rules of good scientific practices' and can be downloaded at http://www.mpg.de/197494/rulesScientificPractice.pdf. Reading through the booklet does not give you incredibly new insights because the rules are essentially based on common sense and common ethical behavior. So why write an article about good scientific practices if these rules are so obvious?

While most of us can claim that they have never fabricated or falsified data there are other kinds of misconduct you may not be aware of. Did you know that you have to conserve lab books, protocols, unique experimental equipment, samples and data for at least 10 years? Or that you can be accused of plagiarism even though you haven't copied one single word without citing the source? Using someone's idea can get you into trouble as does accepting an authorship without actually having contributed to the work.

...and the thin red line between them

There are many more potential pitfalls in the scientific world. Some of them are indeed obvious, others are not. This is because science is based on trust. The public must trust us (in order to finance our research), colleagues must trust us if we want them to accept our findings or to collaborate with us. The basis for trust is honesty because without honesty there is no trust – and this is the thin line. It is so thin because (often) only you can see the limits between honesty and deceit. Consider a series of measurements during an experiment. You look at the data and some points are extreme. Now imagine that exactly these points prevent you from drawing a nice regression line with a good fit (which would look really great in your paper). What do you do? Delete the data? Keep it? You decide either way and most people wouldn't know, not even the reviewers of your manuscript. Hence, although the MPS has set out the 'rules', only you know if and to what degree you have employed them. Keep up high standards, for you, your lab mates and your colleagues. Be critical – it's all of us making science a trustful business.

At the IMPRS-gBGC in Jena, we offer a one-day course in 'Good scientific practices – a practical guide'. Students get a brief overview of what the Society's rules are and how they relate to young scientists' daily life. If you are interested in this course or have any other questions about good (or bad) scientific practices, please contact me: hhart@bgc-jena.mpg.de and/or visit the course website: https://www.bgc-jena.mpg.de/bgp/index.php/Main/GoodPractices.

For me: life consists of taking continuously one step after the other one, always trying to do the forward step strongly, without erasing the shape of the previous one. However, many times the best thing that could ever happen is the arriving of a dust storm.

Rubén García Martín, Medical Theoretical Center

Moving to Germany

Tonatiuh Nunez Ramirez

The MPS is a quite international organization with PhD students coming from all over the world. In this article, as in every issue of Offspring, a MPS-PhD student from a foreign country is writing about his experiences in Germany. If you are such a student yourself, or if you are German student spending some time abroad, feel free to write us (in less than 500 words) about your encounters – funny, scary, strange, interesting...or just different from what you expected! We will be happy to publish them in one of the next issues!

I went to school at the German School of Guadalajara because it was one of the best schools in my city. There I started my relationship with Germany. I learnt the language, participated in an exchange program and made good friends.

After finishing my Bachelor studies in Mexico, I found a very interesting Master program in Munich and I got accepted. I was very exited about the idea of going abroad and I did not think that it would be difficult. Many of my school friends were already studying or working in Germany so they could always help me out.

The first thing I felt when I arrived in Germany was space to grow. I imagined that a plant might feel the same way when it is transplanted into a bigger pot. I felt very exited with a huge ocean of possibilities in front of me. Now I could follow my dreams. Besides that, I arrived in Munich in the middle of the Oktoberfest and had lots of fun.

There were several things I liked when I arrived. I was finally able to recycle trash (I had been arguing with my parents too long about it). I could get a very interesting student job and live on that money. I didn't need a car anymore. I also felt very comfortable not being afraid of getting mugged around the next corner (not that I ever was but the German social safety net is a good thing).

Some things were harder in Germany. Suddenly I realized that I didn't only have to study, party, and have fun, but I also had to clean my apartment, get groceries, wash my clothes, pay the bills, and of course, deal with all of the bureaucratic hurdles one has to deal with when one moves to a new country. Also, if I stayed in my student apartment, life could get pretty lonely. Fortunately for me, very soon after I arrived (within one month), I met the woman who is now my wife. So now I have a partner and soon, a family, too.

Sometimes I also experienced homesickness. This has led me to appreciate my own country more. I never used to eat spicy food, now I really like it. I now listen to Mexican folk music more often and enjoy Mexican folk dances. And of course, I am more appreciative of the time I spend with my family. One thing I learned is to appreciate the sun. I never would have thought that I would care about sunny days so much. When I visit Mexico my family looks for a place in the shade and I look for a sunny place.

What is life? I'm wondering
What brings to life the lifeless thing?
Bacterium, animal, plant, and fungus
What's the quintessence among us?

Aristotle knew, of course
That life is life through vital force
That physics never could explain
The splendid green that follows rain

The vital force yet lastly fell
When science found out about the cell
With DNA as memory
And feeding on negentropy

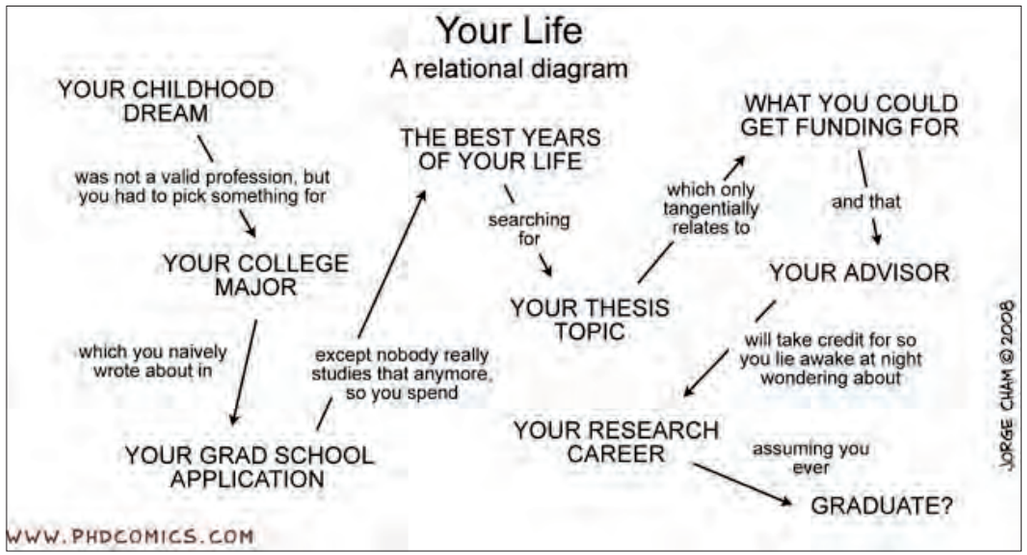
The cells through ages replicate
While evolution drives their fate
To species different as could be
Despite their inner parity

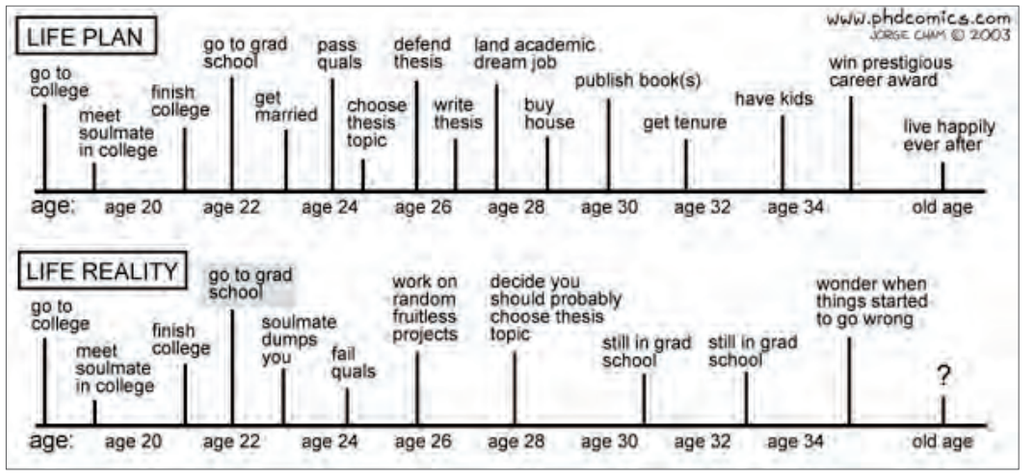
All life on Earth from one descends
But no one knows how it began
That life sprang up unsettles me
A wonder, that's what life must be!

Helge Gössling, MPI for Meteorology,

Life is something that is just easier to bear in good company.

Life means planting ideas and watching them grow.
Valentina und Sebastian Meuren, MPI for Nuclear Physics





‚Piled Higher and Deeper' by Jorge Cham www.phdcomics.com

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