Karlsruhe Institute of Technology

YIN Insight 2014/15

The strong network of
junior research group leaders
and juniorprofessors at KIT

Young Investigator Network (YIN)

Editorial

Dear Reader,

The Young Investigator Network (YIN) has started with many new faces into its seventh year and currently represents 50 young researchers of various nationalities and research fields. In exciting times of change and reorientation, YIN has successfully maintained its position as a strong network, representing the junior research group leaders and junior professors at KIT. YIN continues to provide outstanding training and education to its members and sponsors interdisciplinary collaborations. This is the key to developing successful leadership skills and career paths for young investigators.

Connect – Interact – Educate. By establishing a platform where members can connect and interact both scientifically and socially on a regular basis, YIN members have the possibility to exchange and impart their experience. This especially helps foreign group leaders who not only have to learn how to manage a group but also to integrate into a new cultural environment. Together with professional education, we strive for a surrounding that encourages non-competitive support, confidentiality, and personal development.

To tie in with a proven format, we have created the new YIN Insight 2014/2015. On the next pages, you will find out how YIN has developed over the last year in facts, figures and faces. We report about successful acquisition of funding, summarize the YIN-Grants, are proud to introduce our new members and a growing list of alumni. Moreover, on the pages of YIN Insight we have started a discussion about career prospectives for young scientists and report about recent related political and social initiatives. This brochure has been a collaborative effort and we would like to thank all of the individuals for their contributions.

We wish you an interesting and enjoyable read,
the PR-Committee


Dr. Felix Löffler


Dr. Julia Syurik


Dr. Kathrin Valerius

Contents

What to expect 2
Welcome 3
Hot Topic Working Conditions for Young Investigators 4-7
News 8-9
YIN Statistics 2014 10-12
Transdisciplinarity YIN Lecture Series 13
Transdisciplinarity YIN Grants 14-16
First Honorary YIN Member 17
Leadership Training Interview 18
Leadership Training Continuing Education 19
Point of View Habilitation 20-21
New Members 22
New Alumni 23
Scientific Highlights 24-26
YIN Mission 27

Greetings

The Young Investigator Network (YIN) was established seven years ago. It is a success story of KIT and a strategic element of KIT's program to support young scientists. With YIN, KIT has gained attractiveness not only for national, but also for international young scientists. Approximately every fourth YIN-member comes to Karlsruhe from abroad to establish her or his own junior research group at KIT. This directly enhances KIT's research strengths and positively affects KIT's standing in the international science community. The young scientists from abroad bring along their contacts to previous education and research institutions and after returning home or moving to another institution in the world, YIN alumni act as bridges to the KIT.

YIN members regularly practice international exchange beyond the borders of their disciplines. From this exchange, they will benefit throughout their professional career. It is at these interfaces of disciplines where new visions are generated, which will stimulate and advance science at KIT.

Junior research group leaders typically also are apt and committed teachers: Their young age, close to that of students, the up-to-dateness of their research topics studied , and their enthusiasm make the young researchers role models at KIT. Their contributions to the education at KIT should not be underestimated.

Let me wish the current members of YIN much success in their future professional career. May the YIN alumni keep the time they spent at KIT in good memory and maintain and deepen their contacts to YIN. And may all readers of this annual journal have an interesting read.

Professor Dr.-Ing. Holger Hanselka
President

Working Conditions for Young Investigators: Curiosity versus Uncertainty

by Dr. Julia Syurik and Dr. Kathrin Valerius

In the last 11 years, the number of scientists with short-term contracts increased by 53%. It was a great time during your doctorate studies: You successfully completed a project and also published your results. You are still young and want to stay in science as a postdoc or maybe a junior group leader. There are quite some financial opportunities and you managed to obtain funding for a few years. But what comes next?

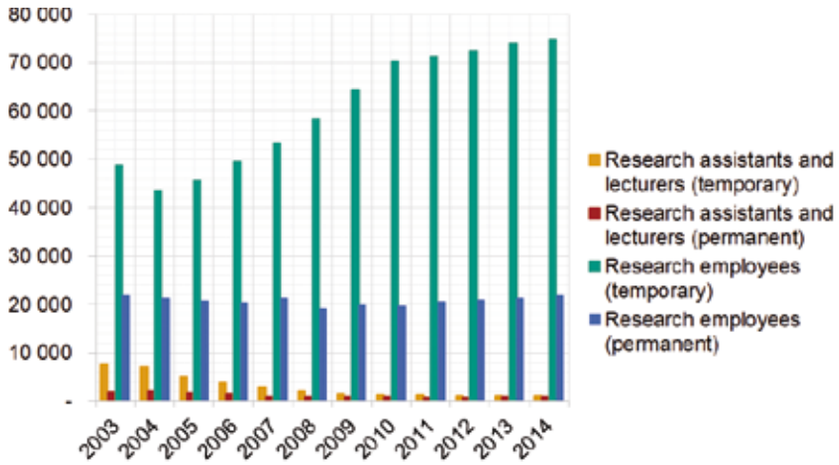
Some researchers opt for leaving academia towards industry. But what happens with those enthusiasts who just want to do science? The situation is tough as the number of positions for non-professorial research staff with permanent contracts is decreasing in contrast with rising number of postdoc and junior group leader opportunities. In fact, by virtue of three pacts ("Exzellenzinitiative", "Hochschulpakt", "Pakt für Forschung und Innovation") the number of so-called qualification positions for young researchers grew from 108 000 to 158 000 [1]. Recently published statistics indicate a threefold increase of postdoc positions in the USA over the last 30 years [2], introducing "permadocs" as a special class of scientists hopping from one short-term contract to another for decades.

The statistics available for Germany do not represent postdocs as a special class of researchers [3], however, they indicate a rise of the number of research employees with fixed-term contracts (excluding professors, including postdocs) by

YIN meets Ministerial Director Dr. Simone Schwanitz

In November 2014, YIN members had the opportunity to meet with Dr. Simone Schwanitz, the Ministerial Director at the Ministry of Science, Research and the Arts in Baden-Württemberg. Together with Dr. Elke Luise Barnstedt, the KIT Vice President for Human Resources and Law, Dr. Schwanitz addressed our most pressing questions and shared her vision about employment conditions and career perspectives for young investigators in Baden-Württemberg. Thus, a large part of the discussion evolved around the realization of new career paths towards a tenured position or professorship. These questions were discussed in view of the amendment of the state of Baden-Württemberg's Law on Universities and Colleges (Landeshochschulgesetz, LHG) and of the Act of Academic Fixed-Term Contract (Wissenschaftszeitvertragsgesetz, WissZeitVG) which, despite its original intent to support mid-level academic positions, has turned out to put young researchers under a considerable amount of pressure and is perceived as a burden rather than relief by many individuals.

Several of the questions raised by YIN members concerned suitable conditions to balance work, family, and private life. Especially at a stage of life where the pursuit of a career and founding a family often compete, practical aspects – such as day-care during conference visits – can make a big difference.



The number of research employees has widely increased, with 53% rise of position with fixed-term contracts and only 0,4% slight growth of positions with permanent contracts. (Data for graphs on this page is compiled from Statistisches Bundesamt, Fachserie 11, Reihe 4.4: Personal an Hochschulen, 2003-2014)

53% from 49 000 to 75 000 between 2003 and 2014. At the same time, the amount of researchers with permanent contracts has remained almost unchanged (+0,4%), which also means a drop in percentage correlation between people with permanent contracts to limited ones from 45% to 29%. In other words, every third researcher in 2003 had a permanent contract, nowadays only every fifth.

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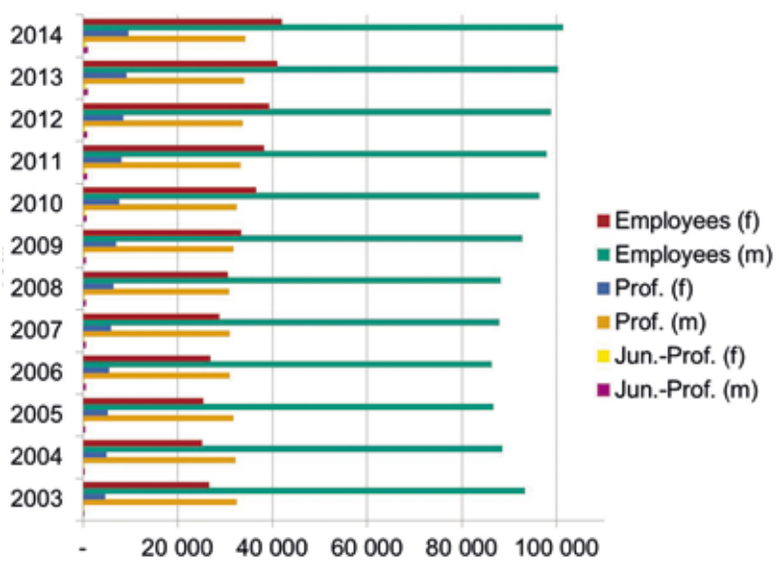
The overall academic staff in Germany has also grown by 42% with a 21% increase in professorship positions. However, with the general occupational growth in academia, the number of lectures and assistants with both limited and unlimited contracts saw a huge drop by 84% and 50%, respectively. A part of the reduced positions (3 000 out of 10 000) was, however, replaced by lecturers with special tasks ("Lehrkräfte für besondere Aufgaben"). For professors, the number of time limited contracts fluctuates between 9% and 15% over the last 11 years, where the latter is a maximum registered in 2010.

A large increase in female researchers by 58% could be seen in Germany over the last 11 years, while the number of male researchers has a much slower growth rate (+9%). For the professors, this number is even higher – plus 107% of female researchers versus plus 6% for male ones. Despite this big step towards gender equality, still a dominance of male professors (78%) as well as male research employees (71%) can be seen. To notice, the gender correlation for junior professors is 61% versus 39% for men and women respectively, demonstrating a tendency towards equality.

As a consequence, this leaves thousands of highly skilled and extensively trained academics without security and a clear career perspective. Only a few of them have chances to obtain a professorship or a permanent academic position. What will happen to the rest? Who can be held accountable for transforming the naturally competitive environment in academia to a "survival of the fittest" race by both increasing the number of qualification positions and decreasing the number of permanent faculty positions? What happens to scientific creativity in these harsh conditions and for how long can one keep fighting before one is too old, one legged, or over educated to go to industry?



An increase of female researchers by 58% is a big step towards gender equality. However, a dominance of male professors (78%) as well as male research employees (71%) can still be seen.

Moreover, the problem of finding a job also concerns freshly graduated PhD holders. The number of people obtaining a PhD degree in Germany increased by 12% to 12,6 thousand over 14 years from 1999 to 2013 [3]. Taking into account the 80%-increase of the number of researchers in Germany, one can see a drop of the number of PhD-holders going to industry. One of the explanations for this is a lack of positions for PhD-holders in industry. This effect in combination with copious funding for early postdoc stages leads to a very unbalanced situation. There are no simple answers, but the situation will not change unless we ask these questions.

About 34% of YIN members are young, well-educated, ambitious females. This is comparable to the general trend for Germany (29%). (Photo: Markus Breig, KIT)

A similar situation can be observed in the United States of America (U.S), where an increased number of PhD graduates per year conflicts with decreasing numbers of tenure or faculty positions available [4]. The amount of positions for PhD holders in industry also does not show a rapid growth. A crisis of over-education was recognized in the U.S., Singapore, China, Japan, and Germany already in 2011 [4], however, the situation does not appear to be changing for the better.

From the position of a company, it is not profitable to recruit a PhD holder for a job a Bachelor can do. So is it worthwhile to embark on 10+ years of studies, risking to end up being unemployed due to over-education? And what should the people do who have already spent these 10+ years for their education?

In Germany, three petitions have been initiated this year, providing a platform to the mounting dissatisfaction and incertitude among mid-level academic employees.

In the meantime, a recent initiative [5] of the federal government and the federal states gives hope to solve these critical issues: 100 Million euros per year over a time span of 10 years are envisioned to be dedicated to the improvement of career perspectives for young researchers. This unprecedented move may provide a great incentive to German universities to follow through with modern and sustainable career development concepts. The Joint Science Conference (Gemeinsame Wissenschaftskonferenz, GWK) has tasked a working group to fill this pledge with concrete ideas and provide a conceptual draft. In the October session of GWK, Senator Eva Quante-Brandt emphasized the importance of reaching a successful closure of the negotiations between the federal and state governments. She pointed out that in order to attract and retain excellent young scientists, the federal and state government should support an improvement of predictability and reliability of career paths [6].

Prominent voices from within the science community – such as Jürgen Mlynek, former president of the Helmholtz Association [7] – are cautioning politics to use this chance wisely. Providing clear perspectives – either positive encouragement towards securing a career in academics, or a signal to leave early on – without raising unrealistic hopes should be a paramount goal, Mlynek says. A careful elaboration of contents for this initiative will be required, which is clearly not trivial in light of a multitude of constraints, for example the Act of Academic Fixed-Term Contract (Wissenschaftszeitvertragsgesetz, WissZeitVG).

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Meanwhile, early June the Alliance of Science Organizations in Germany (Wissenschaftsallianz) composed an open letter [8] for the Federal Minister of Education and Research Johanna Wanka. Therein, the Alliance voices concerns that a restriction of fixed-term contracts, as foreseen by the revision of WissZeitVG, would imply a considerable loss of flexibility in managing academic employment – in particular in projects with third-party funding. In light of these contrasting viewpoints and interests, finding a sustainable consensus among the coalition parties and in the negotiations between the federal government and the federal states does not appear an easy task. Many young researchers currently set their hopes on the ongoing process of transformation of the German academic sector and will follow the political discourse eagerly.

Panel Discussion "Young Scientists in Focus"

On November 25th 2015 the Minister for Science, Research and the Arts of Baden-Württemberg Theresia Bauer visited the Karlsruhe Institute of Technology in frames of a panel discussion with the topic "Young Scientists in Focus".The event is the last in the discussion series between Theresia Bauer and the universities of Baden-Württemberg.

Alongside with Minister Bauer, the KIT president Holger Hanselka and the KIT vice president for Higher Education and Academic Affairs Alexander Wanner were part of the panel.

YIN members Dr.-Ing. Katrin Schulz and Jun.-Prof. Dr. Henning Meyerhenke presented the opinions junior research group leaders and of junior professors, respectively. For the doctoral students at KIT, Anja Bachmann joined the discussion.

F.l.t.r. Minister Theresia Bauer, Dr.-Ing. Katrin Schulz, Jun.-Prof. Henning Meyerhenke, KIT president Holger Hanselka (Photo: Sandra Göttisheim, KIT)

[1] Ein Lob der Vielfalt - Karrierewege zur Professur, Heike Schmoll, Forschung und Lehre 05/2015
[2] The future of Postdocs, Kendall Powell, Nature 146 (520), 2015
[3] Statistisches Bundesamt, Wiesbaden, Fachserie 11, R 4.4: Personal an Hochschulen, 2003-2014
[4] Education: The PhD factory, David Cyranoski et al., Nature 472, 2011nmj
[5] Neue gemeinsame Initiative von Bund und Ländern für den wissenschaftlichen Nachwuchs. Pressemitteilung 03/2015 der Gemeinsamen Wissenschafts konferenz, Berlin/Bonn, 17.04.2015. Available online: www.gwk-bonn.de/fileadmin/Pressemitteilungen/pm2015-03.pdf . Date 23.06.2015
[6] Wechsel in der GWK: Wanka und Quante-Brandt übernehmen GWK-Vorsitz für 2016/2017. Pressemitteilung 09/2015 der Gemeinsamen Wissenschafts konferenz, Berlin/Bonn, 30.10.2015. Available online: https://www.bmbf.de/files/PM_09_2015.pdf
[7] Klare Ansagen für junge Forscher, Jürgen Mlynek, Physik Journal 06/2015
[8] Unis und Außeruniversitäre wollen kein neues Gesetz . http://www.tagesspiegel.de/wissen/streit-um-befristete-stellen-in-der-wissenschaft-unis-und-ausseruniversitaere-wollen-kein-neues-gesetz/11892786.html

High-ranking visitors from the BW ministry

Junior scientists were the main focus when Winfrid Kretschmann, first minister of Baden-Württemberg, and Theresia Bauer, the minister for Science, Research and the Arts, visited KIT. YIN speaker Dr. Stefanie Speidel presented the network and her research, as did Dr. Steffen Scholpp and Dr. Roswitha Zeis. The Southwest German broadcasting SWR reported on radio and television.

FEMS Lecturer Award for Excellence in MSE and DGM Masing Memorial Award

Federation of European Materials Societies (FEMS) awarded the FEMS lectureship 2014 to YIN speaker Dr. Christian Greiner for his pioneering work in the field of contact mechanics and tribology. With this distinction the federation encourages selected young materials scientists to lecture throughout Europe as "ambassadors" of the materials community.

The German Society for Materials Science (DGM) honored Dr. Christian Greiner for his excellent contributions to metallurgical research. Since 1956, the DGM bestows the award in remembrance of the former chairman Prof. Georg Masing to one of its younger members.

© Badisches Landesmuseum (Photo: Uli Deck)

Margrave Karl-Wilhelm visits YIN member at his Lab

300 years after he founded the city of Karlsruhe in 1715, Charles III William, Margrave of Baden-Durlach, roams its streets again. As live-sized figure, supervised by the Baden State Museum, the Margrave visited the lab of YIN member Dr. Guillaume Delaittre at the Institute for Toxicology and Genetics. In search for Gold, Karl-Wilhelm had set up three labratories himself in the newly found Karlsruhe.

Upcoming talk: Fair Appointment procedures

Dr. Dagmar Höppel, representative of equal opportunity for Baden-Württemberg and editor of the handbook "Fair appointment procedures", is a recognized expert in her field. At the YIN member meeting in Febuary, she will share her knowledge and give recommendations.

LookKIT with YIN Special

KIT Vice President and mentor of YIN, Prof. Detlef Löhe, explains the idea behind the Young Investigator Network. The top-level research of current YIN members as well as the YIN alumni – among them 18 professors – state its success. A few exemplary projects are presented in this issue.

Otto Kienzle coin awarded to YIN member

Dr. Steven Peters received the Otto Kienzle commemorative coin 2015 for his outstanding achievements in the field of manufacturing technology. Since 1970, the German Academic Society for Production Engineering annually awards young Ph.D. engineers in memory of Professor Otto Kienzle.

Facts and figures 2014

The following data was compiled from the YIN-survey 2014: 34 out of 64 members participated.

Members

The number of YIN members has fluctuated around 60 for the past years as shown in Fig. 1. Nevertheless, we have observed a slight rise in the share of female members over the years. In 2008, when YIN was founded, there were 12.8% female members, nearly doubling to 23.5% in 2009 and increasing further to 28.3% in 2014.

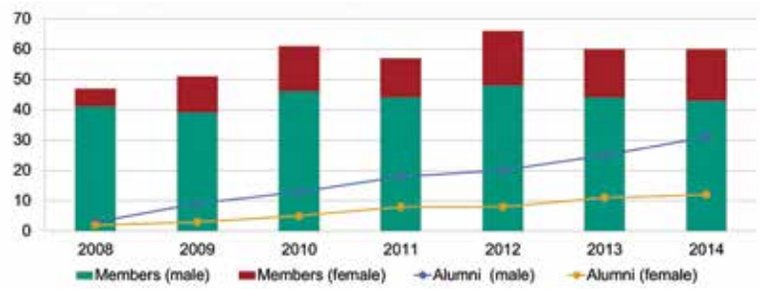


Fig. 1: Number of YIN members and alumni from the foundation of YIN until the end of 2014

While 22% of our members have an international background (including even members from America and Australia), the majority comes from European countries. In order to qualify for YIN membership, one needs to be the leader of an independent third-party funded research group with personnel responsibility and limited contract.

Even after leaving KIT or after obtaining a permanent position at KIT, many of its former members stay in close contact to YIN. Therefore, the number of associated alumni is increasing yearly, climbing to 43 by the end of 2014. The average age of a YIN member at the start of their junior group is 34, with the youngest member being 28 years old and the oldest 45.

Areas of expertise

YIN members cover four areas of research: the main group (52%) works in the natural sciences, followed by 23% in computer science and mathematics, 23% in the field of engineering, and finally only 2% of all YIN members are employed in the area of economics and humanities. The distribution is shown in Fig. 2.

Types of Junior Research Groups

YIN unites a variety of different group types and funding sources. A significant number of groups is still financed by funds allocated from KIT and initiated by the excellence initiative: 12 Young Investigator Groups, 3 KIT-Shared Research Groups, and 2 KIT-Research Groups. In addition, there are 9 YIN members leading Helmholtz Young Investigator Groups which are partially funded by the Helmholtz Initiating and Networking Fund and partly by KIT as well as their hosting Institutes.

Many YIN groups are entirely funded from external sources such as the Federal Ministry of Education and Research (BMBF) (3), the German Research Foundation (DFG) via its Emmy Noether Program (5), and the European Research Council (ERC) via Starting Grants (4). There are 4 junior professors and 8 KIT-Junior Research Group leaders ("KIT-Nachwuchsgruppenleiter") in YIN. Other YIN groups are funded by the state Baden-Württemberg (Margarete von Wrangell Program), the DFG (Heisenberg Stipendium), the Center for Functional Nanostructures (CFN), and the EU (Marie Curie Grant). Fig. 2 shows an overview.

The amount of initial grant money for the different funding types varies from 80 000 for one year to 1.7 million euros over five years. The duration of the junior research groups at KIT is between three and six years. The largest funding is granted by the ERC Starting Grant, followed the by DFG Emmy Noether and the Helmholtz program.

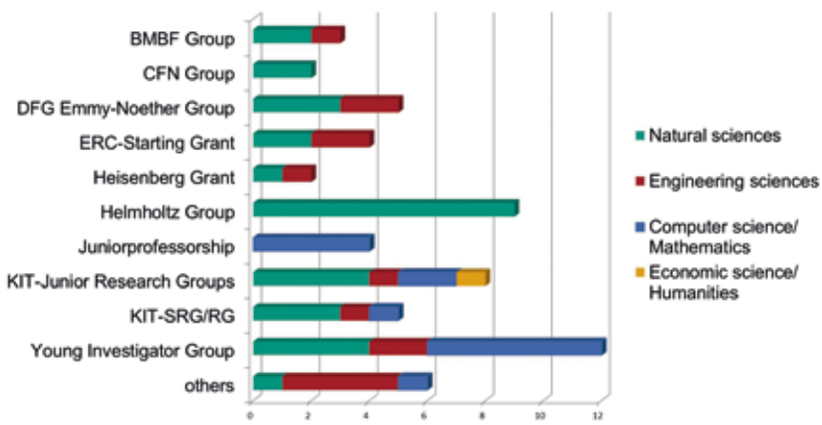


Fig. 2: Distribution of types and number of YIN groups and areas of expertise (Data from YIN-Database, Dec. 2014)

Subsequent Funding

In addition to the initial funding of the groups, YIN members (34 respondents) have acquired a substantial amount of additional funding, in total 5.2 million euros for 2014. The vast majority, about 76.8% of these grants, is provided by external funding agencies such as the DFG. 17.7% are contributed by industrial partners and the remaining 5.5% by KIT.

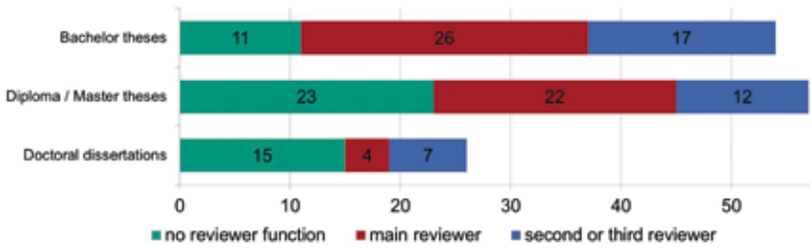


Fig. 5: Number of theses finished in 2014 supervised by YIN members.

Staff

The average size of a junior research group represented in YIN is 8.8 members. A detailed look at 34 (out of 64) YIN groups shows that these groups comprise a total of 300 members including 27 postdoctoral researchers, 114 doctoral candidates, 58 Diploma/Master students, 47 Bachelor students and 31 student assistants. In addition, the groups employ 8 technicians, and 5 guest scientists and 5 trainees, as shown in Fig. 3.

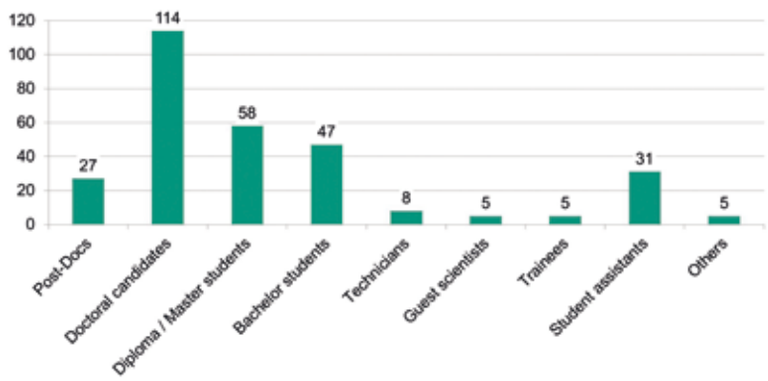


Fig. 3: Number of members in YIN groups (for 34 survey respondents)

Among the doctoral - and post-doctoral researchers within the YIN groups, 55% originate from Germany. However, the groups are very internationally staffed, as 23% of these researchers come from Europe, 12% from Asia, 10% from North and Central America. This distribution is visualized in Fig. 4.

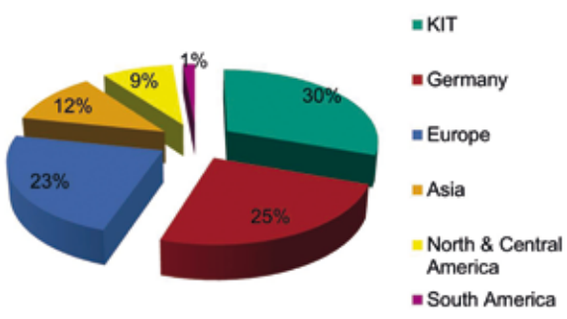


Fig. 4: Origin of doctoral and post-doctoral researchers within YIN groups

Teaching and supervised theses

About 80% of all YIN members contribute actively towards teaching at KIT. While only 24% of them have a lectureship or teaching assignment, the majority of group leaders are committed to teaching out of their own interest and on their own account. In the summer term 2014 and winter term 2014/15 combined, YIN members contributed a total number of 195 weekly course hours (SWS) of regular teaching at KIT. On average, these are 6 weekly course hours per YIN member. In comparison, a full professor in Baden-Württemberg teaches 9 weekly course hours (Verordnung der Landesregierung über die Lehrverpflichtungen an Universitäten - Lehrverpflichtungsverordnung LVVO).

In 2014, YIN members taught 98 SWS in lectures, 56 SWS in practical training courses, 11 SWS in tutorials and 30 SWS in seminars. In addition to teaching, YIN members supervise doctoral students, Diploma/Master and Bachelor theses. In 2014, 26 doctoral theses, 57 Diploma and Master as well as 54 Bachelor theses were prepared by students in YIN groups. An overview of this data is shown in Fig. 5.

KIT Associated Fellow

KIT has implemented the instrument of an Associate Fellowship to give junior research group leaders at a young age the chance to take total responsibility of their personnel and gain experience in human resource management. It offers the young group leaders the opportunity to not just contribute to supervising their group members, but also to take part in the doctoral examination of their doctoral students.

6 out of 11 faculties offer this chance to young group leaders, which is an important step on their way to professorship. A distribution of KIT-Associated Fellows at KIT can be seen in Fig. 6.

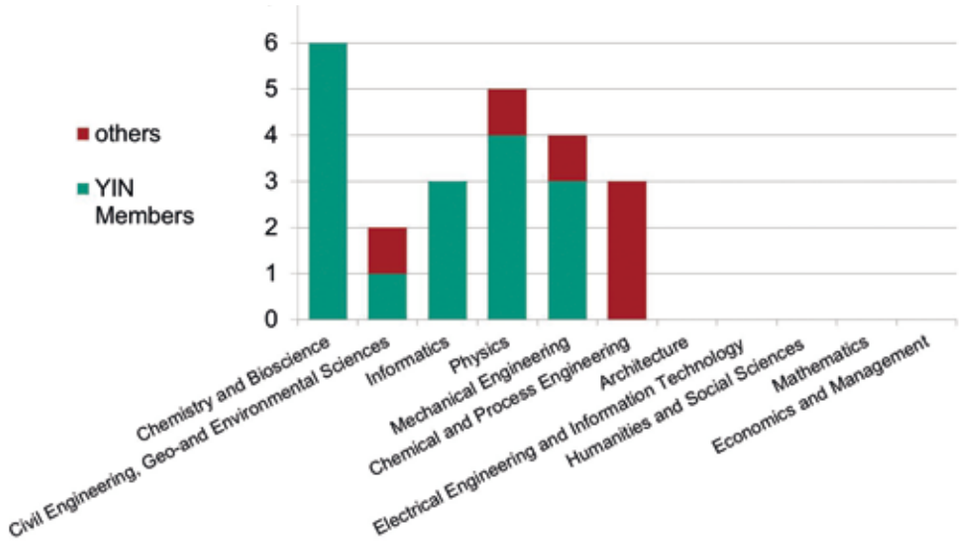


Fig. 6: Number of KIT Associated Fellows within different faculties at KIT. (Information given by the faculties in a telephone survey.)

Habilitation

The status of a junior group leader (Nachwuchsgruppenleiter mit Prüfungsberechtigung) was thought to replace the habilitation in future. However, the significance of the habilitation versus a junior group leader position is perceived differently in the faculties. Due to this, 85% of the participants still plan on making (26%), have completed (21%), or at least think about making (38%) their habilitation. Only 15% of the YIN members see the habilitation as dispensable for their career.

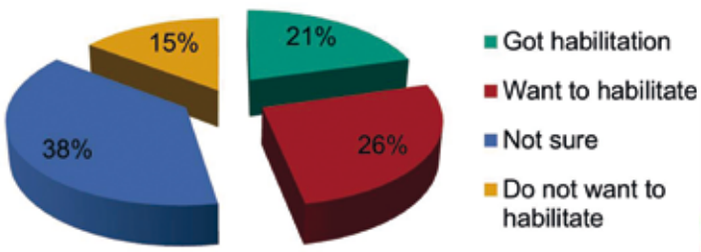


Fig. 7: Habilitation as seen by YIN members.

Publications, h-Index and Conferences

A total of 169 papers and articles were published in 2013 for the 34 (out of 64) groups that participated in this survey. The average Hirsch-Index of YIN members is 12 with a standard deviation of 4.7; the differences should be interpreted in light of different publication customs across the various disciplines represented in YIN.

Some of the papers are published in high ranking journals such as Advanced Materials, EMBO Report, PNAS (Proceedings of the National Academy of Sciences) and Small. In addition to publications, YIN members present their scientific work - and also represent KIT - at numerous occasions. In 2014, the 34 participants of this survey presented their research results at 116 international conferences.

Distribution of working hours

At this stage of their careers, the time young group leaders spend in their labs or writing papers diminish as other activities take more and more time and precedence. As all YIN members have personnel responsibility, 28% of their time is taken by supervising and mentoring, 16% by teaching and 13% by grant writing. Since all YIN members are third party funded this last point is a very important part of their job. Furthermore, there are increasing administrative duties they have to fulfill, which takes 15% of their time on average.

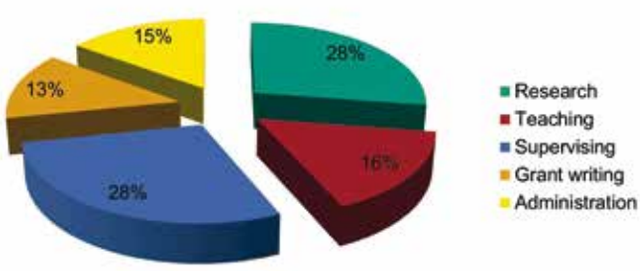


Fig. 8: Distribution of working hours of junior group leaders with personnel responsibility

YIN Lecture Series has started

Interview with organizer Dr. Guillaume Delaittre

Why start a lecture series?
The idea was to attract high-profile scientists who could gather people beyond academic levels and disciplines. At the same time, our aim is to increase the visibility of YIN by offering a recurrent event for interdisciplinary discussion. Dr. Pavel Levkin, now YIN alumnus, and I came up with the concept during a strategy meeting in 2014.

Nobel Laureates confirmed for 2016:
Prof. Harald zur Hausen *(Physiology and Medicine 2008, DKFZ, Heidelberg) in May,*
Prof. Stefan Hell *(Chemistry 2014, Max Planck Institute for Biophysical Chemistry, Göttingen) in September*
Prof. Jean-Marie Lehn *(Chemistry 1987, ISIS Strasbourg, France) in December*

What motivates you to organize the event?
I am curious by nature: topics from other disciplines included. As a chemist, I am trying to increasingly interact with biologists and physicists. In addition, I always had the disposition for organizing events… they were usually parties though! To be more serious, I find it very important to try to further the exchange between the various disciplines of science. It is not easy as everyone is studying very specific aspects nowadays. But I think it is important to try to a certain extent. I was recently comforted in this idea, reading in one of Albert Einstein's excerpts that he was campaigning for keeping scientific research interdisciplinary even then.

What are your hopes for the lecture series?
The installment of the YIN Lecture Series was quite a success: Prof. Metin Sitti gave an inspiring talk on "Small-Scale Mobile Robotics" to a large audience. The new KIT senate hall was almost full. The following questions and discussion clearly showed that also many non-specialists were interested in the topic. We got very positive feedback from those who attended.

For next time, I hope we will have even more people joining and that the room will be packed! The names and achievements of our confirmed speakers should help in that respect. But, as Prof. Sitti demonstrated, not only Nobel Laureates are fascinating scientists doing great research! So I hope the YIN Lecture Series will become a magnet on its own – Nobel Prize winners are sparse after all.

Life science meets simulation – *Nature* reports

Simulation of Wnt propagation by a filopodia mediated transport mechanism

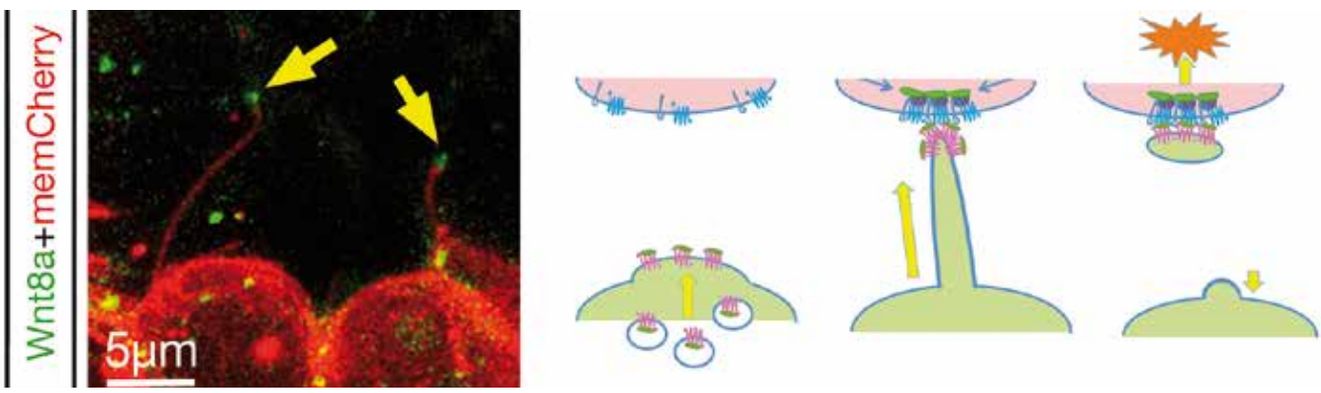
Cells reach out to each other by forming slender microspikes or filopodia. Signaling proteins attached to the tips of these structures can, thereby, be passed on to neighboring cells. But how can they actually be distributed over the whole organism? At the coffee table, developmental biologist Dr. Steffen Scholpp (l.) meets up with his fellow YIN member and simulation expert Dr. Alexander Schug (r.): The ideal combination for working out a robust computational model on how cells communicate over larger distances. The result of this YIN-funded project were published in *Nature Communications.*

Tissue development is a key process for life starting from the earliest embryonic stages during which stem cells differentiate into later organs composing the entire body. An essential component for these developmental processes but also for tissue regeneration and stem cell regulation is the communication of cells by chemical signaling. As a consequence, mis- or deregulated communication are often linked to human birth defects, cancer, and other major diseases.

The highly conserved family of Wnt proteins represents important regulators of all these processes mentioned above by inducing responses in a concentration dependent manner. The Scholpp laboratory identified a novel way of spreading of Wnt proteins in vertebrates: Wnt molecules are mobilized on specific cell protrusions so-called signaling filopodia. These specialized filopodia transmit signaling proteins between communicating cells and allow a high degree of control of propagation speed, direction and concentration of the transmitted ligand. The signaling molecules are delivered directly to the receiving cells by a direct contact model and parameters such as filopodia length or speed of filopodia formation dictate local Wnt concentration.

As it is very difficult to determine the specific impact of individual parameters in a complex biological system by a purely experimental approach, the Schug laboratory complemented the experimental measurements with computational modeling. Currently, both laboratories develop a robust quantitative mathematical model for the distribution of signal molecules on the basis of signaling filopodia.

Publication in Nature Communications:
E. Stanganello et al., Filopodia-based Wnt transport during vertebrate tissue patterning.
2015, 6: 5846



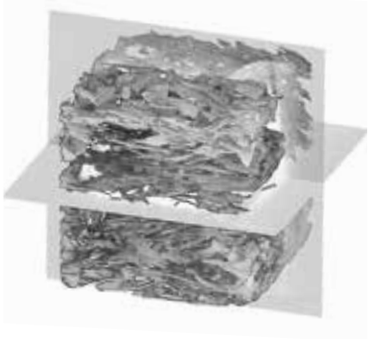
Live imaging of zebrafish cells displaying signaling filopodia (red) with Wnt8 protein (green) at the tip (yellow arrows). Schematic representation of Wnt transport on filopodia.(Images: Dr. Steffen Scholpp)

Deformation in high-strength composites

Processable like metal and at the same time strong as glass? Composite materials combine different properties but also imply challenges such as the metallurgic and mechanical interaction of the constituents. To better predict damage or crack evolution in aluminum reinforced with metal glass, composite scientist and YIN-alumnus Prof. Kay Weidenmann joined hands with Dr.-Ing. Katrin Schulz working on dislocation-based continuum models. The idea took form during an open-air lunch break in summer 2014 – one year later the results could be presented at the 20th International Conference on Composite Materials Copenhagen.

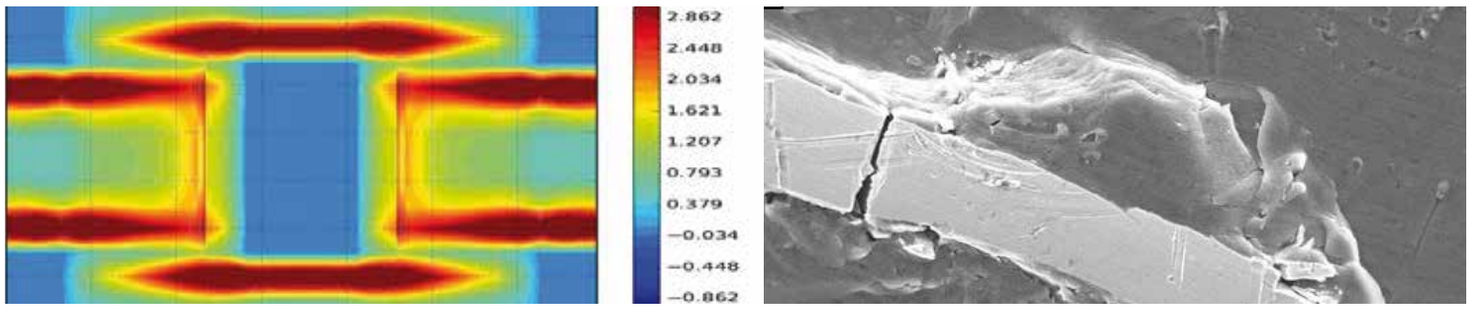
This YIN grant investigated the evolution of plastic deformation and micro cracks in metal matrix composites reinforced with metallic glasses made from $Ni_{60}Nb_{20}Ta_{20}$. The deformation behaviour was investigated experimentally by means of in-situ characterization of the composites under compression. The results from the materials characterization are compared to numerical analyses. A dislocation-based continuum model is adapted to the microstructure and allows to investigate the interaction between the impenetrable particles and the surrounding aluminum matrix. Local stress concentrations are analyzed which occur in these composites due to inhomogeneous dislocation movement and, hence, cause plastic deformation in the composite material. The predicted regions of high plastic slip concentrations in the model composite coincided with the occurrence of extrusions of matrix material during in-situ compression, hence proving the quality of the modelling approach used.

We did not expect to find such a good coincidence of the simulated forecast of the plasticity and the experimental results. This encouraged us to present this outcome on the 20th International Conference on Composite Materials in Copenhagen in July 2015, the largest conference on composite materials worldwide.



3D-microstructure analysis of cuboid sample showing the orientation of the metallic glass platelets inside the composite (Image: Institute for Applied Materials - Materials Science and Engineering, KIT)

K. Schulz, K. Lichtenberg, K.A. Weidenmann: Discussion of the Evolution of Micro Cracks by Characterization and Modeling of Metal Matrix Composites reinforced by Metallic Glass Particles, Proc. of the ICCM20, Copenhagen, 2015



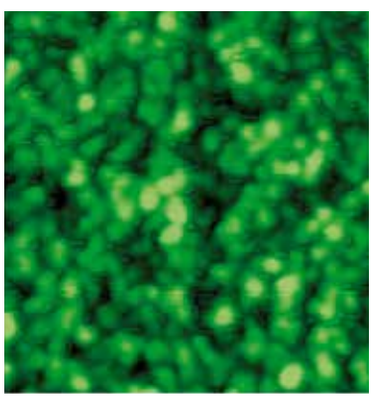
The distribution of plastic slip over the structure indicates the strongly inhomogeneous matrix behaviour during mechanical loading (left image: Institute of Applied Materials - Computational Materials Science, KIT). The predicted concentration of plastic slip on the inclusion edges corresponds to the formation of extrusions at these regions observed during in-situ-SEM-tests (right image: Institute for Applied Materials - Materials Science and Engineering, KIT).

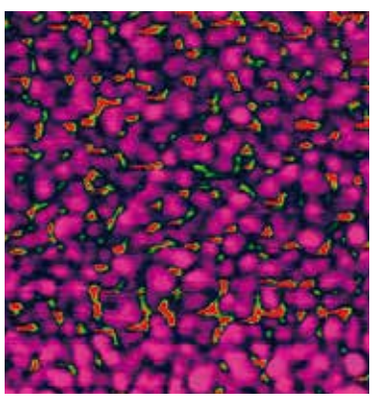
AFM-based characterization of peptide arrays

Allergies, ebola or cancer – many diseases that affect millions have unclear etymology and challenging diagnostic procedures. Multiple diagnostic tests can already be done in parallel using a lab-on-the-chip approach: Realized with high density dots (peptide arrays) on a glass slide by the group of PD Dr. Alexander Nesterov-Müller. However, so far the only way to see the disease-causing peptides was by detection of a fluorescent signal coming from died antibodies. Thus, important quantitative information about peptide arrays like their morphology, roughness and density were missing. That is where Dr. Julia Syurik's expertise in characterizing morphology of polymeric surfaces with atomic force microscope (AFM) comes in. The idea came up at a YIN-get-together and was realized due to the YIN-Grant.

The project profits from the synergies of both groups and develops new insights into peptide synthesis surfaces with nanoscale characterization of their morphology and phase contrast. The change of morphology for a full creation process of a peptide array was measured and analyzed. The pictures show AFM images of a PEG polymer layer after solid phase peptide synthesis and staining with antibodies. As PEG is a polymer blend, it is not surprising to see phase segregation on the morphology image (left). However, to see the strong inhomogeneity on the phase image (right) was unexpected. A 63 % phase difference suggests that peptides attach to the valleys in the PEG matrix, which was not known before. The minimal size of the islands with a non-polymer material is 8 nm, what corresponds to the radius of the cantilever.

These results can be used to understand protein folding, protein-protein interactions in vivo, cell migration and for development of novel bio inspired electronic materials. The novel methodology allows comprehensive varying of peptides in high density array format, thus giving clues for protein manipulation.





Both morphology (left) and phase image (right) show segregation of the PEG polymer blend. In the valleys created by the polymer another material with significantly different mechanical properties – presumably antibodies – can be seen. (AFM-Images: Dr. Julia Syurik)

YIN Grants 2015

Microstructured peptide arrays for high-throughput antibiotic and biofilm inhibitor screening
Dr. Felix Löffler, Dr. Jörg Overhage

Protein Structure Prediction by tracing Amino Acid Co-Evolution via Graph Theory
Dr. Alexander Schug, Jun.-Prof. Henning Meyerhenke

Towards Massively Parallelized Electrochemical Dip-Pen Nanolithography
Dr. Dr. Michael Hirtz, Dr. Julia Syurik

Prof. Detlef Löhe is first Honorary YIN Member

Dear Prof. Löhe,

On behalf of all active and former YIN members, we wish you all the best for your retirement. We are grateful not only for your vision – which led to the founding of our network – but especially for your loyal and compassionate mentorship of YIN since its formation.

All of us who have had the chance to meet you in person within the past years have valued your openness and honesty and greatly appreciated your leadership quality in particular. One reason for this certainly arises from how you always presented constructive criticism in an open, forthright, and appreciative manner.

We are certain that you will have many ideas and planned activities for your impending retirement. We wish you success in your future endeavors and, above all, good health! Please be assured that even far after your retirement, there will exist a network of young academics whose careers and personal development will be greatly fostered because you realized your vision for YIN with your tireless commitment.

PD Dr.-Ing. Timo Mappes,
Senior Vice President Innovation, ZEISS Vision Care BG
YIN speaker (2008-2011)
„My first touch-point with Prof. Löhe was when he acted as Dean of Mechanical Engineering, since them experienced him a very fair and target-oriented leader. On the very day of my PhD defense Prof. Löhe approached me, offering to join the small core-team for writing the „Concept for the Future" of what was to become KIT. It was my great pleasure to work with Prof. Löhe, as he was always fighting for the improvement of research and teaching at KIT. In some of the most critical weeks, there was no time-gap larger than 4 hours between his Emails. Researchers and students at KIT owe him a lot. I hope he will see the vision he had formed of KIT come to pass."

To express our deep appreciation, we would like to induct you as the first honorary member of YIN and hope to see you again in future.

S. Speidel

Dr.-Ing. Stefanie Speidel
Representative YIN Speakers

Dr. Christian Greiner

Dr. Dominic von Terzi
Manager at GE Global Research
YIN speaker (2008-2010)
„At the founding meeting of YIN, Professor Löhe promised its members independence and his support whenever we would ask for it. He stood by his promise and thus helped to create a space of freedom and creativity for young leaders early in their career. For this forming experience, I am deeply grateful and hope that his legacy will continue."

Prof. Christoph Eberl
Deputy Director at the Fraunhofer Institute Freiburg
YIN speaker (2008-2012)
„Als ehemaliger Sprecher des YIN hatte ich das Glück zusammen mit meinen Kolleginnen und Kollegen direkt mit Professor Löhe zusammenarbeiten zu dürfen. Was mich hier von Anfang an beeindruckt hat, war mit welcher großen Wertschätzung, Vertrauen und Freiheit wir bedacht wurden. Professor Löhe verstand es uns durch ein hohes Maß an Verantwortung, die er uns Nachwuchsführungskräften einräumte, optimal zu motivieren sowie kreative Ideen und Ansätze zu finden und am KIT umzusetzen. Für uns war auch immer klar, dass trotz seiner wohlwollenden Einstellung, ein Anspruchsdenken nicht unterstützt würde, sondern wir immer nur durch Leistung und überzeugende Argumente zum Ziel kommen würden – fördern durch fordern. Ich danke ihm für die lehrreiche Erfahrung in Bezug auf Führung, die ich bis heute sehr wertschätze."

Dr. Britta Trautwein
Director of the Karlsruhe House of Young Scientists (KHYS)
„Professor Löhe is a fighter and a visionary with great foresight. Thinking one step ahead of everyone else, he was always focused on the young researchers at KIT. When Prof. Löhe approached me with the idea to partner YIN and KHYS, we were provided the ability to connect young scientists on each academic level and further knowledge transfer among them."

Academic Leadership – what it means for me

Interview with Prof. Kay Weidenmann

Prof. Kay Weidenmann, KIT

What triggered your decision as YIN alumnus to get the Certificate Academic Leadership?
I was engaged in appointment procedures and was very well prepared for questions regarding my research profile. However, in the first interview I was invited to I was overrun by the first question about my style of scientific leadership. Only afterwards, did I realize its importance and started asking myself: How do I lead other researchers and what are my skills in this area?

Though, you had already managed your own research group as YIN member?
It was mostly learning by doing. My group had organically grown from one PhD student to more than six. It worked, but I had never really taken the time to reflect on the measures I'd taken or how they could be improved. After the above-mentioned interview, I had reached the point where I wanted to actively approach these questions and improve the quality of working in my group and the interaction between the group members including myself. I also realized, if I wanted to go for the certificate, it is now or never! The workload is not becoming any less when a scientific career proceeds.

Prof. Katja Schmitz
TU Dortmund
„Heading a research group implies a number of new tasks outside the actual science. The YIN qualification program has helped me a lot with leadership issues and the development of my group. It was very supportive that all participants were young research group leaders themselves but no competitors and that all cases were discussed confidentially and respectfully. The knowledge I obtained and the advice I got have been a great help since I accepted a professorship, in particular during the move and for supervising a split group at two locations."

Did the YIN-continuing education program convey all the skills you were looking for?
In retrospective, I can say, yes it did. Especially helpful to me were the courses on time- and self-management as well as on leadership in the gender context. Not to forget a course specifically addressing the dual function of group leader and coach: PhD students do not only expect to be lead but also to be supervised.

You were just appointed associate professor at KIT – did you profit from the certificate?
Well, negotiations are not part of the appointment procedure. But in the obligatory interview with the dean, I relied on my own qualities, presented what I have to offer and stood my ground. The leadership certificate certainly helped me deal with such interview situations – that is: how to present myself, what tactic to employ and also how to impersonate the role one plays in such a context.

Do you now lead your group differently?
Yes, we actually took a whole day to restructure the working processes. Today, I certainly lead my group more professionally and focused than I did two years ago.

On the side: *You also acquired the BW Certificate for Didactics in Higher Education. Wasn't that enough?*
The two certificates complement each other. Didactics is all about teaching. Academic Leadership is about how to build up and lead your group and how to establish yourself as a competent leader in science.

Could you give an example?
I used to have an open-door policy for upcoming questions of my doctoral students. Once their number grew up to ten, my office became like a pigeon loft, my advice not as sound as it could be. Now, we thoroughly discuss the status of each doctoral theses every four months and set intermediate goals until the next meeting.

Have you noticed positive effects, so far?
Yes. We evaluated my leadership skills. Group work beyond the individual topics was one of the critical point; the second was the quality of supervision. Both have noticeably improved.

And what comes after the certificate?
Continuity is really important. With the YIN certificate, you just got your leadership "driver's license". Still you need to practice, reflect and expand your knowledge to stay on top. Therefore, I also took part in the advanced course for leadership excellence offered by YIN this year.

Continuing Education towards Leadership Excellence

One major advantage for YIN members is having access to a high quality continuing education program – free of charge. The courses are exclusively for young research group leaders and junior professors, thereby providing an atmosphere of understanding and trust. While being specially tailored for young scientific leaders, the modular program also flexibly adapts to the current needs of YIN members: Twice a year, they decide which topics and skills will be most relevant to them in the upcoming semester.

The courses themselves are conceptualized, organized and implemented by the department of Personnel Development and Vocational Training (PEBA) of KIT. Highlights in 2014/2015 were the courses *Leadership Excellence*, *Organizing Application Papers for Professorship* as well as *Negotiations to Professorship* and *The Art of Presenting Oneself*.

By accumulating 200 units of attendance-time, passing the colloquium as well as developing a competence profile, young research group leaders and junior professors can obtain the certificate "Academic Leadership – Führung in der Wissenschaft" from the Presidential Committee of KIT.

The *Interim Review i*s the central element within the Continuing Education Program. In small groups YIN members identify their abilities and talents, at which point they are in their career and which steps are necessary to reach their personally set goals. During the moderated process, individual questions emerge and are discussed with the method of collegial coaching. Young research group leaders and junior professors can share their challenges and learn a lot about their own situation by reflecting on the questions addressed by their peers. The trustful atmosphere makes it possible for all participants to consider and reconsider old role models and sets the stage to work successfully on their leadership personality.

The course ***Leadership Excellence I*** focuses on developing the young researcher´s leadership competence. Topics include self-perception as a leader, strategic alignment of a team and selection of new staff, employee appraisal and anchorage in networks. Participants will also work on their own appearance, their presentation skills and their ability to realistically estimate implementation rates for their ideas and visions. The advanced training ***Leadership Excellence II*** shifts from topics concerning leadership of research groups to leadership of whole departments or companies. Alumni of the network can also take part.

Dr. Dominic von Terzi
Manager at GE Global Research
„My current employer is spending one billion U.S. dollars in employee development each year and is recognized as a role model in global leadership development for more than a century. Still, I regard the leadership training that was developed with and specifically for YIN as second to none. I believe that I have a competitive advantage over many of my peers from skills developed and insights learned there. Elements like coaching, providing feed-back, stress management, leading others and many more are as timely as ever. But that courses and seminars are designed based on development needs identified by YIN members in peer counseling I find extraordinary.

Habilitation – out of date or currently

Professor without habilitation? The legal framework for higher education in Germany allows alternatives: Junior professors, junior research group leaders and experts from industry with a PhD can also apply for professorship. However, some young scientists end up walking multiple paths instead of just a single track.

Martin Nöllenburg (36)
Assistant Professor at the TU Vienna
formerly head of KIT-Young Investigator Group (YIG) and private lecturer (PD)

You've successfully led a junior research group. Why did you also habilitate?
In Germany, we have quite a variety of different junior research groups and, as in my case, not all of them are known outside the KIT. In job interviews throughout Germany and neighboring countries, I always had to explain, how I acquired my YIG and how competitive the process was. A habilitation, in contrast, is the classical qualification and accepted as such. In Austria, it is required for my contract to become permanent.

What about the Anglophone countries?
In the USA or even the UK, the PhD is the only formal requirement. They rather look at your scientific achievements and your teaching experience. A junior research group stands for third-party funding which is perceived very positively.

Its reputation is one reason, what else speaks for a habilitation?
At KIT it gives you more rights than junior group leaders or even associate fellows. As a private lecturer you can, for example, award doctorates like any professor. For junior group leaders it differs from faculty to faculty. Associate fellows can be PhD examiners, but they still need a professor from their faculty as well as an external one. Moreover, private lecturers can teach independently. For me it did not make a difference, but many junior research group leaders still depend on the head of their institute.

Should young scientists rather go for a habilitation that a junior research group?
Not at all! The habilitation is just a formal qualification. Leading a group gives you a working basis: You finance your own research project, you have personnel responsibility, and you are much more independent than postdocs doing their habilitation.

Corinna Hoose (35)
Professor at Institute of Meteorology and Climate Research, KIT
Helmholtz group leader

Did you plan to habilitate when you were a junior group leader?
Yes, I did and probably would have followed through, had I not been engaged in the appointment procedure for professorship. It took quite a while and I didn't want to start anything that might interfere. After all, by inviting me, the commission had already acknowledged my accomplishments as equivalent to a habilitation.

Did it become an issue during the procedure?
Not the habilitation itself but rather my experience in independent teaching. Had I habilitated, I probably wouldn't have had to provide further proof. As it were, I had already held my own classes for two terms, aiming to qualify for professorship, but wasn't listed in the official university calendar as the person mainly responsible those classes. In the end, however, it counted.

a must-have for professorship?

So why had you even considered habilitating?
I think, I would only have done it, if the additional effort wouldn't have been significant. That is habilitating cumulatively instead of writing a lengthy monography. In principle, I did all the work required for a habilitation anyway: raising funds for my projects, writing publications and holding lectures. However, I wasn't entitled to examine the PhD students I supervised. Young investigator group leaders from other Helmholtz centers are usually granted the right to award doctorates at the universities they were associated with.

Did you encounter other situation where a habilitation might have been an advantage?
No, not really. I know quite a few colleagues who were appointed professor without a habilitation. Often they are former group leaders, be it Helmholtz, Emmy-Noether or something similar. It would have eased my mind, had I been aware of that back then when I applied.

Did not being habilitated affect your status?
Yes and no. In the scientific community it played no role at all, you would rather be asked about the size of your group than a habilitation. Within the physics faculty, however, I had no place as a mere group leader.

Christian Greiner (37)
Emmy Noether group leader at the Institute of Applied Materials, KIT

Are you asked for a habilitation when applying for professorship?
No, not so far. Leading an Emmy-Noether group is sufficient. At least in my field of research. The programme is very well established in the German science system.

And in the European context?
Many countries have similar instruments. So I compare my group to those or to the Starting Grant of the European Research Council. But often, this is not necessary. Emmy-Noether enjoys an excellent reputation that even reaches the United States.

So recognition is not an issue. Are there other reasons to habilitate?
In most disciplines you can really do without. However, it might advance your status at a department, especially, when there is a time lapse between your Emmy Noether Group and the appointment for professorship. While having the group, it depends very much on the university. In Germany, the majority grants Emmy-Noether group leaders the rights of junior professors. In so far, KIT is an exception. Besides this, I have heard that a habilitation is appreciated at applied universities – probably because private lecturers can award doctorates, while the institution itself can't – at least not yet.

Would habilitating further any extra skills?
No, I don't think so. I teach, I offer my own lectures and I publish my scientific results. I don't expect I would gain much by putting them all together for a habilitation thesis.

And in contrast, what do you gain from leading a group?
Two major aspects are personnel and science management – that is how to lead a group and how to set up your own research project. You also have to get to grips with independence: to be free to pursue new scientific ideas, but also to be solely responsible for the progress.

Is the habilitation out-dated in your option?
I think, by and by, the habilitation will be replaced by junior research groups, Juniorprofessorships and such.

Dr. Damian Cupid
Institute for Applied Materials

Helmholtz-Young Investigator Group
Integrated Computation Materials Engineering of Electrochemical Storage Systems

Dr. Andreas Haupt
Institute for Sociology, Media- and Cultural Sciences

KIT-Junior Research Group
Economic Inequality and Labor Markets

Dr. Gerardo Hernandez-Sosa
Light Technology Institute

BMBF-NanoMatFutur
Printed and Sustainable Electronics

Dr. Dr. Michael Hirtz
Institute of Nanotechnology

Research Group with third-party fundings
Bioactive surfaces and sensor functionalization by Dip-Pen Nanolithography and related techniques

Dr. Patrick Jochem
Institute for Industrial Production

KIT-Junior Research Group
Interaction of Science and Technology with Society | Energy, Transport, and Environmental Economics

Dr. Samiro Khodayar
Institute of Meteorology and Climate Research

BMBF-Young Investigator Group
Predictive Models for Extremes and High Impact Weather under Climate Change

Jun.-Prof. Boris Neubert
Institute for Visualization and Data Analysis

Juniorprofessorship
Visual Computing

Dr. Lars Pastewka
Institute for Applied Materials

Emmy-Noether Group
Atomic-scale modeling of contact, friction and wear

Dr. Achim Rettinger
Institute of Applied Informatics and Formal Description Methods

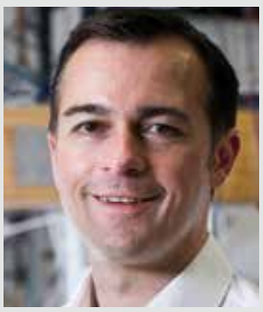
KIT-Junior Research Group
Adaptive Data Analytics - Inferring Knowledge Across Modalities

Jun.-Prof. Petra Schwer
Institute for Algebra and Geometry

Juniorprofessorship
Geometric and combinatorial group theory

Dr. Kathrin Valerius
Institute for Nuclear Physics

Helmholtz-Young Investigator Group
Analysis of KATRIN data to measure the neutrino mass and search for new physics



Dr. Martin Weides
Institute of Physics

ERC Consolitator Grant
Quantum computing with superconducting qubits, and hybrid quantum systems

Name	Group	Instiution	Current position
Marc T.P. Adam	YIG Young Investigator Group (KIT)	University of Newcastle, Australia	Lecturer
Felix Fritzen	YIG Young Investigator Group (KIT)	University of Stuttgart	Emmy-Noether group leader
Clemens Grabher	Marie Curie Scholar	Austria	Management Food Industry
Christoph Jacob	CFN Junior Research Group (KIT)	TU Braunschweig	Professor for Theoretical Chemistry
Tobias Jochum	YIG Young Investigator Group (KIT)	Economy	
Pavel Levkin	Helmholtz Young Investigator Group ERC Starting Grant	Karlsruhe Institute of Technology	Group leader
Emmanuel Müller	YIG Young Investigator Group (KIT)	Hasso-Plattner-Institute, Berlin University of Potsdam	Professor for Informatics
Alexander Nesterov-Müller	ERC Starting Grant	Karlsruhe Institute of Technology	Group leader
Martin Nöllenburg	YIG Young Investigator Group (KIT)	TU Wien, Vienna, Austria	Assistant Professor for Informatics
Peter P. Orth	YIG Young Investigator Group (KIT)	University of Minnesota, USA	Senior Research Scholar
Wolfram Pernice	Emmy Noether Group	Westphalian Wilhelms-University Münster	Professor for Physics
Ramona Piat	Heisenberg Scholar	University of Applied Sciences Darmstadt	Professor for Mathematics
Martin Seipenbusch	Shared Research Group (KIT)	University of Stuttgart	Group leader
Carsten Sinz	Shared Research Group (KIT)		
Miriam Sinnhuber	Helmholtz Young Investigator Group	Karlsruhe Institute of Technology	Group leader
Svetoslav Stankov	Helmholtz Young Investigator Group	Karlsruhe Institute of Technology	Group leader
Lars Wegner	Shared Research Group (KIT)		

Cosmic Radiation hints at Dark Matter

Ten times heavier than the Milky Way, taking up ten times its space and yet imperceptible: Dark matter is presumed to form a giant spherical halo around our galaxy. Physicists use this concept to explain observed gravitational effects in the universe. While they have collected overwhelming evidence for the existence of dark matter, its components remain elusive. A close analysis of cosmic radiation may yield hints: The Young Investigator Group of Dr. Iris Gebauer has detected a sharp increase in high-energy positrons, the anti-particles to electrons, which indicates a new positron source. Dark matter is a possible candidate. This hypothesis could also explain the number of measured antiprotons rising in parallel.

"Dark matter is basically everywhere, permeates everything but almost never interacts. Therefore, it is hard to detect directly," says Dr. Gebauer. With the Alpha Magnetic Spectrometer AMS, a huge particle detector on board the International Space Station, her group searches for indirect evidence in cosmic radiation: Coliding dark matter particles eventually fragment into traceable particles of opposite charge known from the standard model of particle physics. Without disturbance from the earth's atmosphere, the young investigators detected variations in the positron flux: Its intensitiy rising significantly between 8 and 275 giga-electron-volts. "Measurements in the relevant energy range have never been more accurate," the research group leader enthuses. "They actually challenging our calculations - just speaking on a percentage level is a novelty in astrophysics."

The peak of high-energy positrons at 275 GeV suggests a new positron source."Dark matter is one explanation, but there might also be point sources like rotating neuron stars, called pulsars," Dr. Gebauer continues. To narrow down the possible options, her group also took a closer look at the antiproton flux: Without an additional source it was predicted to decrease steadily. However, the data revealed a flat behavior up to 500 GeV. "This anomaly is not prominent enough to ensure that a new source exists, but it does comply with the hypothesis of dark matter, which predicts an increase in antiprotons," so the research group leader. Pulsars, on the other hand, do not produce antiprotons.

To further distinguish between possible sources, the junior scientists are going to measure the directional dependence of high-energy positrons. "Originating from a local point source, we would expect all the positrons to come from the same direction," explains Gebauer. Positrons from the annihiliation of dark matter particles, however, could advance from everywhere."

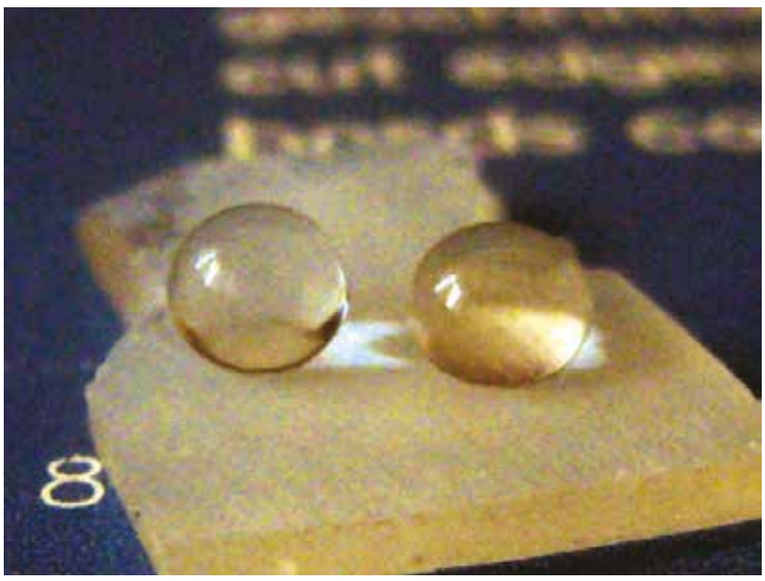
AMS will continue its journey on the ISS for at least another nine years. The additional data, as well as future missions onboard the ISS, will help to pin down the essence of dark matter or whatever is out there.


© NASA

Water and Oil Roll off new Material

Walls to which no graffiti paint sticks or shoes that remain clean on muddy paths – the material "Fluoropor" might make it possible. Both water and oil droplets roll off this new class of highly fluorinated super-repellent polymers. The Federal Ministry of Education and Research (BMBF) has now decided to fund its further development within the young investigator group of Dr. Bastian Rapp with 2.85 million euro.

The phenomenon is known from lotus plants as well as from cabbage leaves: Water droplets simply roll off. "This trick, however, does not work for oils," group leader Bastian Rapp explains. "Oil-repellent surfaces need to have another chemical structure, fluoropolymers are required for this purpose." These are high-performance plastics with a high heat resistance and chemical stability. Teflon, the known anti-stick coating material for frying pans, belongs to this category of substances.



The novel material "fluoropore" repels water (left) and oil (right). These droplets do not adhere to or wet the surface. (Photo: Dr. Bastian Rapp, KIT)

"When combining the chemical properties of fluoropolymers with the roughness of the lotus plant on one surface, both water and oil droplets will roll off," Rapp says. He has already succeeded in producing such super-repellent surfaces with this lotus 2.0 effect in the laboratory. In practical use, however, they turned out to have an insufficient stability. A big problem is sensitivity to abrasion. Rapp therefore works on developing a new class of fluorinated polymers which are far more robust. These polymers, called "Fluoropor", are to possess the lotus 2.0 effect on nearly any surfaces and thus form universal protective coatings against any type of staining. On car window panes, for example, they would prevent water from condensing and freezing in winter.

The research project of the young KIT scientist was recently successful in the NanoMatFutur competition for young scientists launched by the Federal Ministry of Education and Research (BMBF). Rapp's project "'Fluoropor' – chemically inert, micro- to nanoporous 'teflon' with an adjustable wetting behavior" is granted 2.85 million euro for the establishment of a young investigator group in the next four years. By the NanoMatFutur competition, the BMBF supports highly qualified young scientists in the areas of materials research and nanotechnology. Funds are granted to application-oriented fundamental research projects with a high industrial implementation potential.

In the young investigator group headed by mechanical engineer Rapp, chemical process engineers and experts of organic chemistry, materials chemistry, and process technology work on the development of the new material. "At the KIT Institute of Microstructure Technology and its Karlsruhe Nano Micro Facility, we can use a large variety of analysis and structurization methods for our work, for example, scanning force and scanning electron microscopes," Rapp emphasizes.

Climate reseachers on board Polarstern

The greenhouse gases carbon dioxide and methane are the drivers of man-made climate change. To assess their sources and sinks, dense observation coverage and high measurement precision are essential. Remote sensing by satellites delivers very high data density. The achievable accuracy, however, needs careful validation through ground-based measurements. To cover remote regions, the Emmy-Noether group RemoteC, led by Dr. André Butz, has developed spectrometers that can be installed on mobile carriers such as ships or cars. The first field deployment took place on board of the German research vessel "Polarstern" in 2014. Covering the distance from Capetown to Bremerhaven, the campaign records constitute one of the few datasets available for validating satellite measurements above the ocean. Further, the transect from the Southern into the Northern Atlantic is suited to verify the interhemispheric transport of greenhouse gases in meteorological models.

"We need a better understanding of the natural carbon cycle to fully determine the impact of man-made emissions on the climate," Dr. Butz explains. Each year, over 210 billion tons of carbon dioxide and methane are exchanged between the Earth's surface and the atmosphere – all the while preserving a subtle net balance which is disturbed by anthropogenic emissions. RemoteC focuses on the mass transfer of carbon dioxide and methane: "We want to identify carbon sources and sinks and determine which fraction of man-made greenhouse gases remain in the atmosphere." From deck of the Polarstern, the KIT-spectrometers measure direct sunlight.

© Folke Mehrtens, Alfred Wegener Institute

By analyzing the absorption features, the scientists determine the concentrations of carbon dioxide and methane. "Our ship-based measurements are about 5 to 10 times more accurate than satellite observations," says the research group leader. "From their position in space, satellites collect sunlight that has been reflected by the Earth's surface and atmosphere. In the process, airborne particles such as aerosols or thin clouds might scatter the incoming sunlight and perturb its path."

The researchers compared the Polarstern records with those from the Japanese Greenhouse Gases Observing Satellite (GOSAT): While the satellite accurately reproduced the North-South concentration gradients, the spread of its soundings was substantially greater than the expected measurement precision. Currently, the European Center for Medium Range Weather Forecasts (ECMWF) uses the campaign records to gauge their greenhouse gas model.

The equipment of the research group RemoteC is being loaded and set up on board the research vessel Polarstern. (Photos: Friedrich Klappenbach, KIT)

"Our setup, based on portable spectrometers and fast solar trackers, has demonstrated its capabilities for field deployments on moving platforms," emphasizes Butz. In September 2015, his team carried their instruments to mount Aetna on Sicily to observe volcanic carbon emissions.

What we stand for

YIN, a group consisting of research group leaders and junior professors in the early stages of our scientific careers, was created in 2008 as part of KIT's Excellence Initiative program. Our members occupy that critical step between post-docs and tenured professors, an important, but often overlooked period. The continued existence of YIN is a testament to role it fills and service it provides to our members. Our mission, comprised of the following three statements, has and will continue to guide YIN.

We encourage each YIN member to become a better group leader. YIN members can take part in continuing education courses tailored to the needs of young group leaders in cooperation with PEBA. These courses include topics such as developing leadership abilities, improving research and teaching performance, as well as personal coaching. Rather than a static offering of courses, our members suggest and vote on desired themes to ensure that these courses directly meet our needs. YIN members can also discuss and compare their experiences with other members and alumni. These discussions can help new members navigate KIT and older members plan their next steps.

We represent the interests of all independent young investigators at KIT. Our group leaders face an uncertain future given changes to the academic landscape and leadership priorities at KIT. YIN represents our interests by working with and persuading the administration to best define our official standing, the supervision of doctoral students, and other rights and responsibilities. This area has received renewed interest in the last year, as highlighted within this newsletter, as KIT reevaluates the pathway towards KIT professor and the role of independent group leaders. YIN has also hosted discussions with representatives from Baden-Württemberg and various funding sources to understand and shape the policies affecting our members.

YIN strives to make KIT an ideal place for young scientists. YIN helps its members thrive in their research pursuits by encouraging collaborative discussions and projects. Interdisciplinary clusters help to bring members of related disciplines together to share their respective expertise and resources. YIN Grants provide a further incentive to pursue these collaborative projects. YIN has also invited leading scientists to speak to YIN members directly and to an open audience as part of the YIN Lecture Series. YIN also maintains a network of alumni and contacts with industry with which our members can discuss research opportunities.

While our three mission statements have remained relatively unchanged throughout the years, our interpretation has evolved in response to member interests. We sincerely hope that YIN will continue to help our members grow, prove their independence and receive recognition in their respective fields. We also want KIT to remain an attractive place for young investigators. These goals require the active participation of our members and the support of the KIT community. To that end, this newsletter has been prepared to provide you with an update on our membership and activities.

YIN Speakers: Dr. Stefanie Speidel, Dr. Christian Greiner, Dr. Erin Koos, Dr. Dr. Michael Hirtz, Dr. Julia Syurik, Dr. Achim Rettinger (Photo: Markus Breig, KIT)

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