Max-Planck-Institut für biophysikalische Chemie

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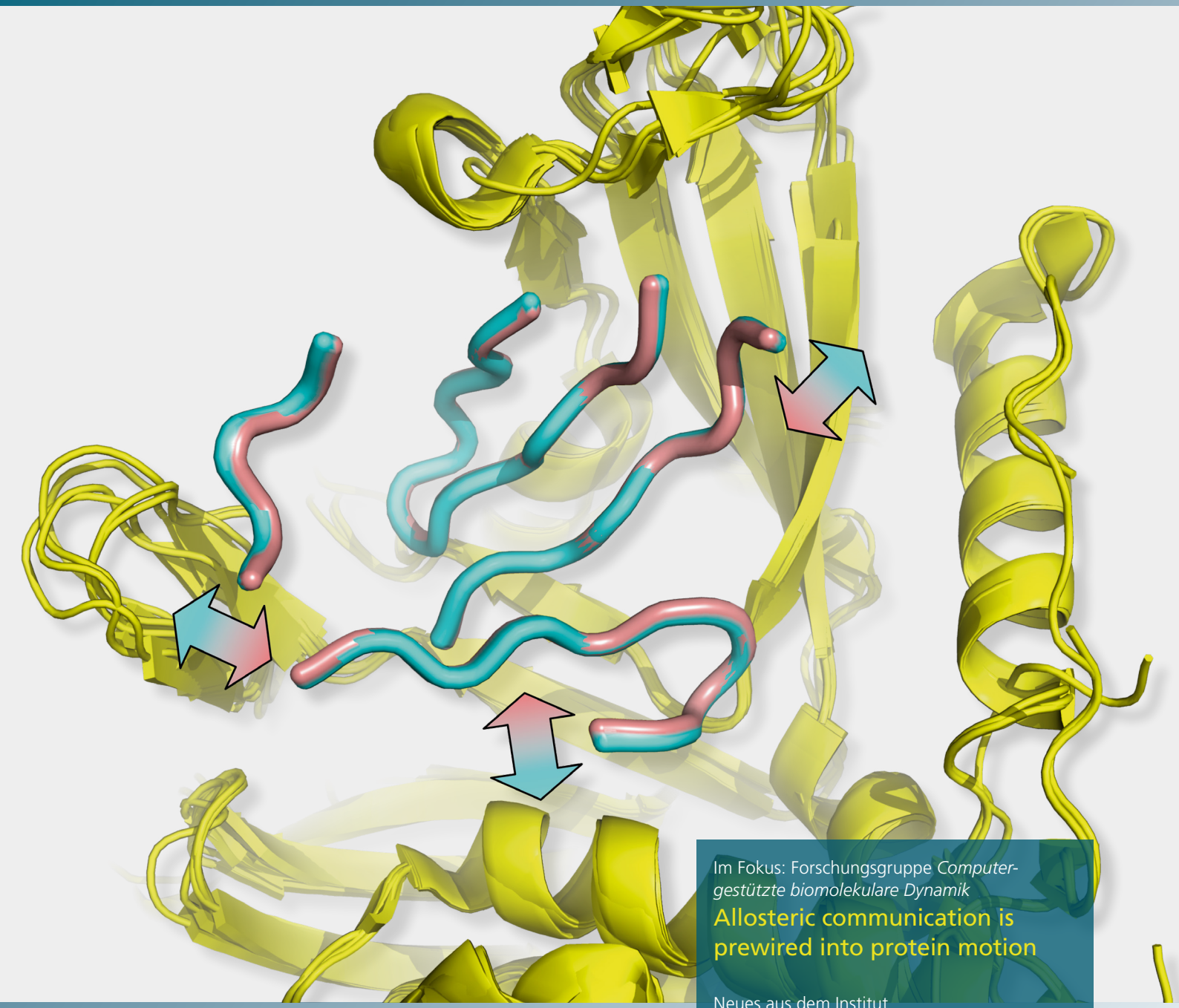

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Allosteric communication is prewired into protein motion

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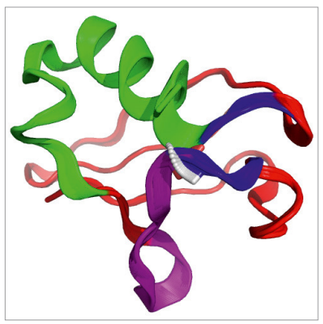

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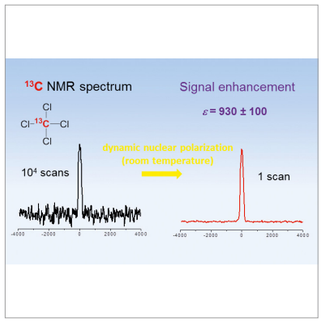

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AUS DER MAX-PLANCK-GESELLSCHAFT

Titelbild: Allosterisch reguliertes Zusammenziehen von Ubiquitin erlaubt die Bindung an Ubiquitin-spezifische Proteasen (Deubiquitinasen, gelb). *(Abbildung: Colin A. Smith / MPI-BPC)*

Cover image: Allosterically regulated, sub-angstrom contraction of ubiquitin enables binding to ubiquitin specific proteases (deubiquitinases, yellow). *(Image: Colin A. Smith / MPI-BPC)*

Hinweis: Obwohl aus Gründen der Lesbarkeit im Text die männliche Form gewählt wurde, beziehen sich die Angaben stets auf Angehörige beider Geschlechter.

Allosteric communication is prewired into protein motion

Colin A. Smith, David Ban, Supriya Pratihar, Karin Giller, Maria Paulat, Stefan Becker, Christian Griesinger, Donghan Lee, Bert L. de Groot

Research Group *Computational Biomolecular Dynamics* &
Department of *NMR-based Structural Biology*

To enable living organisms to respond to their environment, they have evolved mechanisms for rapidly communicating signals from one region to another. In individual protein structures, this happens through a process called allostery, where a change in shape at one part of the protein causes a corresponding change elsewhere in the macromolecule. By combining state-of-the-art experimental and computational techniques, we have developed an atomic picture of how this takes place in the case of ubiquitin. Importantly, the allosteric coupling is an intrinsic part of the protein motion, suggesting that identifying such motions could lead to new ways of regulating proteins and treating diseases.

Proteins play a pivotal role in biological processes. In order for folded proteins to fulfill their function correctly, it is critical that they are either activated or inactivated at the correct times. One of the key ways this is done is through allosteric regulation, which involves communication between distant regions of protein structures. However, the mechanisms behind this communication, especially the role of intrinsic protein motion, are often still not well understood.

In a long-standing collaboration between the Research Group *Computational Biomolecular Dynamics* and the Department of *NMR-based Structural Biology*, we have been focused on determining the nature of these motions. In the course of these studies, we discovered a novel allosteric pathway in human ubiquitin, a protein not previously known to be allosteric and usually thought to be relatively rigid. As the name implies, ubiquitin is involved in many different cellular processes, usually through its chemical attachment to other proteins. One of the dominant reasons for this tagging is to mark proteins for recycling or degradation.

The primary experimental technique we used in the study was nuclear magnetic resonance relaxation dispersion (NMR-RD), which sensitively probes microsecond to millisecond biomolecular motions and was recently used to detect the presence of such motions in ubiquitin[1-3].

To build a detailed structural model capable of identifying allostery, we conducted an in-depth NMR-RD analysis

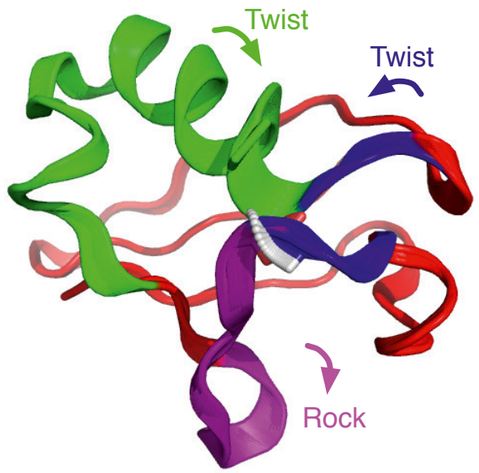

Fig. 1: An atomic model for microsecond motion in ubiquitin links rotation of a peptide bond (center) to a global motion involving twisting and rocking of semi-rigid structural elements (green, blue, and purple).

Abb. 1: Im atomgenauen Modell der mikrosekundenschnellen Bewegung im Ubiquitin ist die Rotation einer Peptidbindung (Mitte) an eine globale Bewegung gekoppelt, die Dreh- und Schaukelbewegungen halbstarrer Strukturelemente (grün, blau und violett) beinhaltet.

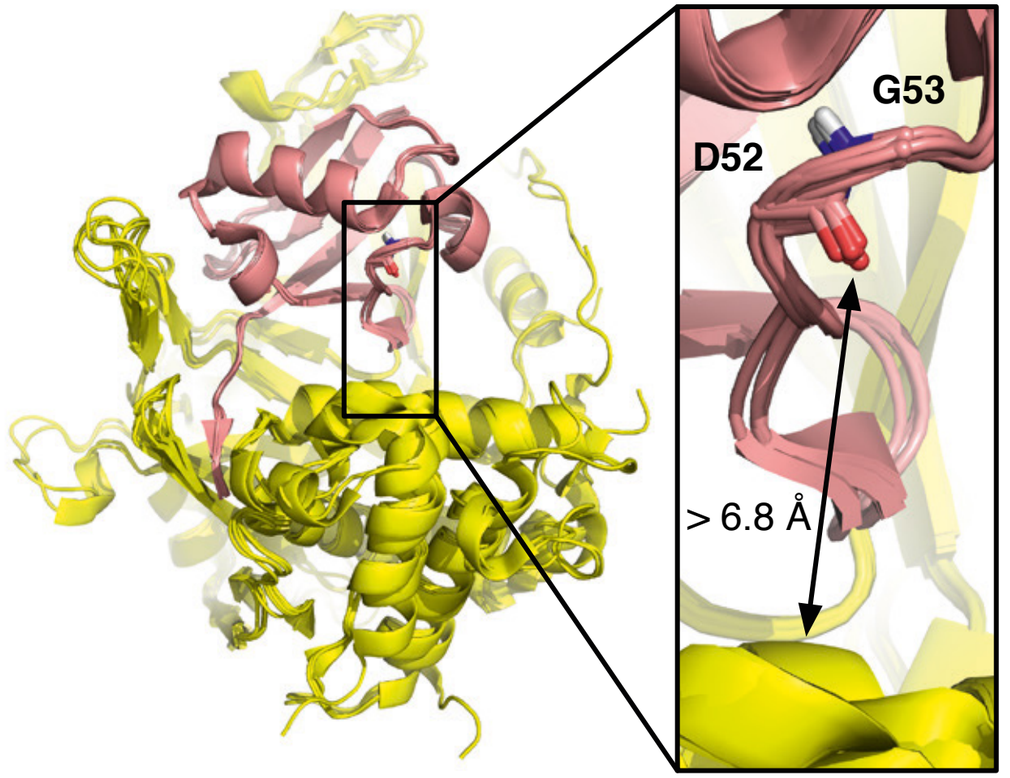

Fig. 2: The conformation of the D52-G53 peptide bond is allosterically coupled with the rest of the ubiquitin structure (pink) and affects binding to a ubiquitin specific protease (USP) deubiquitinase (yellow), even though the peptide bond is far away.

Abb. 2: Die Konformation der Peptidbindungen D52-D53 ist allosterisch an die übrige Ubiquitin-Struktur (rosa) gekoppelt und beeinflusst die Bindung an die Ubiquitin-spezifische Protease (USP) Deubiquitinase (gelb), selbst wenn die Peptidbindung weit entfernt ist.

of the backbone and side chain methyl groups of ubiquitin. This survey showed many atoms (>30) with microsecond fluctuations which are distributed throughout the structure. Strikingly, nearly all showed the same exchange rate, which suggests that ubiquitin undergoes collective motion involving both the backbone and the side chains. Furthermore, comparison of different methyl nuclei indicates that the nature of the side chain fluctuations is almost entirely due to changes in the populations of different side chain conformations. Therefore, a key finding was that while side chains rapidly switch between different conformations, the relative populations of those conformations change over time due to slow backbone motion through a mechanism we termed "population shuffling"[4].

While the NMR-RD experiments provide high-quality atomic resolution data, the interpretation of such data can be difficult because it depends on subtle structure-induced changes in the magnetic field experienced by each atom. To address this problem, we developed a novel computational algorithm to determine a single collective description of the motion that represents an atom-level reaction coordinate corresponding to the NMR-RD data.

The resulting model suggested that a localized peptide bond switch distant from the binding interface was allosterically coupled to changes throughout the structure. To test this hypothesis, we made several mutations that were known to bias the peptide bond towards a single conformation. These mutations silenced motion at nearly all the atoms where it was observed in the natural protein. Furthermore, the pattern of perturbations to the peak locations in the NMR spectrum was highly correlated with what would be expected from the NMR-RD data. Put together, this confirmed the presence of this long-distance communication between the peptide bond and backbone and side chain motion all over the molecule.

To explore the function of this allosteric network, we analyzed a completely different set of data, namely previous high-resolution crystal structures solved by X-ray crystallography. Through our analysis, we found one set of ubiquitin binding proteins – the ubiquitin specific protease (USP) deubiquitinase family – always crystallizes with a conformation of the key peptide bond that is rarely observed in other complexes. This would not be surprising except for the fact that the peptide bond is at least 7 Å away from any part of the USP structure.

Given the large number of ubiquitin structures available, we thought there might be a statistically significant correlation between the coordinates of ubiquitin atoms that did interact with the USP and the peptide bond conformation. Using advanced machine learning algorithms[5], we found this was indeed the case. Follow-on mutational studies showed that restriction of the peptide bond to a conformation not observed crystallographically led to a decrease in binding affinity. This work demonstrated the importance of allosteric regulation and conformational changes in enabling multi-specificity.

In summary, we found that nearly all the microsecond motion in ubiquitin could be explained by a collective global motion involving both the backbone and the side chains. Moreover, an integral part of that motion was a discrete structural switch distant from where ubiquitin usually interacts with other proteins. This conformational switch is allosterically coupled to changes on the other side of the protein that affects binding to an important ubiquitin regulatory enzyme.

The approach taken and the corresponding computational tools we developed should enable the determination of high-resolution models of how allostery functions in other proteins, which may enable the development of chemical probes and therapeutics that alter these preexisting allosteric motions.

Original publication

Colin A. Smith, David Ban, Supriya Pratihar, Karin Giller, Maria Paulat, Stefan Becker, Christian Griesinger, Donghan Lee, Bert L. de Groot: Allosteric switch regulates protein-protein binding through collective motion. *Proc Natl Acad Sci USA* **113**, 3269-3274 (2016).

www.mpibpc.mpg.de/groups/de_groot/ubiquitin_allostery.html

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Allosterische Kommunikation in Proteinbewegung kodiert

Damit lebende Organismen auf ihre Umwelt reagieren können, haben sie Mechanismen entwickelt, die es ermöglichen, Signale schnell zwischen verschiedenen Proteinregionen weiterzuleiten. In einzelnen Proteinen geschieht dies durch einen sogenannten allosterischen Prozess, bei dem die Formänderung in einem Teil des Proteins eine entsprechende, damit zusammenhängende Veränderung an einer anderen Stelle im Makromolekül verursacht. Durch Verknüpfung modernster experimenteller und computergestützter Techniken konnten wir ein atomistisches Bild entwickeln, wie dieser Prozess im Protein Ubiquitin abläuft. Entscheidend ist hierbei, dass die allosterische Kopplung ein intrinsischer Teil der Proteinbewegung ist. Aus der Kenntnis solcher Proteinbewegungen könnten sich neue Ansätze für die Regulation von Proteinen und die Behandlung von Krankheiten ergeben.

Enhancing carbon-13 NMR signals in liquids

Limitations in sensitivity often complicate the analysis of complex (bio)molecules by nuclear magnetic resonance (NMR) spectroscopy. Now, a research team headed by Marina Bennati at the MPI-BPC, together with colleagues at the University of Florence (Italy), has shown that carbon-13 (^{13}C) NMR signals can be strongly enhanced in solution by resonant microwave irradiation of a nitroxide organic radical used as polarizer for ^{13}C nuclei. The new method shows up to 1000-fold improvements in sensitivity and promises to study small molecules and metabolites in much greater detail. (*Nature Chemistry*, February 13, 2017)

Nuclear magnetic resonance (NMR) is a fundamental spectroscopic technique for studies of biological systems and materials, molecular imaging as well as analytics of small molecules. Since it detects interactions at a very low energy scale, it is non-invasive and applications include animals and humans. Despite of its achievements, one of its most severe limitations is the low sensitivity, which results from the small interaction energies involved. Accordingly, this issue has been a long-standing goal in the field, leading the community to a continuous search for new excitation and detection technologies.

One way to boost NMR signals is through dynamic nuclear polarization (DNP), in which microwave irradiation transfers spin polarization from electrons of a stable organic radical to nuclear spins of interest. DNP has historically worked well in solid-state NMR experiments, but struggled in liquids. Marina Bennati and her team, in collaboration with Italian colleagues, have now demonstrated, for the first time, that signal enhancement of 2 to 3 orders of magnitude for room-temperature ^{13}C NMR experiments can be achieved by DNP at magnetic fields around 3 Tesla and experimental conditions relevant for liquid NMR as well as magnetic resonance imaging (MRI).

Polarization transfer in liquids is driven by electron-nuclear cross relaxation resulting from molecular motion. It was thought that translational and rotational diffusion of molecules provide the main mechanism for cross relaxation, which becomes intrinsically ineffective at increasing magnetic fields (that is, at Larmor resonance frequencies of electron spins around 100 GHz and higher). One work-around proposed in the past has been to polarize the nuclei at very low temperatures in the solid state and then rapidly warm up the sample into the liquid state. But that approach limits the signal acquisition to a single scan and poses the sample under an enormous temperature-stress. After optimizing several parameters in the DNP-NMR protocol, the scientists observed that fast molecular collisions in the pico- to sub-picosecond time scale can drive the polarization transfer at high magnetic fields by modulating scalar hyperfine interactions between electron and ^{13}C nuclear spins.

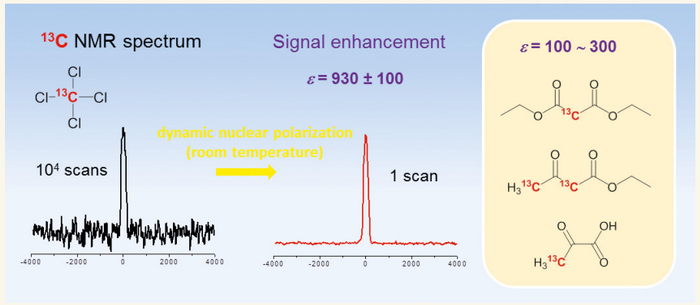
The experiment can be repeated within seconds for signal averaging without interfering with the sample magnetic homogeneity. Thereby, the method is compatible with conditions required in high-resolution NMR. Enhancement of ^{13}C signals on various organic compounds, particularly on metabolites used for cancer imaging, opens up new perspectives for DNP as a general tool to increase sensitivity in solution NMR for metabolomics, structural and dynamic characterization of small biomolecules as well as a suitable tool in MRI.

The results now raise the need of much broader investigations such as screening of signal enhancements in several compounds as well as thinking about suited devices for larger sample volumes to avoid microwave absorption and heating in aqueous solutions. The present detection of a very efficient mechanism for NMR signal enhancements in liquids opens up new perspectives for applications of liquid NMR spectroscopy, which would benefit greatly from higher sensitivity.

Marina Bennati

Original publication

Guoquan Liu, Marcel Levien, Niels Karschin, Giacomo Parigi, Claudio Luchinat, Marina Bennati: One-thousand-fold enhancement of high field liquid nuclear magnetic resonance signals at room temperature. *Nat Chem*, doi: 10.1038/nchem.2723 (2017).



The figure illustrates the ^{13}C NMR spectrum of $^{13}CCl_4$ at 3.4 Tesla without (left) and with DNP (center). The spectrum without DNP required about 2 days of signal averaging, whereas the one with DNP takes only 15 seconds. The inset (right) shows representative organic compounds, for which considerable signal enhancements were achieved.

(Photo: Fotolia / Dan Race)

Institut schafft Paketbox-Anlage für private Sendungen an

Ganztägig berufstätig und trotzdem jederzeit Pakete empfangen – dies soll für Institutsmitarbeiter künftig möglich sein. Neben dem Besucherparkplatz wird das MPI-BPC dazu eine Reihe von Paketboxen installieren, die ähnlich einfach wie eine DHL-Packstation funktionieren.

In den vergangenen Jahren war es – obwohl vom Institut untersagt – gängige Praxis, dass Mitarbeiter sich hin und wieder auch private Pakete an das MPI-BPC liefern ließen. „Dies war immer schon ein Problem, aber seit dem Umbau in 2015 haben wir schlichtweg keine Kapazitäten mehr, private Sendungen bei uns zwischenzulagern“, berichtet Gerhard Tille von der Warenannahme. Er stößt damit bei den Mitarbeitern zwar auf Verständnis, doch für viele von ihnen ist die Paketannahme nach wie vor ein großes Problem. Nicht jede Ware lässt sich zum Wunschtermin zusenden. Und nicht jeder Nachbar ist auf Dauer gewillt, Paketempfänger für andere zu spielen.

Erschwerend kommt hinzu, dass der Online-Handel Prognosen zufolge zukünftig an Bedeutung noch zunehmen wird. „Ich würde viel lieber direkt in Göttingen einkaufen, doch oftmals schaffe ich es nicht rechtzeitig bis Geschäftsschluss in die Läden. Und manche Dinge wie Elektronik-Artikel oder Kletterequipment bekomme ich einfach besser über Fachhändler im Internet“, sagt Thomas Nick, stellvertretender Sicherheitsingenieur. Auch Kerstin Mosch bestellt hin und wieder über das Internet. „Aber durch meinen vollen Arbeitstag schaffe ich es weder morgens noch abends zu den Öffnungszeiten auf das Postamt, und eine Packstation ist bei mir leider nicht in der Nähe“, berichtet die EU-Beauftragte. Die beiden hatten sich daher auch im Namen anderer betroffener Mitarbeiter an Ulrich Nauber, Referent des Geschäftsführenden Direktors, gewandt, ob sich denn hier nicht vonseiten des Instituts etwas machen ließe.

Das MPI-BPC hat sich nun nach Sichtung verschiedener Angebote dazu entschlossen, Paketfächer anzuschaffen. Die *Paketbox Plus*-Anlage der Schweizer Firma *Koch* soll neben dem Besucherparkplatz am Eingang zum Institutsgelände ihren festen Platz finden. Dort sind diese nicht nur für die Paket-Zusteller gut zu erreichen. Auch Mitarbeiter können nach der Arbeit bequem die Paketboxen anfahren, um ihre Sendung abzuholen – einfacher parken lässt sich vor keinem Postamt. Da der Paketbote seine Lieferung ohne großen Aufwand in ein freies Fach einwerfen kann, können Mitarbeiter von allen gängigen Paketanbietern – ob DHL, Hermes oder DPD – Sendungen erhalten.

„Um die Attraktivität des Instituts als Arbeitgeber zu erhöhen, wird der Bereich *Work-Life-Balance* immer wichtiger“, so Nauber zur positiven Entscheidung der Institutsleitung: „In der Wissenschaft gibt es nun mal keinen *Nine-to-Five-Job*. Mit den Paketboxen kann das MPI-BPC die Mitarbeiter mit vertretbarem Aufwand an langen Arbeitstagen entlasten.“

Wie funktioniert die Paketbox für Mitarbeiter?

Institutsangehörige müssen sich dafür zunächst persönlich bei den einzelnen Paketanbietern registrieren. Wichtig ist, dass hierbei die „Paketfach-Anlage Am Faßberg 11“ als Adresse zum Empfangen von Sendungen hinterlegt wird. Im nächsten Schritt muss die leicht zu bedienende App der Paketbox-Herstellerfirma auf das Smartphone heruntergeladen werden. Hat der Bote die Sendung in ein freies Fach eingeworfen, wird der Empfänger per App informiert und kann über einen Code „sein“ Paketfach öffnen. Retouren allerdings lassen sich in der aktuellen Ausbaustufe über die Paketanlage noch nicht verschicken. Diese müssen weiterhin auf dem Postamt oder in einem Paketshop aufgegeben werden.

Damit nicht mehr Paketboxen angeschafft als tatsächlich benötigt werden, sind alle interessierten Mitarbeiter aufgerufen, bis zum 15. April an einer kurzen anonymisierten Online-Umfrage teilzunehmen. „Die Umfrage umfasst nur vier Fragen und ist in wenigen Minuten ausgefüllt“, so Nauber. Auf Wunsch können die Fragebögen alternativ auf Papier ausgefüllt werden. Bitte wenden Sie sich dafür an die Presse- und Öffentlichkeitsarbeit, die auch gern bei Problemen mit dem Ausfüllen der Online-Umfrage weiterhilft.

Zur Online-Umfrage gelangen Sie über den folgenden Link: *www.mpibpc.intern/umfrage/paketbox.html* (cr)

Institute establishes package box system for private deliveries

Holding down a full-time job while at the same time being able to receive packages at any time will become a reality for institute employees in future. To this end, the MPI-BPC will install a number of package boxes next to the visitors’ car park that will work along the lines of a DHL packstation.

In recent years it has been standard practice – although prohibited by the institute – for employees to have private packages sent to the MPI-BPC from time to time. “This has always been a problem, but since the construction work in 2015, we simply haven’t had the capacity to store private deliveries,” says Gerhard Tille of the goods receiving department. Although the employees sympathize with his plight, receiving packages remains a major headache for many of them. Not every item can be dispatched when desired. And not every neighbor is willing to play package recipient for others.

To make matters worse, the online retail trade is predicted to grow in future. “I’d much rather do my shopping at stores in Göttingen, but I’m often unable to reach the city in time before the stores close. And some things, like electronic articles and climbing equipment, I’m simply better off getting from a specialist shop online,“ deputy safety engineer Thomas Nick states. Kerstin Mosch also occasionally makes purchases on the Internet. “But working full time, I’m unable to make it to the post office during opening hours in the morning or evening, and unfortunately there’s no packstation near me,” says the EU liason officer. The two therefore appealed to Ulrich Nauber, scientific officer to the Managing Director, also on behalf of others, to find out whether the institute can do something about it.

After reviewing various offers, the MPI-BPC decided to purchase package lockers. The *Packagebox Plus* System manufactured by the Swiss company *Koch* will be permanently set up next to the visitors’ car park at the entrance to the institute’s site, where it will be accessible to all parcel services. It will also be convenient for employees to drive to the package boxes after work to pick up their deliveries. No post office offers such comfortable parking. Because the couriers can simply drop off deliveries into any free locker, employees can receive deliveries from all the usual parcel services – whether DHL, Hermes, or DPD.

“Work-life balance is becoming more and more important to improve the attractiveness of the institute as an employer,” explains Nauber, referring to the positive decision by the institute’s management: "There’s no such thing as a nine-to-five job in science. Thanks to the package boxes, the MPI-BPC is able to help its hard-working employees with a reasonable investment.”

How does the package box work for employees?

Institute members must first register personally with the individual parcel services. You then have to add “Package Box, Am Fassberg 11” as the address for receiving shipments. Afterwards, download the package box manufacturer’s easy-to-use app to your smartphone. As soon as the courier places the delivery in a free compartment, you will be informed by the app and will be able to open the package locker with a code. However, returns cannot be sent via the parcel system at present. These still have to be handed in at a post office or courier station.

To ensure that no more parcel boxes are purchased than actually needed, we are asking all interested employees to complete a short anonymous online survey by April 15. “The survey only contains four questions and can be completed in just a few minutes,” Nauber assures. Alternatively, you can complete a paper questionnaire. Please consult the public relations office, which will also help you with any problems you might have completing the online survey.

To access the online survey, click on the following link: *www.mpibpc.intern/umfrage/paketbox.html*

(cr)

Mit *eduroam* sicher ins Internet

Eduroam ist bei vielen Mitarbeitern beliebt, um sich mit Laptop und Smartphone nicht nur im Institut, sondern in vielen Bildungs- und Forschungseinrichtungen weltweit mit dem Internet zu verbinden. Sowie die SSID (*Service Set Identifier*) *eduroam* sichtbar ist, meldet sich das Gerät mit dem konfigurierten *username@mpibpc.mpg.de* und dem Standard-Kennwort an, und man hat eine Verbindung zum Internet.

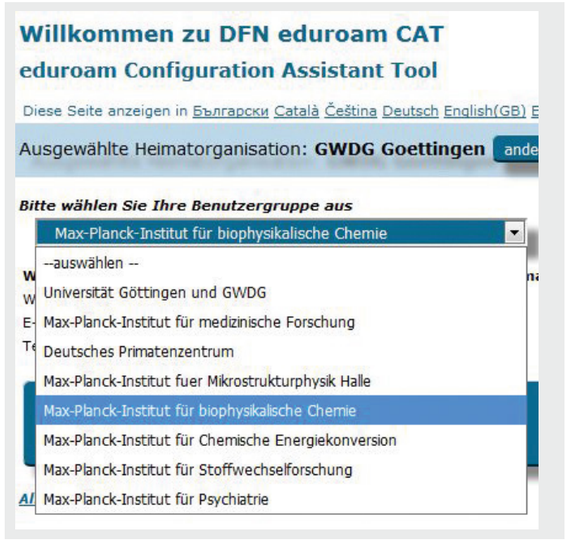
Dabei muss man jedoch sicherstellen, dass diese WLAN-Verbindung richtig konfiguriert ist. Die Zugangsdaten dürfen erst dann zur GWDG verschlüsselt übertragen werden, wenn die Identität des Authentifizierungsservers bei der GWDG anhand des Zertifikats überprüft wurde. Ansonsten kann ein böswilliger Hacker eine SSID *eduroam* anbieten, sich als Authentifizierungsserver ausgeben, die Anmeldedaten mitlesen und dabei im schlimmsten Fall das Kennwort auslesen!

Allerdings ist eine sichere Konfiguration von *eduroam* mit Überprüfung des GWDG-Zertifikats nicht immer einfach. Android-Geräte machen es einem hier besonders schwer. Es gibt aber ein Konfigurationstool für fast alle Betriebssysteme namens *eduroam* ***C****onfiguration* ***A****ssistant* ***T****ool* (*CAT*), das man unbedingt verwenden sollte.

Android-User, die bisher *eduroam* händisch konfiguriert haben, sollten dies noch einmal mit dem Konfigurationstool wiederholen, um zu gewährleisten, dass *eduroam* sicher konfiguriert ist!

Gehen Sie dafür bitte wie folgt vor:

1. Vergewissern Sie sich, dass Sie auch ohne eine Verbindung mit *eduroam* Internetzugang haben. Im Institut können Sie dazu die SSID *GuestOnCampus* verwenden.
2. Falls Sie bereits mit *eduroam* verbunden waren, entfernen Sie das *eduroam*-Netz unter Ihren WLAN-Einstellungen.
3. Installieren Sie dann auf Ihrem Android-Gerät die App *eduroam CAT* (*Freeware*) aus dem *Google Play Store*. **Bitte die App im Folgenden nicht öffnen!**
4. Öffnen Sie mit einem Browser die Seite von *eduroam CAT* mit der URL *https://cat.eduroam.de*
5. Wählen Sie *GWDG Göttingen* als Ihre Heimatorganisation und *Max-Planck-Institut für biophysikalische Chemie* als Ihre Benutzergruppe aus.
6. Wählen Sie den zu Ihrem Betriebssystem passenden Installer über das Dropdown-Menü aus, laden Sie die Konfiguration herunter und installieren Sie diese. Falls Sie nicht automatisch zum Öffnen der Datei weitergeleitet werden, können Sie die heruntergeladene Konfigurationsdatei aus Ihrer Download-Liste manuell öffnen.
7. Geben Sie dann bei der Installation Ihre Zugangsdaten *username@mpibpc.mpg.de* mit dem normalen Kennwort ein.
   Ersetzen Sie dabei „username“ mit Ihrem Account-Namen (zum Beispiel *crotte@mpibpc.mpg.de*), die Version *vorname.nachname@mpibpc.mpg.de* funktioniert nicht!
8. Sie sind nun sicher mit *eduroam* verbunden!



Wenn Sie einen Laptop oder ein iOS-Gerät haben, benötigen Sie keine spezielle App. Ansonsten ist das Vorgehen gleich.

Falls Sie Fragen haben, wenden Sie sich dazu an den IT & Elektronik Service mit einer E-Mail an *support@mpibpc.mpg.de*

Petra Küster

Using *eduroam* for secure Internet access

Eduroam is very popular to connect to the Internet within the institute but also worldwide at many universities and research institutions. As soon as the laptop or mobile device detects the SSID (Service Set Identifier) *eduroam*, it authenticates with *username@mpibpc.mpg.de* and standard password – and you are online.

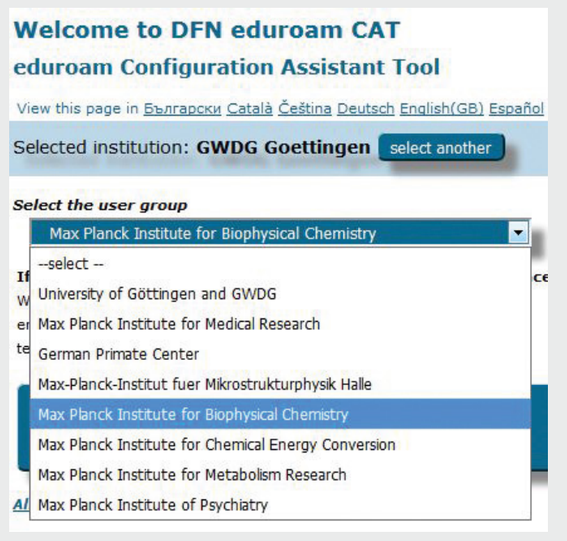
But it is very important that the Wi-Fi connection has been configured properly. Your credentials must not be transmitted unless the identity of the authentication server at the GWDG has been proven using its certificate. Otherwise, there is a danger that a malicious hacker provides the SSID *eduroam* and pretends to be the GWDG authentication server. In the worst case he will be able to read your password!

However, configuring *eduroam* properly, so that it verifies the GWDG certificate, can be tricky. This is especially the case with Android devices. But a simple *eduroam* ***C****onfiguration* ***A****ssistant* ***T****ool* (*CAT*) available for many platforms makes this job easy.

Android users, who have configured *eduroam* manually, are strongly advised to redo it using *eduroam CAT* for secure Internet access!

To do so, please go ahead as follows:

1. Make sure that you have a stable Internet connection other than *eduroam*. In the institute, you can use the SSID *GuestOnCampus*.
2. Uninstall your current *eduoram* profile using the Wi-Fi settings of your device.
3. Download the app *eduroam CAT* (freeware) from the *Google Play Store*. **But do not open the app!**
4. Use a browser to open the *eduroam CAT* website following the link at: *https://cat.eduroam.de*
5. Select GWDG Goettingen as your institution and the Max Planck Institute for Biophysical Chemistry as user group.
6. Download the configuration. In case the tool does not display your operating system automatically, you can select the suitable platform manually. Click on the *Open* button or, alternatively, open the downloaded configuration file.
7. Install the file by accepting the profile. Please, use *username@mpibpc.mpg.de* and your standard password if asked for your login credentials during the installation process. Replace “username” with your account name (e.g. *crotte@mpibpc.mpg.de*), using *firstname.lastname@mpibpc.mpg.de* will not work!
8. Now you can connect to *eduroam* in a secure way!



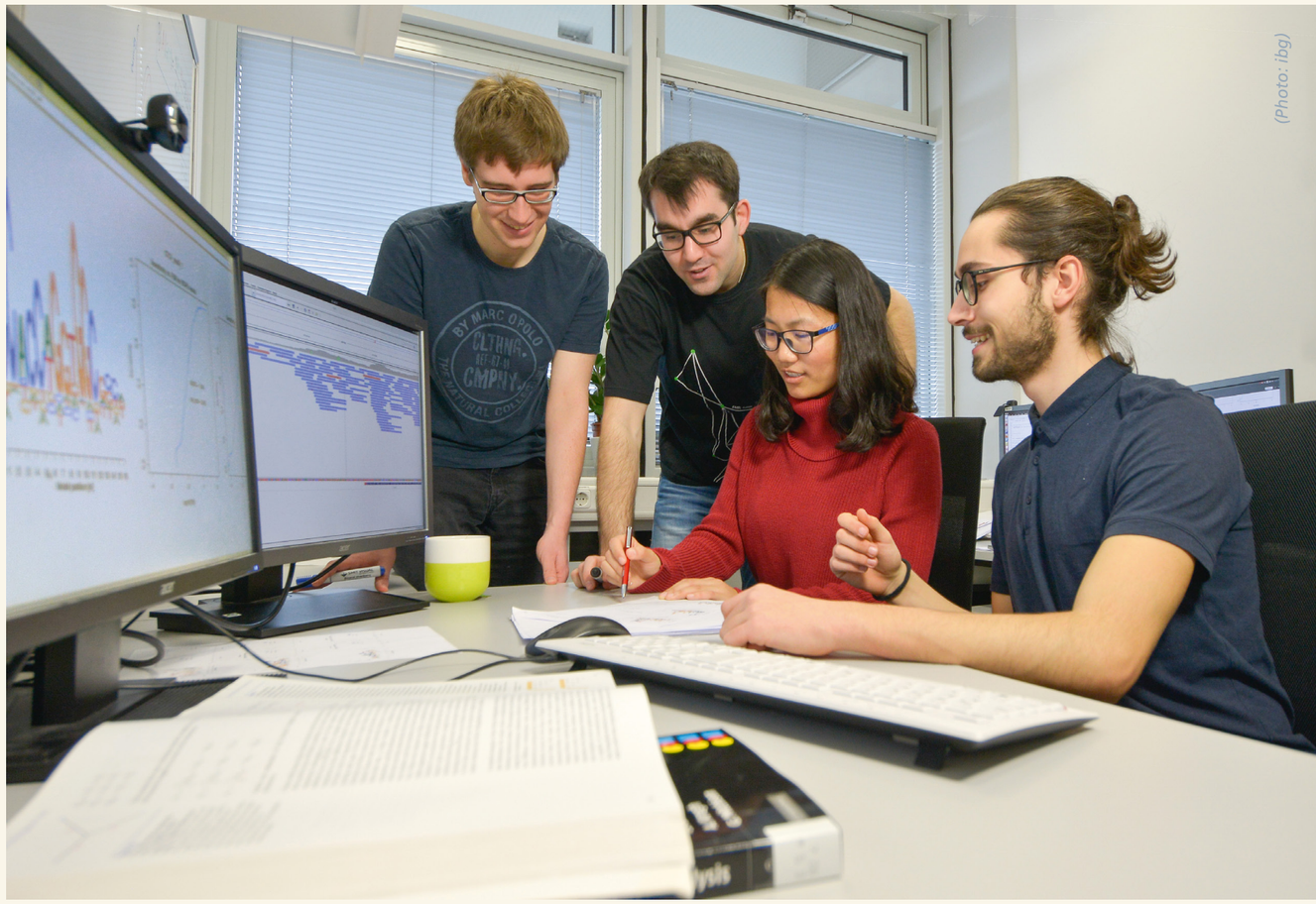
For laptops or iOS devices you do not need a special app, otherwise the procedure is the same.

If you need any help, please contact the IT & Electronics Service by sending an e-mail to *support@mpibpc.mpg.de*

Petra Küster

Göttingen gets *International Max Planck Research School for Genome Science*

In fall this year, the *International Max Planck Research School (IMPRS) for Genome Science* will start at the Göttingen Campus. It is a cooperation between the University of Göttingen and four Max Planck Institutes (MPI) – the MPI-BPC, the MPI for Dynamics and Self-Organization, and the MPI for Experimental Medicine in Göttingen as well as the MPI for Molecular Genetics in Berlin. Additionally, the German Primate Center, the German Center for Neurodegenerative Diseases, and the *Gesellschaft für wissenschaftliche Datenverarbeitung Göttingen* participate in the new research school. The doctoral program combines state-of-the-art techniques in experimental and computational life sciences to train young researchers in the interdisciplinary field of genome science. Interested students with suitable qualification can apply until April 15, 2017.



(Photo: ibg)

Over the last decade, technical progress has accelerated data acquisition in the molecular life sciences. In particular, the development of so-called high-throughput technologies applied to characterize genomes and their cellular products has led to a massive increase in the amount of data generated per experiment. The new teaching program aims at qualifying young scientists for the analysis of large data sets and research at the interface between experimental and theoretical disciplines in genome science. To this end, the students will get to know different fields of research during their studies, including experimental disciplines like genomics, transcriptomics, proteomics, metabolomics, and bioimaging as well as important theoretical disciplines, such as stochastics, theoretical physics, bioinformatics, and computational biology.

"Our doctoral program provides visibility to genome science and allows us to implement innovative ideas for interdisciplinary research. For example, PhD students will have the option to collaborate and tackle a scientific question using complementary experimental, and computational approaches. Thereby, they will be supervised by two faculty members, who cover both fields," says Patrick Cramer, spokesperson of the *IMPRS for Genome Science* and Director at the MPI-BPC.

> «Our doctoral program provides visibility to genome science and allows us to implement innovative ideas for interdisciplinary research.»
>
> Patrick Cramer

The new doctoral program is the fifth IMPRS located at the Göttingen Campus. There, it will be embedded into a well-established and successful organizational structure provided by the *Georg August University School of Science* (GAUSS) and the *Göttingen Graduate School for Neurosciences, Biophysics, and Molecular Biosciences* (GGNB). Further, the Faculty of Biology and Psychology, the Faculty of Medicine, the Faculty of Physics, and the Faculty of Mathematics and Informatics of the University of Göttingen are involved in the doctoral training.

The doctoral program seeks for talented graduate students from Germany and abroad holding a diploma or Master's degree in the life sciences, mathematics, computer sciences, statistics, physics, or a related field. It admits up to ten doctoral students annually, enabling them to complete their PhD within three years. Theoretical and methods training is complemented by regular mentoring and a lecture series on genome sciences. In addition, students can participate in seminars and courses for communication and presentation techniques or project and team management. They are further encouraged to organize lectures with external speakers or annual symposia. The program language is English.

Please find further information on the IMPRS website following the link at *imprs-gs.uni-goettingen.de*

(ad/Henriette Irmer)

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About the *International Max Planck Research Schools*

Since 2000, the Max Planck Society, in cooperation with Universities in Germany, is building up a network of doctoral programs, the *International Max Planck Research Schools* (IMPRS). The joint program's aim is to recruit and promote excellent junior researchers from Germany and abroad. It offers both a structured scientific training as well as excellent research opportunities. On average, more than 60 percent of the IMPRS stipends available have been awarded to international students. Currently, there are 60 IMPRS Germany-wide.

Göttingen erhält eine *International Max Planck Research School for Genome Science*

Im Herbst dieses Jahres startet ein neues Promotionsprogramm am Göttingen Campus. Die *International Max Planck Research School (IMPRS) for Genome Science* ist eine Kooperation zwischen der Universität Göttingen und vier Max-Planck-Instituten (MPI) – dem MPI-BPC, den MPI für Dynamik und Selbstorganisation und für Experimentelle Medizin in Göttingen sowie dem MPI für Molekulare Genetik in Berlin. Darüber hinaus sind das Deutsche Primatenzentrum, das Deutsche Zentrum für Neurodegenerative Erkrankungen und die Gesellschaft für wissenschaftliche Datenverarbeitung in Göttingen beteiligt. Im Promotionsprogramm werden modernste experimentelle und computergestützte Ansätze aus den Lebenswissenschaften kombiniert, um die Studierenden in den Genom-Wissenschaften auszubilden. Interessierte mit entsprechender Qualifikation können sich bis zum 15. April 2017 bewerben.

In den letzten Jahren hat der technische Fortschritt die Datenakquise in den molekularen Lebenswissenschaften beschleunigt. Auch in der Genom-Forschung hat die Entwicklung sogenannter Hochdurchsatz-Technologien dazu geführt, dass einzelne Experimente in kurzer Zeit große Datenmengen generieren. Das neue Promotionsprogramm soll junge Forscher dazu befähigen, große Datenmengen zu analysieren und es soll experimentelle und theoretische Disziplinen der Genom-Forschung besser verzahnen. Um dies zu erreichen, werden die Studierenden während ihrer Promotion verschiedene Bereiche kennenlernen: Dazu zählen experimentelle Disziplinen wie Genomik, Transkriptomik, Proteomik, Metabolomik und Bioimaging sowie wichtige theoretische Disziplinen, darunter Stochastik, theoretische Physik, Bioinformatik und computergestützte Biologie.

„Mit unserem Promotionsprogramm machen wir das interdisziplinäre Zukunftsfeld der Genom-Wissenschaften in Göttingen sichtbar. Zudem wollen wir innovative Ideen für die Spitzenforschung umsetzen. So können etwa zwei Doktoranden mit sich ergänzenden Ansätzen aus dem experimentellen oder dem theoretischen, rechnergestützten Bereich zusammen an einer wissenschaftlichen Fragestellung arbeiten. Dabei werden sie von zwei Fakultätsmitgliedern betreut, die beide Bereiche abdecken“, sagt Patrick Cramer, Sprecher der *IMPRS for Genome Science* und Direktor am MPI-BPC.

Mit dem neuen Promotionsprogramm stärkt nun die fünfte IMPRS den Wissenschaftsstandort Göttingen. Sie wird in die bewährte Struktur der Doktorandenausbildung am Göttingen Campus eingebettet: die *Georg August University School of Science* (GAUSS) und die *Göttinger Graduiertenschule für Neurowissenschaften, Biophysik und Molekulare Biowissenschaften* (GGNB). Vonseiten der Universität Göttingen beteiligen sich die Fakultät für Biologie und Psychologie, die Medizinische Fakultät, die Fakultät für Physik sowie die Fakultät für Mathematik und Informatik.

Für das Programm können sich Studierende aus aller Welt bewerben, die einen Diplom- oder Master-Abschluss in Lebenswissenschaften, Mathematik, Computer-Wissenschaften, Statistik, Physik oder verwandten Fächern besitzen. In die *IMPRS for Genome Science* sollen pro Jahr zehn Doktoranden aufgenommen werden, die Promotionsdauer ist auf drei Jahre ausgelegt. Die Vermittlung von theoretischem Hintergrund und methodischen Kompetenzen wird ergänzt durch regelmäßiges Mentoring und eine eigene Vortragsreihe zu Genom-Wissenschaften. Dazu kommen Kurse zum Erwerb von Schlüsselqualifikationen wie Kommunikationstechniken oder Projekt- und Teammanagement. Darüber hinaus werden die Studierenden ermuntert, Aktivitäten wie Vorträge mit externen Sprechern oder jährliche Symposien zu organisieren. Alle Lehrveranstaltungen finden in englischer Sprache statt. *(ad/Henriette Irmer)*

Weitere Informationen finden Sie auf der *IMPRS*-Webseite unter *imprs-gs.uni-goettingen.de*

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(Foto: Ibg)


(Photo: Arne Sattler)

Career Steps OPPORTUNITIES roadshow in Göttingen

The diversity of scientists is the foundation for cutting-edge research. The Max Planck Society (MPS) considers the design of a gender and diversity-friendly work and cultural environment crucial to enable researchers from all backgrounds to realize their aims and projects.

Career Steps OPPORTUNITIES has been set up to provide comprehensive information on programs and activities in the areas of career development as well as reconciliation of work and family. Additionally, equal opportunities in research institutions throughout Europe are addressed, and reflections on individual perceptions and attitudes on the subject are welcome. *Career Steps OPPORTUNITIES* is organized under the patronage of MPS Vice President Angela D. Friederici.

This is – in short – the aim of the one-day-event *Career Steps OPPORTUNITIES* taking place at four locations throughout Germany. On March 21, 2017, the second event was held in Göttingen. The beautiful, generous atmosphere of the MPI for Solar System Research contributed to the relaxed, creative spirit on that day – despite the fact that the program was quite demanding! In particular, the workshops were offering a lot in a very short time and were based on active participation – so there was no time for drifting away! Time went by much too quickly and there was a lot to take home for everybody. The participants were junior researchers but also senior scientists, both women and men, of the MPIs in Göttingen and other cities, which made the discussions even more stimulating.

Managing Director of the MPI for Solar System Research, Laurent Gizon, opened the event and also offered a guided tour through the institute during the first break. Stefanie Lohaus, founder and editor of the *Missy Magazine* gave the keynote lecture “How feminism makes (scientific) culture more awesome”. She pointed out stunning similarities between the art scene and the world of science in terms of gender roles. Lohaus is strongly propagating (and living) a fair balance between men and women in regard to organizing career and family life. A second overview talk by Martha Roßmayer (MPS headquarters) informed about current and upcoming programs within the Max Planck Equal Opportunities Policy (for details please visit *www.mpg.de/equal_opportunities*).

Stimulating event

The main program offered three workshops each in the areas *work-life balance*, *science career,* and *gender awareness*, all of them led by devoted individuals or professional coaches. Topics ranged from “How to be a cooperative dual career couple” (Dagmar Terbeznik, coach), “How to plan an academic career” (Matthias Schwarzkopf, coach), “Gender equality in European public research and academia” (Nina Steinweg, *Center of Excellence for Women in Science*) to “My personal gender map” (Ulla Weber, MPS headquarters). Participants gathering at the concluding informal get-together were seemingly excited and happy with the outcome. In case you missed the *Career Steps OPPORTUNITIES*, you have a chance to join the next two events in Tübingen on April 6, 2017 or in Munich on May 23, 2017!

For more information please follow the link at: *www.mpg.de/career/careersteps/opportunities*

Ulrike Gerischer

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