



Research Support & Central Units Administration & Research Support



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The high amount of external funding determines the central services' work considerably. Almost half of the MPIMG's total budget is funded by external sources. This is illustrated for instance by the institute's participation in the "Nationales Genomforschungsnetz" (NGFN), solely contributing to almost 48 m EUR during 2001 - 2011. As a consequence, fluctuation of personnel is extensive. A significant amount of the institutional funding is needed for bridging gaps in externally funded posts. Similarly, cash outflow is fluctuating extensively. The aforementioned examples make clear that controlling the institute's budget is therefore possible only to a limited extent. Furthermore, providing an adequate technical infrastructure is increasingly difficult since needs are changing rapidly. Without the growing share of overhead funds and without the Max Planck Society's flexible budgetary rules these challenges could not have been met.

Another challenge during the last years results from the rapid technological advance. Much of the large equipment is outdated already after three years, after five years at the latest. This is why a considerable amount of the consumables are rededicated to complement the short equipment budget. Furthermore, data output of scientific appliances is growing vastly, e.g. for high-throughput image analyses. Even other dimensions of data output are connected with next generation sequencing. In 2009, as a consequence, the institute's cooling system as well as the emergency power supply had to be expanded by means of a container system. Closely related is the steep rise in energy costs (about 80 % during the last five years), caused not only by price increase but more significantly by an increase in consumption.

The new collective labour agreement for the federal public service (TVöD - Tarifvertrag für den Öffentlichen Dienst) effective since October 2005 still bears many structural deficits. Moreover, performance related payments are still not possible within the Max Planck Society since an agreement between the joint works council and the management could not yet be reached. Partial relief brought the possibility to award additional bonuses for scientists and technical staff. Unfortunately, the administrative and technical service units are not eligible. Hiring qualified new staff therefore is still very difficult.

The German law on temporary employment contracts in science (Wissenschaftszeitvertragsgesetz) which came into effect in April 2007 turned out to be mostly helpful to employ young scientists for a limited time-period. Overall, the law is rendering more contractual freedom irrespective whether contracts are financed by institutional or external funds.

As mentioned before, without the flexible budgetary rules the Max Planck Society adopted since 2005, the institute could not have met the challenges during the last years. However, during the last two years special reporting obligations to the funding bodies are increasing. As a result, the budgetary flexibility and control are impeded again. Some of the advantages gained during the last years might get lost.

The cost accounting system of the Max Planck Society, implemented at the MPIMG in 2004, is now routinely used e.g. for calculating and charging special services for internal as well as external users. In 2009, the institute developed a full cost accounting system for the next generation sequencing unit. In 2010 the reporting system will be improved and harmonized for all Max Planck Institutes.



Further improvement is still required for the SAP-driven personnel administration system (PVS), although the system is running since 2003. Reporting procedures and the handling of time limited contracts is still cumbersome.

In 2006, the MPIMG implemented an electronic ordering system for the store-room so that the goods are delivered twice a day directly to the lab. The system is running well and allows reducing stock-keeping costs considerably. In addition the institute reorganized the purchasing process and takes part in the electronic procurement system (e-procurement) of the Max Planck Society since 2007. Goods can be ordered electronically from any work place in the lab or office using a Max Planck specific catalogue for most of the standard goods or by transmitting any other offering electronically to the purchasing department. From the administrative point of view the system's most important advantage might be that substantially more time is provided for dealing with service contracts and large procurements. Only a less significant part of the purchasing activities deals with consumables and standard products; most of the efforts flow into contracts for complex services, a growing part of it are scientific services.

The institute's efforts in vocational education have resulted in 15 graduations since 2003 (10 animal keepers, two office clerks, one laboratory assistant and two IT specialists for system integration). Three trainees were awarded prizes as brilliant or best graduate of the year (another one in 2002). The animal house was awarded a prize as one of the best training sites of the Max Planck Society in 2008.

The MPIMG takes an active roll in supporting the institute's members who have children. The institute cooperates with two day-care centres; in addition, the institute seeks to offer child care during conferences. Within the institute's premises two rooms have been dedicated for small children and school aged children. Flexible working hours and teleworking are common in most groups. According to the German law on temporary employment contracts in science (Wissenschaftszeitvertragsgesetz), temporary contracts during the so-called qualification period ("Qualifizierungsphase") are extended automatically for times of parental leave. Furthermore, the institute is making efforts to offer this also to externally funded employees whenever possible. The "family service", provided by the Max Planck Society to all institutes, offers a broad range of services from child- and elder care to housekeeping. The Christiane Nüsslein Volhard Foundation supports talented young female scientists by financial grants to pay for assistance in household chores and for additional childcare. These initiatives are welcomed by the MPIMG.

For the following years, construction of tower III and the refurbishment of towers I and II will be the most important task. This will enable the institute to close down the premises on Fabeck Street occupied since 2002. Beyond that the growing number of damages in the institute's technical infrastructure puts pressure to finalise these measures as soon as possible.

Research Support & Central Units Technical Management & Workshops



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Carsten Arold
Karsten Beyer
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Glass instruments construction

Peter Ostendorf (part-time)

Technical supply service

Dirk Grönboldt-Santana

In 2003, the institute received the “go ahead” from the President of the Max Planck Society to build tower 3 and to completely renovate towers 1 and 2, built in 1968 and 1970, respectively. The necessary planning funds were approved in early 2006. By August of 2006 the planning stage should have been completed. The actual construction date was set for 2007. However, during the planning stage of 2006 the process for the approval and implementation of building projects of the Max Planck Society was totally revised and changed fundamentally.



The “Gemeinsame Wissenschaftskonferenz” (GWK), the Joint Science Conference of the German Federal and State governments eventually gave its approval for the construction in August 2009. Much of the actual initial planning must now be revised because of partial changes in the requirements that have developed during the past years.

Even more important are legal changes such as new energy saving laws affecting the planning. At present there is no time schedule in place. It is uncertain whether construction will begin before the middle of 2010. The renovation of towers 1 and 2 will not be completed, as originally planned, before the appointment of new heads of department, which weighs heavily on the institute.

The new tower 3 will be used by the Vingron Department, other theoretical research groups, and the IT service group. It will be the central entry foyer for the institute and the designated seminar rooms on the ground floor will be used for events. In addition a new server room will be built in tower 3. The construction work is estimated to last for approximately two years, followed by the renovation of tower 2 and tower 1 respectively. Since the work cannot take place while research is being conducted, it will be necessary to move into the freed up space in other towers and in our satellite offices and laboratories on Fabeck Street. The renovation of the towers 1 and 2 will be completed in approximately three years. Thus the total construction time including building Tower 3 will last roughly 5 - 6 years.

The construction of tower 3 and the renovation of towers 1 and 2 is very urgent due to frequently arising technical issues in the infrastructure. It is becoming increasingly difficult to keep pace with the changing scientific demands. This becomes especially evident in the lack of energy supply for the cooling system and the emergency generator. Consequently, numerous additional small cooling systems had to be installed. To respond to emergency energy needs a container generator had to be installed. In total four emergency generators are being used now. The purpose of the renovations to the technical infrastructure is to resolve the aforementioned issues.

Currently extensive reconstruction is taking place at the animal facility. The animal facility is no longer divided into two areas. The mice are kept under specified pathogen free conditions in areas with restricted access only. Additionally new labs are being built. Defects identified on several occasions by the authorities are being addressed and resolved. By extending the ventilation and cooling system, the essential technical requirements are met to purchase a new cage system. This will increase the capacity of the cage system by 35 % and amount to almost 2,000 additional cages.

Research Support & Central Units

Analytics & IT



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Sven Klages (since 09/95)
Katja Borzym (since 03/96)

Bettina Moser (since 07/07)
Kathrin Huth (since 01/09)
Melanie Bienek (03/07-03/09)
Julia Cekanov (02/08-02/09)
Sven Knaack (03/07-09/08)

Lab kitchen

Silvia Schneider (since 05/08)
Özlem Demirel (since 06/08)
Silvia Kiesel (since 06/09)
Elke Habich (01/07-09/07)
Birol Köysüren (05/07-04/09)
Elisabeth Sahler (10/04-07/08)

Trainee

Julia Cekanov (09/04-02/08)

Computing Group

IT specialists

Dr. Alfred Beck (since 08/92)
Peter Marquardt (since 08/95)
Donald Buczek (since 12/96)
Sven Püstow (since 10/96)
Frank Rippel (since 01/95)
Marius Tolzmann (since 08/07)
Stefan Heider (08/07-08/08)

Trainees

Tobias Dreyer (since 09/08)
Matthias Rüster (since 08/09)
Josefine Mages (08/06-06/09)
Stefan Heider (09/04-08/07)

Introduction

The scientific service group is active in the fields of DNA template preparation, purification, sequencing and sequence analysis, protein purification and analysis by Edman sequencing (terminated by Mai 2009), MALDI-MS methods (terminated by August 2009), enzyme preparation and purification as well as synthesis of highly specific oligo-nucleotides like Energy-Transfer primers etc.

Next generation sequencing (NGS) has been established since December 2006, starting with a Solexa GA Ix and a Roche GS 20 system and has become the fastest growing part of the service group, besides the needs for computational analysis. Since January 2008, the NGS activities of the institute have been continued in several groups, one run by Bernd Timmermann (using Illumina GA II and Roche 454 instruments), and two groups within the Department of Vertebrate Genomics (H. Lehrach), headed by Andreas Dahl, mainly working with SOLiD systems, and



Alexey Soldatov, using both Illumina and SOLiD systems. For my own scientific projects, NGFNplus, DFG- and EU-projects, internal MPG-services and co-operations, we are using Roche 454 and SOLiD systems for *de novo* sequence analysis of nc μ RNAs and methylation analysis etc. Specific reports are presented by B. Timmermann and within the Department of Vertebrate Genomics.

Automation of procedures in any of these methods plays an important role. Another very important feature of our work is the miniaturisation, e.g. the down-scaling of reaction volumes and costs per reaction. Within the framework of a Bio-Chance-plus project, we have developed a nano-liter amplification system, based on a 454-DLX pico-titerplate and a piezo-dispenser, working with only few nl reaction volume. With a newly developed piezo-system (Scienion AG), we are optimistic to increase the speed of sample and volume transfer and to minimize the loss of sample after picking up the reaction products.

The group has a good infrastructure for mutation analysis and DNA-sequencing, with a special focus on the analysis of medically related re-sequencing projects. In parallel to conventional and NGS sequencing, we have examined approaches designed for improving the efficiency of large-scale projects, like MS-MALDI methods for base determination, SNP detection and mini-sequencing (terminated).

The service costs for our main issues are calculated and those requesting the service are charged of an individually assembled cost calculation. Besides the service aspects of our work, the group is a cooperation partner of the international HUGO project, European based projects, the national DFG and NGFN projects together with the Departments of Hans Lehrach, H.-Hilger Ropers and Martin Vingron. For this purpose, several software tools were optimised or developed in close cooperation with the computing people of the group, using advanced LINUX/UNIX based clustered hardware. For further needs we will extend new clustering strategies (multi-processor PC-based LINUX-cluster) for the automated assembly of very large data sets, automated checking and editing steps and web based software tools for co-ordinating projects with external partners. Most of this will be done in close co-operation with the Department of Computational Molecular Biology (M. Vingron) at the institute, the Sanger Centre (UK) and the University of Washington (USA).

Infrastructure analytic group

The analytic group has established a good infrastructure for large-scale genomic analysis projects as sequencing, mutation analysis and mass spectrometry, using most advanced methods and systems for protein purification and sequencing (ABI 394 and Bruker 2-D-MALDI (terminated)), SNP-detection and DNA-sequencing, including NGS (Roche 454 and SOLiD), mutation- and genetic variation analysis (WAVE-systems, ABI 3730XL and automated MegaBace 4500 (terminated 03/09)). With the aim of miniaturisation, highly automated procedures including various kinds of robotics are continuously developed, e.g. automated PCR, plasmide, fosmide and BAC template preparation and sequencing site, equipped with a CRS robotic arm on a track line, automated precipitation line incorporating a CRS arm, 96 and 384 Beckman Multimek pipetting systems, MTP centrifuges and a MTP-UV detection system. Separately, we have installed an automated clone hit picking device, designed to handle more than 200 MTP's in one run, incorporating an arm. Routinely available are MTP centrifuges, Tecan Twister freedom evo device to use 1536er MTP's and various automated 384er Hydra/Twister mini systems to handle DNA samples to be purified, using our patent related magnetic beads methods and a novel PEG/org. solvent based fractionated precipitation method (thesis Heiner Kuhl). Our angular gel electrophoresis system (patented) is able to visualise

384 sample on a MTP-sized gel and to be automatically processed exploring a capacity of more than 15.000 samples per day. An 'Illumina bead station platform' provides the latest generation of μ -array technology for expression profiling and genotyping for human and mouse samples. Besides these 'high throughput highlights', our lab equipment involves all necessary items to run large scale projects, e.g. thermocycler, centrifuges, incubators, protein purification systems and sophisticated computer equipment.

Infrastructure IT-group

The IT-group responsible for the operation and development of the whole IT-infrastructure of the institute, which includes workstation and server systems, wire based and wireless LAN, Internet access, Internet services and remote access *via* modem, ISDN and DSL, security devices (anti-virus and anti-SPAM software, data backup-, fire-wall). Additionally, the maintenance of the biological databases and corresponding software tools are served also by the IT-group.

Our online storage capacity on disk-based file servers exceeds 700 TB of data, while the monthly backup volume has increased due to the needs of new projects to about 60 TB (without NGS systems!). Presently we serve about 450 Window based PCs and 600 Linux/Unix systems with a variety of hard- and software components and about 80 MAC systems. A variety of WEB-server are protected by our fire-wall installation, about 60 WEB-server are active and maintained by us, including hard- and software development and are serving the scientific departments as well as the service and administration groups.

Since 2008, the new requests of the NGS technology have dramatically increased the effort of the IT-group to serve the computational and storage needs for data processing and analysis. Within the last 18 month, we have established a new concept for short and long term data storage based on disk-arrays, installed additionally a storage capacity of more than 1500 TB and have increased the computational power, based on UNIX systems, by more than a factor of 100. The connection of the distributed NGS systems, one SOLiD is installed in Fabeckstrasse, is based on a separated fiber-glass ring to minimize the interference with the standard institute connections and to guarantee a contiguous connection and data flow. The back bone is based on 10-Gbit technology between the computational and disk servers, while each sequencer itself is connected *via* Gigabit. The data flow for one sequencing run is between two to five TB, depending on the protocols and sequence demands, while the final data storage after image analysis and subsequent data reduction is still in the range of 500 GB, including the quality files. This needs to be further down sized, but international efforts is necessary for standardisation.

To manage and control the flow of data, our fibre based 10-GigaBit-LAN, connecting laboratories in Fabeck- and Harnackstrasse to the campus Ihnestrasse, is segmented by about 100 manageable switches giving us the ultimate flexibility to control each segment and if necessary to configure each switch port individually. These additional needs have put extreme pressure on the personal capacity of the IT-group, as one and a half persons are completely absorbed by the NGS infrastructure. Thus, there is the urgent need to increase the personal power of the group to maintain the other requests of the scientific groups and to keep updated with the rapidly growing demands for security requests.

Both, analytic- and IT-group are very active in the training and education of young technicians, students, trainees and apprentices.



Research Support & Central Units

Next Generation Sequencing



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Overview

The Next Generation Sequencing group at the MPIMG was founded at the end of 2007 and is a central service unit open to all groups of the institute. The group was established to help researchers process DNA samples in an efficient and economical manner. By centralizing equipment and expertise, we have dramatically reduced the overall expense to the institute, while increasing the efficiency and quality of the data generated. At the moment we are using two different technical platforms: Roche/454 FLX and Illumina GAIIx systems.

Over the last two years protocols for the next generation sequencers were established and permanently improved. Both platforms, the Roche/454 and the Illumina GAIIx system, have been extensively used for different applications (a number of them in collaboration with other MPG institutes).

- *de novo* sequencing of eukaryotic and procaryotic genomes (e.g sequencing of the canaris genome in collaboration with Prof. M. Gahr, MPI for Ornithology);
- large-scale resequencing of human genomes (e.g. in the 1000Genomes Project with Dep. Lehrach);
- analysis of individual eukaryotic chromosomes (Dep. Ropers);
- expression profiling (Dep. Herrmann and Dep. Lehrach);
- microRNA Sequencing (with S. Sperling, Dep. Lehrach);
- ChIP-Sequencing analysis (Dep. Herrmann and Dep. Lehrach);
- methylation studies (Dep. Herrmann and Dep. Lehrach);
- mapping translocation breakpoints (Dep. Ropers);
- resequencing of enriched candidate genes and target regions (collaboration with M. Schweiger and L. Bertram, Dep. Lehrach).

Within the institute all departments having wet labs (Dep. Herrmann, Dep. Lehrach, Dep. Ropers, Research Group Mundlos and Otto Warburg Laboratories) are using the NGS facility.

The Next Generation Sequencing Group is currently acting as international reference side for Roche and as beta test side for Illumina. This provides access to technical improvements of the instrument early on. In our cooperations with Roche we have developed work flows for using of human whole exome enrichment arrays in combination with Titanium sequencing kits. As beta test side of Illumina we are currently testing new polymerases for performing longer sequencing reads.



Research Support & Central Units Animal Facility & Transgene Unit



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David Brandenburg
Christin Franke
Sarah Hackforth
Janina Hoppe
Nadine Lehmann
Dijana Micic
Kristin Schulze

Service

Edward Somera

The Animal Facility was completely brought into service in the year 2003. It provides an optimal research environment in the field of Laboratory Animal Science which includes the basic animal breeding and maintenance service for approximately 300 genetically modified and 30 wildtype mouse strains and technical services with a highly motivated staff. The mouse strains are kept under specified pathogen free (SPF) conditions in areas with restricted access. By using several physical barriers and standard working protocols we have been strongly committed ourselves to keep our rodent colony free of rodent pathogens. All strains are housed in individually ventilated caging systems and are handled under sterile conditions (approximately 6,000 cages).

The Animal Facility provides high standard services which includes:

- experimental work and colony maintenance;
- cryopreservation of mouse embryos and sperm freezing;
- *in vitro* fertilisation (IVF);
- Sterile Embryotransfer;
- tissue biopsies;
- blood and organ collection;
- assistance in experimental design and techniques;
- training for researchers, caretakers and trainees;
- rederivation;
- import/export of animals.

For the management of these mouse strains and the offered services, a mouse-colony management software program (PyRAT[®]) was established. By using this software all mouse data are easily accessible for scientists.

The *Transgene Unit* of the Animal Facility was established in the year 2004 to enable the successful and efficient generation of genetically modified mice for the scientific staff of the institute. It provides a centralised resource and state-of-the-art technology in generating knockout mice by injection of embryonic stem cells into mouse embryos or by aggregation of diploid and tetraploid embryos and transgenic mice by injection of DNA into the pronucleus of fertilised mouse oocytes. Above that the service provides cleaning, freezing and thawing of mouse embryos, sperm freezing and in-vitro-fertilisation.

Already more than 200 DNA constructs were used for pronuclear microinjection to generate transgenic mice and 80 ES-cell clones were used for blastocyst microinjection to generate knockout mice.

In addition to this more than 100 mouse strains were cryopreserved for backup of important transgenic mouse lines of scientists of the institute and stored in liquid nitrogen.

The Fish Facility of our institute is set up to raise and keep up to 15,000 zebrafish (*Danio rerio*). The aquatic system is located in the animal house and consists of approximately 150 single tanks. It is available to all researchers at the institute, either to keep fish, or to provide eggs, embryos and larvae. For embryonic manipulations the pressure-driven microinjection technique for mRNA or DNA is available.



Research Support & Central Units

Library



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- Ralf Sudbrak, EU coordinator
- Ralf Spörle, Dept. Developmental Genetics
- Sigmar Stricker, Research Group Development & Disease
- Knud Nierhaus, Ribosome Group
- Michael Lappe, Otto Warburg Laboratory

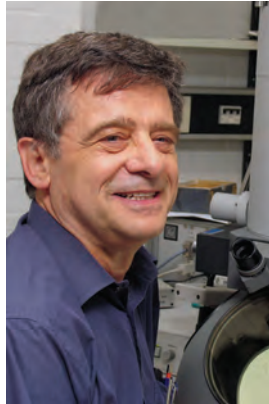
The library supports the scientific work of the institutes *via* an optimal supply of literature and information. Its main function is to have the scientific literature as up-to-date and as complete as possible in a reference library.

The library holds about 60 000 volumes and subscribes to over 80 scientific journals and series. It still reduces the holdings of print journals but improves the electronic spectrum of scientific information and e-books. In addition to the web catalogue, an increasing number of databases as well as electronic interlibrary loan service are offered. Online workshops are available to staff and guests of the institute to provide an overview and a better understanding of important scientific information resources and tools for literature searching and bioinformatics-related research on scientific information resources and methods. The team also offers introduction courses in how to use the library, databases and other library services. Seminars with guest speakers about current subjects like electronic information systems, Open Access and E-science are offered for the scientists. All publications of the institute are edited and submitted into the yearbook of the Max-Planck-Society. The library team is part of the pilot program within the Max-Planck-Society projects “PubMan” and “OpenAccess”.

The goal for further development of the library is still to improve the “Virtual Library”, a network of knowledge systems ensuring the delivery of information to researchers’ desktops wherever and whenever needed.

Research Support & Central Units

Imaging



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Technician

Beatrix Fauler

The microscopy group is a central scientific service unit for the institute. We provide a broad variety of techniques, support, service and maintenance in both, light microscopy and electron microscopy.

In light-microscopy, the group is responsible for the service, maintenance and training of an increasing number of microscopes and user. Meanwhile, we support three confocal microscopes (Zeiss LSM510, LSM510meta and LSM700) and two fluorescence microscopes (an upright Zeiss AxioImager, an inverted Olympus microscope), covering a broad range of cell-biological applications. These instruments are used as shared equipment within all departments of the institute. Our group services and maintains the instruments. We introduce and train new users to the different instruments and techniques. Furthermore, we support all users according to their biological questions and implement new techniques and applications.



Monica Shevack
(part time)

The scientific illustrator closely cooperates with the scientists to prepare publications and presentations. Most of the artwork is computer generated (PC and Mac) using programs such as Photoshop, Adobe Illustrator, Freehand, Powerpoint and other interactive tools. In addition, conventional hand drawn illustrations can be prepared on request. Recently the textbook "Systems Biology in Practice" was illustrated for the Kinetic Modeling group.



Katrin Ullrich
(part time)

The classical wet darkroom is replaced by digital methods. Main tasks involve scans for presentations and photographic documentation including the finishing of the digital images in Photoshop. There is a broad range from photo reproduction of colonies or well plates, update the online catalogue to portraits of the groups and documentation of events in the institute. Various scanners and cameras are provided as general equipment.