Leibniz-Gemeinschaft

Der Senat

27. November 2014

Stellungnahme zum Leibniz-Institut für Molekulare Pharmakologie (FMP) im Forschungsverbund Berlin e. V.

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Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.[1]

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Die Stellungnahmen des Senats bereitet der Senatsausschuss Evaluierung vor. Für die Bewertung einer Einrichtung setzt der Ausschuss Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 11. und 12. März 2014 das Leibniz-Institut für Molekulare Pharmakologie (FMP) im Forschungsverbund Berlin e. V. Ihr stand eine vom FMP erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das FMP nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 27. November 2014 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

1. Beurteilung und Empfehlungen

Der Senat schließt sich den Beurteilungen und Empfehlungen der Bewertungsgruppe an.

Seinem **Auftrag** entsprechend betreibt das Leibniz-Institut für Molekulare Pharmakologie (FMP) Grundlagenforschung mit dem Ziel, neue bioaktive Moleküle zu identifizieren und ihre Wechselwirkungen mit biologischen Zielstrukturen in Zellen oder Organismen zu charakterisieren bzw. zu manipulieren. Seit der letzten Evaluierung hat das Institut sein außerordentlich hohes Leistungsniveau gehalten und sich dynamisch weiterentwickelt. Das Gesamtkonzept ist sehr überzeugend. Die drei Sektionen „Molekulare Physiologie und Zellbiologie“, „Strukturbiologie“ und „Chemische Biologie“ ergänzen sich hervorragend und generieren durch ihre Zusammenarbeit einen klaren Mehrwert: Durch die Integration dieser Bereiche und durch die systematische Anwendung modernster, insbesondere auch biophysikalischer und chemischer Methoden auf biologische Fragestellungen verfügt das Institut über ein einzigartiges Profil.

Das FMP ist international deutlich sichtbar und anerkannt. Die **Leistungen** in den begutachteten Einheiten werden in acht Fällen als „exzellent“, in drei Fällen als „sehr gut bis exzellent“, in sieben Fällen als „sehr gut“ und in drei Fällen als „gut bis sehr gut“ bewertet; zwei erst vor Kurzem eingerichtete Gruppen wurden noch nicht bewertet. In der zentralen Tierhaltung werden essenzielle Serviceleistungen für das gesamte Institut

[1] Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e. V.

erbracht. Neben den Forschungsarbeiten bietet das FMP hochwertige Dienstleistungen z. T. auch für externe Partner an. In der Einwerbung von Drittmitteln für Forschungsprojekte ist das Institut sehr erfolgreich. Insbesondere wurden in erheblichem Umfang Mittel bei der DFG und der EU akquiriert.

Das FMP ist ausgezeichnet in die Berliner Forschungslandschaft integriert. Es pflegt intensive und ertragreiche **Kooperationen** mit der Humboldt-Universität zu Berlin, der Freien Universität Berlin und der Charité – Universitätsmedizin Berlin sowie mit dem Max-Delbrück-Centrum für Molekulare Medizin (MDC) in der Helmholtz-Gemeinschaft, das auf dem Campus Berlin-Buch in unmittelbarer Nachbarschaft liegt. Durch die klare Aufgabenkomplementarität profitieren alle Einrichtungen in hohem Maße von dieser Zusammenarbeit.

Mit der Koordination des EU-OPENSCREEN-Netzwerks hat das FMP eine bedeutende Aufgabe für die europäische Wissenschaft übernommen. Das Institut ist hervorragend geeignet, diese zentrale Stellung wie geplant dauerhaft zu übernehmen. Es wird daher begrüßt, dass der Bund das Projekt durch seine Aufnahme in die nationale Roadmap des *European Strategy Forum on Research Infrastructures* (ESFRI) unterstützt. Es ist richtig und gut begründet, in diesem Zusammenhang eine Baumaßnahme vorzusehen.

Am FMP sind **Frauen** im wissenschaftlichen Bereich unterrepräsentiert. Keines der sechs Departments wird von einer Frau geleitet. Das FMP muss den Frauenanteil im wissenschaftlichen Bereich und insbesondere auf der Leitungsebene steigern. Es ist positiv, dass im Rahmen der jüngsten Berufungsverfahren für eine vakante Professur Wissenschaftlerinnen aktiv angesprochen und zu einer Bewerbung ermutigt wurden.

Die Förderung des wissenschaftlichen **Nachwuchses** am FMP ist exzellent. Der Senat begrüßt, dass alle Promovierenden am Programm der im Wettbewerbsverfahren der Leibniz-Gemeinschaft eingeworbenen FMP Graduate School teilnehmen. Auch Nachwuchsgruppenleiterinnen und -gruppenleiter werden in hervorragender Weise gefördert. Mit der verbindlichen Zusage einer auf fünf Jahre befristeten Beschäftigung, die bei positiver Zwischenevaluierung um weitere vier Jahre verlängert werden kann, stellt das FMP ein äußerst wirksames Förderinstrument bereit, das dazu beigetragen hat, exzellenten Nachwuchs von außerhalb zu gewinnen.

Die Mechanismen der internen **Qualitätssicherung** sind sehr wirksam. Verschiedene Leistungsanreize werden von den Mitarbeiterinnen und Mitarbeitern gut angenommen. Die Betreuung und kritische Begleitung des Instituts durch seinen Wissenschaftlichen Beirat ist hervorragend.

Das FMP verfügt über moderne Gebäude und Infrastrukturen. Es ist beabsichtigt, in erheblichem Umfang neue Geräte anzuschaffen und die **Ausstattung** zu erweitern; die Finanzierung dieser Investitionen ist jedoch noch nicht geklärt. Es wird empfohlen, die vom FMP aufgelisteten Bedarfe unter Einbeziehung des Wissenschaftlichen Beirats und des Aufsichtsgremiums des Forschungsverbundes Berlin zu priorisieren. Anschließend sollten verschiedene Finanzierungsmöglichkeiten auf ihre Machbarkeit hin geprüft und ggf. entsprechende Evaluierungsverfahren in die Wege geleitet werden. Dabei sollten

auch Beteiligungsmöglichkeiten der engsten Kooperationspartner des Instituts analysiert werden.

Mit seinem breiten interdisziplinären Ansatz, der Strukturbiologie, Genetik, Biochemie, Chemische Biologie und Techniken der Bildgebung effektiv miteinander verbindet, hat das FMP ein beeindruckendes Alleinstellungsmerkmal entwickelt, das ihm große internationale Sichtbarkeit verleiht. In dieser Form ist die Erfüllung seiner Aufgaben an einer Hochschule nicht möglich. Eine Eingliederung des FMP in eine Hochschule wird daher nicht empfohlen.

Das FMP erfüllt die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu stellen sind.

2. Zur Stellungnahme des FMP

Der Senat begrüßt, dass das FMP beabsichtigt, die Empfehlungen und Hinweise aus dem Bewertungsbericht bei seiner weiteren Arbeit zu berücksichtigen.

3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das FMP als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

19 February 2014

Annex A: Status Report

Leibniz Institut für Molekulare Pharmakologie (FMP) within the Forschungsverbund Berlin e. V.

Contents

1. Structure, Tasks and Institutional Environment

Development and Funding

The Leibniz Institut für Molekulare Pharmakologie (FMP) was founded in 1992, succeeding the Institute for Drug Research in the Acadamy of Sciences of the German Democratic Republic. It is a member of the *Forschungsverbund Berlin e. V.* (FVB) and as such of the Leibniz Association. 50 % of FMP's institutional funding is provided by the Federal Government, 50 % by the States (*Länder*). The national importance of FMP was confirmed by the German Council of Science and Humanities in 1999 and by the Senate of the Leibniz Association in 2007.

Responsible department at *Länder* level: Department for Economics, Technology and Research of the Berlin Senate (SenWTF)

Responsible department at federal level: Federal Ministry of Education and Research (BMBF)

Mission and tasks

According to its statutes, FMP conducts interdisciplinary research in the field of molecular pharmacology with the aim of identifying, characterising, and manipulating novel biological targets for pharmacological interference. The long-term goal is to extend the currently narrow basis for drug-based therapies.

Legal form, structure, and organisation

As a member of FVB, FMP belongs to a registered non-profit organisation under private law. Its supervisory committee is the Board of Trustees of FVB, which consists of ten members. The chair is appointed by the responsible department at *Länder* level; the deputy chair is appointed by the responsible federal department. The Board of Trustees is responsible for endorsing the programme budget and business plans, confirming the annual accounts, and appointing the FMP directors, the managing director of FVB (head of administration), leading scientists, and the members of the Scientific Advisory Board. Subject-specific matters concerning FMP are prepared by a dedicated subcommittee.

The institute is led by the Board of Directors, with one of the directors serving as the managing director (scientific head) for a period of three years, and the managing director of FVB (head of administration). The scientific director is in charge of staffing matters and responsible for designing and implementing the research programme. The head of administration is responsible for the institute's budget. At the moment, as an interim solution, there is only one scientific director, who accordingly serves as the scientific head. Until further directors have been appointed, an informal executive committee (the so-called *Leitungsgremium*) comprising the department heads and representatives of the group leaders serves as the major platform where FMP's research strategy is discussed. These boards are complemented by the Institute's Executive Council with representatives of all status groups and by the Institute's General Assembly, in which all employees participate.

The Scientific Advisory Board (SAB) advises the institute's management on fundamental aspects of the scientific work programme, on national and international cooperations, and on appointment procedures for the directors and leading scientists. It evaluates the institute's scientific performance at regular intervals.

Research is conducted within three scientific sections: "Molecular Physiology and Cell Biology", "Structural Biology", and "Chemical Biology". Each section comprises two departments, several research groups headed by senior or independent junior group leaders, and core facilities open to all members of the institute (for details cf. Chapter 3).

National and international scientific environment

According to FMP, the institute is nearly uniquely positioned both at national and international levels due to its interdisciplinary approach to molecular pharmacology and its thematic focus in the run-up to drug research.

Among the leading centres for chemical biology in Germany, the institute mentions the Max Planck Institute (MPI) for Molecular Physiology in Dortmund, the Helmholtz Centre for Infection Research (HZI) in Braunschweig, and the universities of Munich, Bonn, and Konstanz. Among the prominent research institutions in NMR-based structural biology research, it lists the MPI for Biophysical Chemistry in Göttingen, the Helmholtz Centres in Munich and Jülich, and the universities of Frankfurt/Main, Munich, and Bayreuth. According to FMP, the leading institutions in molecular neuroscience and cell physiology research are found in Göttingen, Tübingen, Freiburg, Heidelberg, Munich, and Berlin.

Internationally, major institutes with a chemical biology approach to compound development include the Broad Institute of Harvard University, the Department of Chemistry and Chemical Biology at Harvard University, the Institute of Chemistry and Cell Biology at Harvard Medical School, the Massachusetts Institute of Technology (MIT; all at Cambridge, MA, USA), the Chemical Genomics Center at the National Institutes of Health (NIH; Bethesda, MD, USA), the Skaggs Institute for Chemical Biology at Scripps (Jupiter, FL, USA), Imperial College London (UK), and the Research Center for Molecular Medicine (Vienna, Austria). Also, FMP mentions pharmacological university institutes at Dundee, London (both UK), and Zurich (Switzerland) as conducting internationally renowned research in molecular pharmacology. As major centres using NMR-based structural biology methods, FMP lists NIH, MIT, the University of California at Berkeley and at San Diego (all in the USA), the RIKEN institute at Yokohama and Osaka University (Japan), the ETH in Zurich (Switzerland), and the University of Utrecht (The Netherlands). Among the leading research institutes in molecular neuroscience and cell physiology, FMP mentions the Karolinska Institute (Stockholm, Sweden), the Picower Center for Learning and Memory at MIT (USA), the Neuroscience Campuses in Amsterdam (The Netherlands) and London (UK), and the RIKEN institute (Japan).

National interest and justification for funding as a non-university institution

According to the institute, the development of novel strategies for pharmacological intervention is of prime interest. The expected rise in incidence in age-related diseases such as cancer and neurodegenerative disorders as well as infectious diseases require

novel approaches in drug-based therapies and the development of novel antibiotics and anti-viral agents.

FMP takes a lead role in the European Infrastructure of Open Screening Platforms for Chemical Biology (EU-OPENSCREEN), which has been included in the national roadmap for large research infrastructures by the German Federal Ministry of Education and Research. Furthermore, FMP researchers are involved in various collaborative research projects at local, national, and international level (cf. Chapter 4).

FMP sees a unique feature of its research, setting the institute apart from university institutes, in the collaboration across research topics, methods, and disciplines. Furthermore, it houses large-scale infrastructures, such as screening platforms and NMR facilities, which usually cannot be sustained at universities. According to the institute, the stable long-term funding allows FMP researchers to tackle innovative projects with uncertain outcome while maintaining flexibility both in terms of employment policy and in terms of topical changes.

2. General concept and profile

Development of the institution since the last evaluation

The institute considers itself to be positioned in the run-up to drug research rather than in drug research itself. Its basic approach to molecular pharmacology is described as bottom-up, combining the expertise in structural biology, genetics, biochemistry, chemical biology, and bio-imaging in an interdisciplinary way.

Research is organised in three sections (cf. Chapter 3 for more details). In the "Molecular Physiology and Cell Biology" section, analyses are carried out at the cellular and systems levels by genetic, cell biological, biochemical, and physiological approaches. In the "Structural Biology" section, magnetic resonance imaging (MRI), solution- and solid-state NMR are used to investigate physiological changes and the structure, assembly, and dynamics of pharmacologically relevant systems. Significant efforts are devoted to developing and improving methods to study markers, large protein complexes, and protein structures *in vivo*. In the "Chemical Biology" section, compounds for pharmacological interference with biological targets are developed as well as synthetic chemistry approaches to study and manipulate natural protein modifications. Scientists from all three sections with diverse disciplinary backgrounds interact intensely in order to assess the functional consequences of pharmacological interference with a given protein or pathway.

Since the last evaluation, there have been a number of changes at the level of scientific leaders. The former Director and Head of Department "Anchored Signalling" left the institute at the end of 2008. From 2009 to 2011, the Head of Department "NMR-Supported Structural Biology" served as acting director of FMP. With the appointment of the new Director and Head of Department "Molecular Pharmacology and Cell Biology" in January 2012, research in membrane biology, molecular neuroscience, and bio-imaging has been strengthened, while research on G protein-coupled receptors has been scaled

down. As a consequence, the former section “Signal Transduction/Molecular Genetics” has been renamed “Molecular Physiology and Cell Biology”.

In the “Chemical Biology” section, the Head of Department “Chemical Biology” (2008) as well as two Research Group Leaders (2010 and 2012) retired. A new Head of Department “Chemical Biology II” was appointed in 2012. While the core facility on peptide chemistry remains, research on peptides has shifted towards chemoselective organic transformations for the synthesis and modification of proteins and peptides of central biological relevance. Currently, a Director and Head of Department “Chemical Biology I” position, coupled with a W3-S professorship, is vacant in this section.

In addition, a number of junior faculty members have left the institute since the last evaluation, while other young scientists were recruited, contributing to the broad range of expertise and topics under the umbrella of research in molecular pharmacology as defined by the statutes and structure of FMP.

Results

Research

FMP strives for excellent scientific publications in international peer-reviewed journals. During the reporting period (2010 to 2012), there were 355 articles in peer-reviewed journals, about a fifty-percent increase compared to the reporting period of the last evaluation, 2004 to 2006. In addition, there were 14 contributions by FMP staff in edited volumes and ten articles in other journals or working and discussion papers. Three volumes were edited by FMP researchers. For detailed indicators of the publication record cf. Appendix 2.

Main results of last years’ research efforts include the development of solid-state NMR methodologies and their application to membrane proteins, protofibrils involved in neurodegeneration, and chaperones of the eye lens, the establishment of *in vivo*-NMR methods and their application to the study of histone modifications, and the development of cell-specific, functionalised xenon cages which enable the use of an MRI contrast agent with a greatly reduced acquisition time compared to conventional MRI. FMP researchers have developed and characterised the first small-molecule inhibitors of clathrin function and have discovered and manipulated proteins and lipids involved in networks implicated in cell signalling and cancer. Furthermore, a novel key role of endo-lysosomal chloride-proton exchange in kidney function and bone homeostasis was discovered, and insight into the dynamics of glutamate receptor activation in the brain was gained.

Scientific services and infrastructure

FMP’s high-throughput screening facility has developed into a comprehensive Chemical Biology platform. About 200 screening projects have been conducted for FMP and its partners on the Campus Berlin-Buch as well as for external partners. The screening unit serves as an open-access facility for the German ChemBioNet initiative, for which FMP created and manages the central compound collection of about 65,000 compounds.

Furthermore, FMP provides measurement time on one of its DNP MAS NMR spectrometers and access to in-cell NMR expertise and infrastructure as well as to MAS NMR structure determination expertise and machinery. Major users during the past four years were the Helmholtz Centres in Braunschweig and Munich; other customers include the Berlin universities and several Leibniz institutes.

In the context of two international infrastructure projects, the ESFRI-project INSTRUCT and the EU-project Bio-NMR, access was provided to users from various European countries.

Consultancy, knowledge and technology transfer

FMP scientists engage in consultation activities through membership in academies, in steering committees of federal funding programmes or foreign national, European, and internationally active funding agencies, in scientific advisory boards or supervisory boards of scientific institutions, and in committees of international science projects and scientific societies and foundations. Some FMP researchers hold consultative contracts with companies.

The institute regularly offers training and workshops to scientists from academia and industry, seminars and internships during two weeks in summer, and courses for high school pupils.

FMP pursues an active exploitation and transfer strategy, coordinated by the director. The institute relies on in-house expertise and selects projects to be handled by an external cooperation partner for marketing. It is supported by the joint administration of the *Forschungsverbund Berlin*. Between 2009 and 2012, 14 invention disclosures led to patent applications. As of 2012, FMP held 27 patents and five other exploitation rights or licenses. For one invention, an application for orphan designation was prepared and granted in June 2013.

Scientists who are willing to establish a new business based on knowledge generated at the institute are supported by FMP. Patent families for future spin-offs are excluded from licensing activities.

Academic events and public relations

FMP researchers are regularly involved in organising local, national, and international conferences, symposia, and workshops, e. g. on chemical biology, the blood-brain barrier, the organisation of epithelia and endothelia, NMR-based structural biology, or ligand-gated ion channels.

The institute considers it a part of its duty to inform the public on its research results in molecular pharmacology to convey their potential benefit to society, with a particular emphasis on public health and modern medicine. Parts of these activities are performed in collaboration with the neighbouring Max Delbrück Center for Molecular Medicine, the Forschungsverbund Berlin, or the Leibniz Association.

The institute's website was re-launched in 2010. During the reporting period, 24 press releases were published in more than 100 print and online media. Different brochures, booklets, and newsletters were published, several of them on a regular basis. Further-

more, FMP scientists have been featured in several radio interviews both on regional and nation-wide channels.

FMP is engaged in projects aimed at informing a broader public, such as the "Long Night of the Sciences" and numerous exhibitions in Berlin and beyond. Guided tours are offered to visiting groups, e. g. diplomatic or economic delegations, local politicians, or students.

The institute is very actively involved in providing pupils with the opportunity to experience scientific work. It regularly supports "Girls's Days", the competition "Jugend forscht", and the "Chemistry Olympiad". It also runs ChemLab, a school lab which is integrated into the "Gläsernes Labor", a shared facility for teaching and training of teachers on the Campus Berlin-Buch. About 1,200 pupils participate in different courses every year. In addition, opportunities to conduct internships at the institute are offered.

For the future, FMP plans to intensify its public relations efforts towards more professional visualisation of research results, e. g. via movies or 3D visualisation. In recognition of the growing tasks in this area, the position of public relations officer has been upgraded to full-time.

Strategic work planning for the next few years

In its strategic work planning, FMP focuses on three major strategic goals:

1. Comprehensive functional dissection of key proteins and pathways:

While continuing its strong focus on membrane biology and signalling processes, the institute will strive to expand its scope to proteostasis and ageing research. To this end, RNAi-based screening will be paired with advanced bio-imaging and physiological methods, and novel optogenetic and semi-synthetic approaches will be implemented to dissect protein function in cellular systems and *in vivo*.

2. Novel magnetic resonance and light-based imaging approaches:

The institute will continue to develop methods of structural biology, especially NMR, to determine the 3D structure of proteins and protein complexes. Aims are to develop and establish in-cell NMR measurements, structural investigations of heterogeneous complex systems, novel MRI-based biosensors, and advanced light and electron microscopy.

3. Novel strategies for the pharmacological manipulation of key proteins and pathways:

FMP researchers integrate computational chemistry, genetic and chemical screening technology with proteomics and functional studies. To unravel protein function in cell physiology, a further extension of the screening technology towards in-cell and *in vivo* approaches is required according to the institute. As a promising technique to manipulate biological function, FMP mentions optogenetics, the application of light-based approaches to biological systems.

In order to work towards reaching these goals, FMP plans to intensify and extend research in the "Molecular Physiology and Cell Biology" section in the areas of intracellular membrane traffic, the study of channels and transporters, neurotransmission, and protein homeostasis. Research within the "Structural Biology" section will focus on further

methodological developments to enable structural investigations in a physiological environment. Research in the "Chemical Biology" section will aim at advancing the development of synthetic approaches to manipulate protein function in biological systems.

In the next few years, FMP aims at promoting the interaction between experimentalists and theoretical researchers. In doing so, the collaboration between researchers from different sections will be further intensified. A short-term goal is to fill two vacant W3 professorship positions, one each in the sections "Structural Biology" and "Chemical Biology". Also, the institute will make efforts to attract suitable candidates as junior group leaders.

Appropriateness of facilities, equipment and staffing

In 2012, FMP's total revenue was € 21.3 million, including € 15.1 million (71 %) in institutional funding, € 5.8 million (27 %) in revenue from project funding grants, and € 450k (2 %) miscellaneous revenue (cf. Appendix 3). During the reporting period (2010 to 2012), about one third of third-party funding was raised from the German Research Foundation (DFG) and another third from EU programmes; the remainder was acquired from the Federal and *Länder* governments and other sources.

FMP is located on the Berlin-Buch campus. It is housed in one main research building and shares space with the Max Delbrück Center for Molecular Medicine (MDC) in a second, adjacent building. The institute describes these buildings as well-suited for the research activities. Following the expansion of the "Chemical Biology" section, partly in the context of the EU-OPENSCREEN network, FMP sees a constraint in terms of laboratory and office space. It is therefore envisioned that with the construction of a new building for EU-OPENSCREEN, the "Chemical Biology" section will move into this new building.

Facilities and equipment at FMP are in good condition. According to the institute, some laboratories and parts of the instrumentation require replacement of refurbishment. In order to sustain its activities, FMP sees a need of significant investments in the institute's infrastructure which, according to the institute, cannot be covered from its regular budget. In particular, FMP lists the following items (amounting to a total of € 19.2 million plus € 1.955 million per year):

- Solid-state NMR-Supported Structural Biology: a 1.1-GHz wide-bore NMR spectrometer (€ 15 million), a gyrotron for the 800-Mhz NMR spectrometer (€ 1.3 million)
- Animal Unit: construction and equipment (€ 600k), two animal care-takers (€ 70k per year)
- Chemical Screening and RNA Interference: running costs for EU-OPENSCREEN building (€ 300k per year), a technician for pharmacological and biophysical profiling (€ 40k per year), a technician for lentiviral screening (€ 40k per year)
- Core Facility Imaging: a SIM microscope (€ 1 million), spinning disc and light sheet-based microscopes (€ 1 million), a high-pressure freezing device (€ 300k),

a staff scientist for high-resolution electron tomography (€ 65k per year), a technician for high-resolution electron tomography (€ 40k per year)

- Core Facility Protein Expression: a staff scientist or engineer (€ 60k per year), a technician (€ 40k per year)
- IT support: IT platform development and maintenance (€ 500k per year)
- Consumables and Small Equipment: increased requirement for funding (€ 800k per year)

3. Subdivisions of FMP

Section 1: "Molecular Physiology and Cell Biology" (34.6 full-time equivalents [FTE] in research and scientific service, 13.4 FTE doctoral candidates, 16.3 FTE service staff)

Work programme development

Research within this section addresses the structure, physiological functioning, and trafficking of important receptors, ion channels and transporters, signalling factors, and junctional and adhesion proteins in order to target them for pharmacological interference. Since the recruitment of the new Director and Head of Department "Molecular Pharmacology and Cell Biology" in 2012, research has been more focused on molecular neuroscience and membrane trafficking. In 2013, two junior research groups have been newly established.

Currently, this section comprises two departments, two research groups, four junior research groups, and two core facilities (see below).

Results

Studies of membrane protein-ligand interactions, channels and transporters and their functions in the nervous system, and endolysosomal and secretory membrane traffic have resulted in 121 peer-reviewed publications, seven work and discussion papers, and one contribution to an edited volume during the reporting period. Methods and approaches to manipulate membrane proteins and their associated components as well as the trafficking machineries in living systems have been continuously developed, often in collaboration with colleagues from the other two sections.

Work planning

FMP plans to capitalise on the mechanistic insights gained so far to develop novel treatment strategies for a defined subset of diseases and age-related disorders. The installation of a new junior research group on proteostasis and neurodegeneration is expected to further tighten the link with research on protein structure and dynamics conducted in the "Structural Biology" section; it also expands the repertoire of model organisms to *C. elegans*. It is planned to extend the use of optogenetics to intracellular organelles.

In order to implement high-pressure freeze electron microscopy, FMP plans to purchase a high-pressure freezing device. For upgrading its super-resolution and real-time light microscopic capabilities, it plans to acquire 3D-SIM and light sheet-based microscopes as part of the core facility "Cellular Imaging". Fluorescence-activated cell sorting (FACS)

technology will also be expanded. According to the institute, significant investments are required to enable RNAi screening of primary cells and tissues by viral vectors. Furthermore, a modernized and expanded in-house facility for animal experimentation is required to house a sufficient number of mice and reach the pathogen-free standard needed for physiological studies related to immune cell function.

Department "Physiology and Pathology of Ion Transport" (5.0 FTE in research and scientific services, 6.9 FTE doctoral candidates, 10.0 FTE service staff)

Research in this department aims at understanding ion transport processes from the molecular to the subcellular and cellular levels and that of the whole organism. The latter is addressed with knock-out and knock-in mice and via analysis of human genetic diseases. Topics include endosomal/lysosomal ion homeostasis in endosomes, lysosomes, and synaptic vesicles and their impact on vesicular functions.

During the reporting period, 22 articles were published in peer-reviewed journals and 3 other articles. Total revenue from third-party funding during that period amounted to € 1,882k, mainly from DFG and international / EU funding agencies.

Department "Molecular Pharmacology and Cell Biology" (15.0 FTE in research and scientific services, 9.8 FTE doctoral candidates, 3.8 FTE service staff)

This department was established in January 2012. Research focuses on the mechanisms of endocytic and endosomal membrane traffic, using a wide array of techniques. Aims are to discover how exo- and endocytosis are coupled and how membrane homeostasis is maintained. Results in the past years include the identification and characterisation of chemical inhibitors of clathrin function and different endocytic adaptors, insights into the role of phosphoinositides and PI kinases and phosphatases.

During the reporting period, 32 articles were published in peer-reviewed journals and 3 other articles, including 19 and 1, respectively, from work conducted before the Head of Department moved to FMP in 2012. Total revenue from third-party funding (2012 only; funds from *Freie Universität Berlin* were transferred to FMP during 2012) amounted to € 237k, about one half coming from DFG funding.

Research Group "Protein Trafficking" (2.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 2.0 FTE service staff)

This research group focuses on G protein-coupled receptors (GPCR), which are important drug targets. The aim is to understand why some GPCR possess signal peptides while others do not. To this end, the corticotrophin-releasing factor receptors type 1 and type 2a, which play a major role in stress responses, are examined. One important finding was that these receptor types may be unequally distributed in the plasma membrane.

During the reporting period, 12 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 237k, all from DFG funding.

Research Group "Molecular Cell Physiology" (3.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 2.0 FTE service staff)

This research group focuses on the structure, function, and modulation of cell-cell contacts to explore tight junctions (TJ) in tissue barriers. The aim is to unravel mechanisms that underlie barrier dysfunction and to develop novel strategies to specifically manipulate the blood-brain-barrier and other tissue barriers. Using *in vitro* assays, it could be demonstrated that different membrane proteins, such as claudins and tight junction-associated marvel proteins (TAMP), associate homo- and heterotypically. The sites, mechanisms, and molecular structures of their association were elucidated, and interfering ligands were developed. In the future, the group plans to expand their work to *in vivo* studies based on animal models with respect to ischemia and related neurodegenerative diseases.

During the reporting period, 19 articles were published in peer-reviewed journals and 1 other article. Total revenue from third-party funding during that period amounted to € 839k, approximately one half coming from DFG and international / EU funding agencies.

Junior Research Group "Molecular Neuroscience and Biophysics" (5.6 FTE in research and scientific services, 2.0 FTE doctoral candidates, 1.0 FTE service staff)

This junior research group studies glutamate receptors of excitatory synapses, which are essential for brain function. A special focus lies on the question how the composition and properties of receptor complexes determine features of synaptic transmission in the brain in health and disease. To this end, receptor gating is examined with electrophysiological techniques, and receptors are manipulated with molecular and chemical biological tools.

During the reporting period, 4 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 504k, approximately one half coming from DFG and international / EU funding agencies.

Junior Research Group "Membrane Traffic and Cell Motility" (2.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This junior research group was established in January 2013. It studies the physiological function of endocytic and endosomal adaptor proteins in membrane traffic. Preliminary analyses indicate that the adaptor proteins Gadkin and Stonin 1 modulate cell motility by acting at the interface between membrane traffic and actin dynamics. The group plans to use combined cell biological and mouse genetic approaches to unravel the molecular function of these two proteins *in vitro* and *in vivo* as well as the signals that modulate their activity.

During the reporting period, 8 articles were published in peer-reviewed journals, including 6 from before the group moved to FMP. There were no revenues from third-party funding during the reporting period, but € 98k of funding was obtained from the Federal / *Länder* governments in 2013.

Junior Research Group "Proteostasis in Aging and Disease" (since 09/2013; 2.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This junior research group was established in September 2013. It studies protein misfolding and relevant cellular adaptation strategies, with a focus on protein synthesis and clearance strategies for protein aggregates. Recent results include the finding that chronic proteotoxic stress is associated with a decline of translational activity in *C. elegans*. The underlying regulatory mechanism was uncovered to be chaperone-mediated. Further work included studies on human heat shock proteins. In the future, the group plans to analyse the chaperone and proteolytic capacity of distinct tissues and the whole organism during development and aging and upon chronic stress conditions *in vivo* in real-time in *C. elegans*.

During the reporting period, 5 articles were published in peer-reviewed journals, all of them from before the group moved to FMP. There were no revenues from third-party funding during the reporting period, but in 2013, € 100k of funding could be acquired.

Junior Research Group "Behavioural Neurodynamics" (2.0 FTE in research and scientific services, 2.0 FTE doctoral candidates, no service staff)

This junior research group was established in October 2009. It aims at revealing the contribution of individual neuronal membrane conductancies to the excitability and synchronisation of neuronal networks *in vivo*, focusing on the role of various channels and receptors in the operation of hippocampal networks using genetic mouse models. It could be shown that the voltage-gated channel KCNQ5 controls the excitability of hippocampal networks. A further goal is to examine how molecular metabolic signals sensed by the brain coordinate multiple vital functions, such as food intake and sleep.

During the reporting period, 2 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 90k, obtained from international / EU funding agencies.

Core Facility "Cellular Imaging" (3.2 FTE in research and scientific services, no doctoral candidates, 1.8 FTE service staff)

This core facility consists of the two sub-units "Light Microscopy" and "Electron Microscopy" (EM). It offers service to FMP research groups, but also collaborates with external partners.

The light microscopy facility provides technology and expertise to study biological samples with a focus on single-cell techniques to describe cellular processes. Microscopic techniques such as fluorescence resonance energy transfer (FRET), fluorescence recovery after photobleaching (FRAP), and fluorescence correlation spectroscopy (FCS) are well established. The EM facility offers assistance in visualising cell and tissue architecture and in localising individual proteins at high resolution. Also, high-resolution imaging of 2D protein crystals and fibrils as well as electron tomography is supported. Currently, cryo-methods for protein and cell imaging are being established using a recently acquired electron microscope with cryo-equipment.

During the reporting period, 25 articles were published in peer-reviewed journals, most of them as co-authors.

Core Facility "Animal Facility" (1.0 FTE in research and scientific services, no doctoral candidates, 2.0 FTE service staff)

This core facility provides housing for rodents and frogs. Besides carrying out tasks in e. g. animal husbandry or breeding colony maintenance of transgenic and knockout mice, the group also assists researchers in routine technical procedures such as tissue collection for genotyping. The core facility is committed to professional, responsible animal research, taking into account animal welfare and rules of good scientific practice.

Former research units:

Since the last evaluation, the Department "Anchored Signalling" (until October 2011) and the Research Group "Biochemical Neurobiology" (until January 2011) were closed. The former group moved to the Max Delbrück Center for Molecular Medicine (MDC); its work focused on proteins involved in a) vasopressin-mediated water reabsorption in renal principal cells and in b) the control of cardiac myocyte contractility. The latter group was closed due to the retirement of its leader; its work focused on biochemical and molecular aspects of peptidases, especially on angiotensin-converting enzyme, neutral endopeptidases, and related enzymes.

Section 2: "Structural Biology" (28.1 FTE in research and scientific service, 16.7 FTE doctoral candidates, 9.0 FTE service staff)

Work programme development

Research within this section aims at structural investigations in physiological environments from atomic resolution to imaging and the systematic development of bioactive molecules. During the past years, the focus changed from the structure determination of protein domains towards investigations of proteins in native states and in complex environments, capitalising on recent methodological developments in solid-state and in-cell NMR.

Since the last evaluation, two junior research groups were established, while one research group and one junior research group were closed after their leaders left FMP. In order to facilitate FMP's participation in the EU infrastructure project Bio-NMR and in the DFG-funded G-NMR network of facilities, an NMR core facility was established.

Currently, this section comprises one department (a second is to be established in 2014), three research groups, two junior research groups, and one core facility (see below).

Results

In-cell NMR measurements (of cellular enzyme activity profiles and intracellular structure/interactions of proteins), investigations of heterogeneous systems by solid-state NMR, applications of dynamic nuclear polarisation (DNP) for studying structures of biomolecules in a native context, xenon live-cell MRI with novel switchable contrast

agents, studies of the structural basis of pharmacological interference and of membrane protein interactions, and the development of chemical interference tools have resulted in 129 peer-reviewed publications, one other article, and nine contributions to edited volumes during the reporting period.

Work planning

FMP plans to use the recent methodological advances on novel types of biological samples. This includes systems-level investigations of cellular signalling processes by solution-state NMR and molecular imaging studies targeting selected receptors in live cells. Solid-state NMR will be applied to characterise lysosomes of wildtype and knock-out mice, preparations of cytoskeletal arrangements, endosomal membranes, and native biofilms.

Due to an increasing need of support for recombinant protein expression and purification, FMP plans to transform the current unit for protein expression into a core facility. Solid-state NMR will be further emphasised: a second professorship in this area (head of a new department) is envisioned. Accordingly, the institute sees a need to extend the NMR facility into higher fields, namely a 1.1-GHz wide-bore spectrometer to serve applications involving proton detection, and to acquire a gyrotron for generating microwaves to serve DNP applications.

Department "NMR-Supported Structural Biology" (11.0 FTE in research and scientific services, 3.9 FTE doctoral candidates, 3.8 FTE service staff)

In the past years, this department has developed solid-state NMR techniques to render it a routine method in structural biology. Research projects include studies aimed at determining the structures of membrane-integrated or cytoskeleton-attached proteins, using magic-angle-spinning (MAS) solid-state NMR as the major technique. Furthermore, protein systems involved in protein homeostasis were studied. In the future, it is planned to capitalise on dynamic nuclear polarisation (DNP) methods for structural investigations of functional modules in native environments.

During the reporting period, 34 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 2,378k, mainly from DFG and international / EU funding agencies.

Research Group "Solution NMR" (4.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This research group applies solution-state NMR techniques to investigate the structure and dynamics of biomolecules at atomic resolution, frequently in combination with other biophysical techniques. In the past, emphasis has been placed on the investigation of photoactive peptides and proteins. More recently, the focus has been shifted towards investigations of the role of dynamics in biomolecules.

During the reporting period, 16 articles were published in peer-reviewed journals and 2 other articles. Total revenue from third-party funding during that period amounted to € 274k, mainly from DFG funding.

Research Group "Computational Chemistry/Drug Design" (6.0 FTE in research and scientific services, 2.0 FTE doctoral candidates, 1.0 FTE service staff)

The central research topic of this research group is the structure-based design of non-peptidic inhibitors targeting proline-rich motif-mediated protein-protein interactions (PRM-PPI). In collaboration with colleagues from the University of Cologne, a toolbox of small-molecule fragments suitable for replacing proline units has been developed. The group also supports ligand development projects at FMP, in particular in conjunction with EU-OPENSCREEN. To date, about 50 screening projects have been supported.

During the reporting period, 11 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 214k, mainly from DFG funding.

Research Group "Structural Bioinformatics and Protein Design" (3.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This research group investigates both *in silico* and experimentally structure-function relationships of membrane proteins and potential interaction partners. Investigated systems include G protein-coupled receptors, transporters, and tight-junction proteins. In this context, bioinformatics tools were developed supporting the analysis of evolutionary and function-relevant mutations. Another line of research is the study of the interface between claudins and a bacterial enterotoxin which binds extracellularly to claudin subtypes. Further ongoing work includes screening of the FMP compound library. In the future, the derivation of structure-function relationships of proteins that transport thyroid hormones across the membrane will be another line of research.

During the reporting period, 23 articles were published in peer-reviewed journals and 1 other article. Total revenue from third-party funding during that period amounted to € 607k, mainly from DFG funding.

Junior Research Group "In-Cell NMR" (3.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 1.5 FTE service staff)

This junior research group studies events that lead to protein aggregation in the course of neurodegeneration disorders, with a focus on protein alpha-synuclein and its pathological role in Parkinson's disease. In addition, eukaryotic signalling processes are investigated, in particular enzyme activities that establish post-translational protein modifications (PTM) in response to physiological cues or pathological aberrations. To this end, tools for monitoring the establishment of multiple, chemically distinct PTM in real time have been developed and applied.

During the reporting period, 10 articles were published in peer-reviewed journals and 5 other articles. Total revenue from third-party funding during that period amounted to € 564k, all from DFG funding.

Junior Research Group "Molecular Imaging" (4.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This junior research group was established in September 2009. Funded via the ERC Project BiosensorImaging, it aims to establish a novel approach to Magnetic Resonance Imaging (MRI) for inproving drug development and the monitoring of therapies. Research focuses on *in vitro* and *in vivo* diagnostics using methods based on detecting hyperpolarised xenon (Xe) placed in appropriately functionalised Xe cages. This approach offers a hugely increased sensitivity compared the common ones, which rely on detecting water molecules. First milestones have already been achieved.

During the reporting period, 7 articles were published in peer-reviewed journals and 1 other article. Total revenue from third-party funding during that period amounted to € 415k, mainly from EU funding.

Core Facility "NMR" (3.0 FTE in research and scientific services, no doctoral candidates, 1.8 FTE service staff)

The NMR facility of FMP was reorganised as a core facility to facilitate the participation in the European Bio-NMR network and in the DFG-funded G-NMR network of facilities. It accommodates requests from other research groups from both inside and outside FMP. This has promoted collaboration within the institute as well as with external partners.

Former research units:

Since the last evaluation, the Research Group "Solid-State NMR Spectroscopy" (until February 2010) and the Junior Research Group "Protein Engineering" (until May 2011) were closed. The research group leader moved to Technical University Munich; his group used NMR to characterise biomolecular systems at the interface between solution and solid state, focusing on membrane proteins and amyloidogenic peptides and proteins. The junior research group leader moved to *Freie Universität Berlin*; his group studied molecular interactions that govern protein-protein interactions and assembly of protein complexes.

Section 3: "Chemical Biology" (15.7 FTE in research and scientific service, 6.0 FTE doctoral candidates, 18.3 FTE service staff)

Work programme development

Research within this sections focuses on the discovery, synthesis, and use of chemical tools that can selectively modify and modulate the functioning of target proteins. Peptides, proteins, and low molecular weight drug-like molecules are synthesised, and proteins are analysed by mass spectrometry to monitor the consequences of chemical interference and modification. Biochemical, physical, and computational methods are used to investigate interactions at the molecular level. FMP's research strategy yields priority to investigations of challenging and non-validated novel targets and processes.

Research groups within this section provide access to their infrastructure on peptide synthesis, proteomic analysis, and small molecule screening. The Screening Unit was extended into a comprehensive Chemical Biology platform in 2011 and is open to exter-

nal research groups. It also serves as a central node of the European initiative EU-OPENSCREEN (cf. Chapter 2).

This section has been largely restructured since the last evaluation. Following the retirement of the Head of Department "Chemical Biology" in June 2008, the departmental groups became independent research groups, "Peptide-Lipid-Interaction/Peptide Transport", "Mass Spectrometry", and "Peptide Synthesis". The latter research group was closed in 2012 due to its leader's retirement. Two further research groups and two junior research groups left the institute since 2009. In turn, a new Head of Department "Chemical Biology II" was appointed as a *Leibniz-Humboldt Professor* in December 2012 and a new leader of the Research Group "Medicinal Chemistry" joined FMP in June 2013.

Currently, this section comprises one department (a second is to be established in 2014), four research groups, and two core facilities (see below).

Results

Research on small molecule modulators of protein-protein interactions and on post-translational protein modifications, the development of small molecules with specific chemical functionalities (e. g. for the identification or visualisation of biological targets within cells, tissues, or model organisms) and of different tools to probe the biological activity of peptides and protein have resulted in 104 peer-reviewed publications, three other articles, and five contributions to edited volumes during the reporting period. The Chemical Biology screening platform has been expanded. It now features a compound library managed in a fully automated cold storage.

Work planning

FMP has specified the following main medium-term objectives:

- in the context of small molecule modulators of biological function, a) technology development, b) development of tools for optical imaging, c) development of new methods for the synthesis of privileged scaffolds, d) active tissue targeting for imaging and drug delivery;
- in the context of peptide and protein modifications, a) functional analysis of tau protein and its role in Alzheimer's disease, b) addressing intracellular targets with modified peptides and proteins, c) novel chemoselective reactions for functional protein conjugates.

As a short-term goal, the institute aims at filling the currently vacant position of Head of Department "Chemical Biology I" and Director of FMP.

Department "Chemical Biology II" (5.5 FTE in research and scientific services, 7.2 FTE doctoral candidates, 0.8 FTE service staff)

This department was established in December 2012. It harbours expertise in the engineering of peptide and protein conjugates. Research focuses on post-translational modification of proteins. Recently, new chemoselective organic transformations for the synthesis and modification of biologically relevant peptides and proteins have been developed. Planned future efforts include the combination of intracellular applications

of small branched phosphoramidate-linked PEGylated peptides with direct cellular uptake to yield a universal intracellularly active peptide system as well as research on the role of the tau protein in Alzheimer's disease.

During the reporting period, 21 articles were published in peer-reviewed journals and 4 other articles, including work from before the group's installation at FMP. Total revenue from third-party funding during that period amounted to € 438k, all from DFG funding.

Research Group "Chemical Systems Biology" (6.0 FTE in research and scientific services, no doctoral candidates, 3.5 FTE service staff)

This research group was established in September 2010 when its leader moved to FMP. It was terminated in December 2013. The group investigates cellular targets with multiple/poly-regulatory functions, aiming at the development of pharmacological tools and approaches towards systems interventions and treatments. One focus has been on cellular protein networks regulated by calmodulin. A second important line or research has been the advancement of chemical microarray technology. Finally, the coordinating office of EU-OPENSCREEN (cf. Chapter 2) is part of this research group. The group leader continues to fulfil his duties as coordinator beyond his retirement at the end of December 2013.

During the reporting period, 9 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 1884k, mainly from international / EU funding.

Research Group "Peptide-Lipid-Interaction/Peptide Transport" (1.8 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This research group studies the selective interaction of peptides with cellular membranes and their ability to penetrate them or render them permeable. Using these insights, peptides are developed as targeting or uptake-mediating tools for drugs and lipid-based drug carriers. The current focus is on targeting the blood-brain barrier and the efficient cutaneous delivery of bioactive compounds. In 2013, an "orphan drug" designation was granted by the European Commission for a lipopeptide-modified liposomal formulation of recombinantly expressed transglutaminase 1. A further line of research is directed at the mode of action of small membrane-active antimicrobial peptides.

During the reporting period, 6 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 126k, mainly from DFG funding.

Research Group "Mass Spectrometry" (1.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This research group develops and applies novel mass spectrometry approaches to achieve efficient and robust identification and quantification of proteins. Research focuses on protein-protein interactions and post-translational modifications (PTM), often in collaboration with other groups both within and outside FMP. Results in the past

years include e. g. insights into the mechanisms underlying the toxic response induced by chemical injury or on acetylation-dependent protein interactions of histone H4 that might modulate gene expression. Future work will focus on the improvement of methods for PTM analysis and the establishment of interactome analysis. A further project will address T-cell receptor-associated protein interactions that may function as modulator of cellular adhesion and migration processes.

During the reporting period, 23 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 6,500.

Research Group "Medicinal Chemistry" (since 06/2013; 4.0 FTE in research and scientific services, no doctoral candidates, 3.8 FTE service staff)

This research group was established in June 2013. Its group leader moved from pharmaceutical industry to FMP. Research efforts are directed at the discovery and optimisation of small molecule hits emerging from screening or drug design. Prior to joining FMP, the focus was on kinases, G protein-coupled receptors, proteases, and ion channels. More recently, attention has been shifted towards the general role and impact of the early selection of the appropriate central scaffold of molecules, which are more difficult to exchange than peripheral side-chains. Accordingly, the group plans to investigate and develop new procedures for the synthesis of biologically relevant privileged scaffolds. In collaboration with the Screening Unit of FMP, it will attempt to synthesise activity-based FRET-probes to label and investigate target proteins in their native environment.

During the reporting period, 7 articles were published in peer-reviewed journals, all of them before the installation of this research group at FMP.

Core Facility "Peptide Chemistry" (1.0 FTE in research and scientific services, no doctoral candidates, 1.0 FTE service staff)

This core facility was established in November 2012, building on the infrastructure of the former Research Group "Peptide Synthesis". It provides simple synthetic peptides to FMP research groups. The Head of Department "Chemical Biology II" also leads this core facility and contributes his expertise for the synthesis of advanced post-translationally modified polypeptides and unnatural peptide conjugates. Since January 2013, a guest scientist from the Charité Berlin acts as co-head and contributes his expertise in peptide synthesis, peptide libraries, and peptide arrays on solid supports for screening purposes.

During the reporting period, 33 articles were published in peer-reviewed journals by the co-head, mostly without FMP affiliation.

Core Facility "Screening Unit" (1.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

The Screening Unit serves as an open access technology platform for automated screening, using either compound libraries such as the ChemBioNet collection with approximately 40,000 compounds or genome-wide RNAi libraries. It supports assay development, process automation, screening, and automated data analysis. In addition, the Unit

identifies novel screening technologies and implements these for service. Since its establishment in 2004, more than 170 research projects with scientists from Europe and the USA have been served. Own research focuses on process automation and on establishing novel detection technologies for profiling of biological functions. As possible future additions to the service spectrum, FMP mentions the setup and integration of FACS detection, the establishment of a basic set of hit profiling routines for membrane penetration, microsomal stability, and serum protein binding.

During the reporting period, 14 articles were published in peer-reviewed journals. Total revenue from third-party funding during that period amounted to € 968k.

Former research units:

Since the last evaluation, three research groups and two junior research groups were closed or left FMP.

- The Research Group "Synthetic Organic Chemistry" (closed at the end of December 2012 due to the retirement of its leader) focused on the development of so-called caged compounds.
- The Research Group "Medicinal Chemistry" (closed due to the leader's leaving the institute in March 2010, but kept as a guest group until May 2013) studied the contributions of molecular substructures to the overall activity of protein ligands.
- The Research Group "Peptide Synthesis" (closed in October 2012 due to the retirement of its leader) focused on the design and synthesis of light-controllable, biologically active peptides.
- The Junior Research Group "Biophysics of Membrane Proteins" (closed in October 2010 due to the leader's leaving the institute) studied the biophysical chemistry of the complex interplay among proteins, peptides, lipids, and detergents.
- The Junior Research Group "Protein Chemistry" (closed in September 2011 due to its leader's leaving the institute) developed and used chemical tools to study the physiological functions of post-translational modifications with special emphasis on histones.

4. Collaboration and networking

Collaboration with universities

According to FMP, collaborations with the **Berlin universities** are of particular importance and include *Freie Universität Berlin*, *Humboldt-Universität zu Berlin*, and *Charité Universitätsmedizin Berlin* (the joint medical faculty of *Freie Universität* and *Humboldt-Universität*). The director and the heads of department are usually affiliated with one of these institutions by joint appointment. Furthermore, many of FMP's principal investigators, postdocs, and graduate students are involved in teaching activities at one of these universities.

Currently, four FMP scientists hold professorships: one C4 and one W3 professorship at *Freie Universität*, one W3 professorship at Charité, and one W3 Leibniz-Humboldt professorship at *Humboldt-Universität*.

Two more W3 professorships at *Humboldt-Universität* are to be filled. One of them will also become a director at FMP. With these positions filled, the institute will have reached its planned full capacity, with each of the three sections hosting two departments and several independent research groups.

Principal investigators at FMP regularly act as project leaders in DFG-funded collaborative research and infrastructure projects jointly organised with universities. At present, this includes the Cluster of Excellence NeuroCure, six Collaborative Research Centres (SFB), and projects in a "Research Unit" (FOR) and a "Priority Programme" (SPP).

Collaboration with other institutions in Germany and abroad

At **local level**, FMP researchers collaborate intensively with various institutions in the Berlin-Brandenburg region, especially with the neighbouring Max Delbrück Center for Molecular Medicine (MDC), an institute of the Helmholtz Association. Research activities in both institutes are largely complementary. Both institutes also share large infrastructure, exchange reagents and expertise, and are engaged in joint teaching activities.

The *Screening Unit* and the *Chemical Biology Platform* of FMP play a particularly important role with respect to (local) collaborations. A joint Scientific Screening Board comprising two scientists from each FMP and MDC evaluates and selects projects. Joint activities between the two institutes may be further expanded in the near future as part of the operational phase of the European infrastructure EU-OPENSCREEN (see below).

In 2006 and 2008, FMP, MDC, and the *Helmholtz Centre for Infection Research* (HZI, Braunschweig) signed collaboration agreements under which a compound library was jointly financed and acquired from commercial sources.

NetDDD, the Network for Drug Discovery and Development Berlin-Brandenburg, was founded by FMP and *BioTOP Berlin-Brandenburg* and launched in 2007. NetDDD aims at accelerating the transfer of medically relevant discoveries into innovative drugs and therapeutic concepts by offering support, networking, and professional training.

FMP's *Chemical Biology Platform* has received significant financial support and extension as a vital partner in the Helmholtz Research Consortium *Helmholtz Drug Research* (comprising DKFZ, DZNE, FZJ, HZI, HIPS, HMGU, MDC, TUM, EMBL). The consortium aims at supporting knowledge transfer related to early drug discovery. Further extension of FMP's *Chemical Biology Platform* is planned as an opening for research programmes of the recently founded *Berlin Institute of Health* (BIH), a joint translational research institute of MDC and Charité.

Furthermore, FMP is a member of the *Imaging Network Berlin* (a network of the *TSB Technology Foundation Berlin Group*), which focuses of medical applications of bioimaging methodologies.

Within the **Leibniz Association**, FMP actively participates in the Leibniz Research Networks "Pharmaceutical Agent and Biotechnology" and "Healthy Ageing".

At **European level**, FMP took leadership in the German ChemBioNet initiative in 2004 to submit a proposal to the European Strategy Forum for Research Infrastructures (ESFRI) for a European-type ChemBioNet called EU-OPENSCREEN. As a result, EU-OPENSCREEN became part of the ESFRI roadmap in 2008. Since 2010, a preparatory phase project funded with € 3.7 million from the European Union has been underway. This project's entire infrastructure is coordinated at FMP. Currently (02/2014), it comprises 23 partners from 16 European countries.

EU-OPENSCREEN's core activities will be to conduct large-scale screening projects at selected screening centres while offering access to a common compound library (European Chemical Biology Library, ECBL), operating demanding equipment such as HTS robotics, and offering assay experience with a broad biological scope.

Meanwhile, EU-OPENSCREEN has been added by the Federal Ministry of Education and Research to the national roadmap for large research infrastructures in Germany. The ministry committed itself to support EU-OPENSCREEN with up to € 20.5 million. EU-OPENSCREEN plans to formally found the infrastructure as a *European Research Infrastructure Consortium* (ERIC) at the end of 2014 with its head office in Berlin-Buch. It may resume full operation after a short scale-up period in late spring of 2016.

As a second major focus of collaborative research, FMP provides expertise in biological NMR applications including instrumentation for solid- and solution-state NMR to scientists in Germany and across Europe. The collaborative research project Bio-NMR is financed within the 7th Framework Programme (FP7) of the European Commission as part of a group of European NMR research infrastructures dedicated to structural biology. Bio-NMR involves 19 partners from 15 countries, and enables access for European scientists to the instrumentation and expertise available at eleven of the 19 partner infrastructures.

In addition to these major collaborative networks, FMP is involved in various **other European programmes** funded by the ERC or within the Framework Programmes. These include both projects run by single PIs and collaborative projects.

Finally, FMP groups collaborate with companies on technology development and the synthesis and design of novel chemical approaches or scaffolds of interest to the pharmaceutical industry.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

As of 31 December 2012, FMP employed 219 people (183 FTE including scholarship recipients). Among them, 137 (115 FTE) were scientists (including scholarship recipients and doctoral candidates). Among the scientific staff, 36 % were women, 51 % were funded by third-party money, and 80 % were employed on temporary contracts (cf. Appendix 4).

In January 2012, a new director (jointly appointed with *Freie Universität Berlin*) took up service at FMP and also became the Head of Department "Molecular Pharmacology and

Cell Biology". At the end of 2012, the position of Head of Department "Chemical Biology II" was filled with a Leibniz-Humboldt-Professor (jointly appointed with *Humboldt-Universität*).

Due to the establishment of these two new department heads and their groups, the number of employees increased to 230 by June 30, 2013. In addition to the FMP staff, approximately 50 guest scientists work at the institute.

During the coming years, FMP expects an increased number of staff due to the establishment of two further departments within the sections Structural Biology and Chemical Biology. With their establishment, the period of transition at FMP will be completed.

Promotion of gender equality and family-work balance

FMP is committed to the principles of equal opportunities and a work environment that supports a family-work balance. A work plan for equal opportunities was decided on in 2009 and updated in 2013. It now includes a budget for equal opportunities measures of € 9,000 per year at the disposal of an equal opportunities commissioner.

At the end of 2012, 41 % of the scientists in non-executive positions holding a doctoral degree and 37 % of the doctoral candidates were female. Three of twenty scientific executive positions were held by women. Two additional female scientists assumed leadership of junior research groups in 2013.

FMP allows for flexible work schedules and co-finances a day care facility on the Campus Berlin-Buch. A special "re-entry" position has been created for scientists returning to scientific work after maternity leave. Scientists may also apply for technical staff to support them after returning to work. In 2013, FMP was granted the *beruf**und**familie* certificate for its efforts in enabling a good family-work balance.

Promotion of junior researchers

All scientists at FMP are offered training and consultation according to their individual requirements. There are centrally organised training courses and seminars on topics including career development or team building. Non-German speakers have the opportunity to take A-level German courses. All scientists are encouraged to participate in teaching activities.

Between 2010 and 2012, 29 academic degrees qualifying for doctoral work (diploma, Master's) were completed under the supervision of FMP staff.

During the same period, 56 doctoral dissertations were completed at FMP. At any given time, about 80 PhD students work at the institute. They are supervised by a thesis committee comprised of three experienced scientists who meet annually. Since 2013, all PhD students participate in the FMP Graduate School (FGS). Since 2007, FMP also hosts the Leibniz Graduate School for Molecular Biophysics, a joint training network of FMP, MDC, *Freie Universität* and *Humboldt-Universität*, *Charité*, *Technische Universität Berlin*, and University of Potsdam. There are also several DFG-funded graduate programmes available to FMP's doctoral candidates.

FMP supports the career development of postdocs, e. g. by facilitating scientific exchange through participation in meetings or collaborative projects. All courses and seminars of FGS are open to the postdocs as well. Junior research group leaders usually join the institute with their own funding, e. g. from the *Alexander von Humboldt Foundation*, DFG (*Emmy Noether Programme*), the European Molecular Biology Organisation (EMBO), the European Research Council (ERC), or the Human Frontier Science Program. Conditional on positive external peer review after an initial period of usually five years, they receive funding for an additional four-year stay at FMP from in-house sources. In the past years, three FMP junior scientists left the institute to assume professorships elsewhere (one in 2009 and two in 2011).

Vocational training for non-academic staff

FMP is committed to training its non-academic staff according to their needs. For example, English courses are offered to improve communication with scientists from abroad.

The institute employs apprentices in administration, technical services, and technical assistance (chemistry or biology). Usually, one apprentice in each of those areas is present at the institute. During the reporting period, four apprentices, all technical assistants in biology, successfully completed their vocational qualifications.

6. Quality assurance

Internal quality management

Quality management at FMP takes place at multiple levels; it includes scientific exchange within the institute, joint planning of future research directions and projects, performance-based incentives, professional training of FMP staff, and continuous development or renewal of scientific infrastructure.

The institute is committed to the standards and rules of Good Scientific Practice as published by the German Research Foundation. In addition, it follows Rules to Ensure Good Scientific Practice at FMP and Standard Procedures in Case of Suspected Scientific Misconduct as determined by the Managing Board of FVB. Training in Good Scientific Practice is included in the curriculum of FMP Graduate School (FGS). The leaders of the research groups are responsible for ensuring that these rules are followed. In case of disputes, there is an elected ombudsman of the institute. The graduate students elect their own ombudsman.

In order to encourage high performance, several measures have been introduced: researchers receive 50 % of the overhead allowed with each third-party grant and a bonus of € 6,000 annually for each third-party-financed scientist. There are internal project grants for integrated research projects carrying out cross-sectional collaborative research; successful projects, as evaluated by the so-called *Leitungsgremium* (cf. Chapter 1) receive funding for a graduate student for three years and € 15,000 annually for consumables. Furthermore, technology transfer projects are fostered by up to two technology transfer awards of € 15,000 per year.

Quality management by the Scientific Advisory Board, User Advisory Board and Supervisory Board

The Scientific Advisory Board (SAB) consists of six to twelve scientists. They are appointed by the Board of Trustees of FVB for a period of four years, with the possibility of extension for a second period. The SAB meets annually at FMP, receives a report on the institute's achievements, ongoing development, and future plans. It decides on recommendations for further measures, including advice on the appointment of directors and professors. Between the external evaluations of FMP, the SAB conducts an audit; the last audit took place in 2010.

Implementation of recommendations from the last external evaluation

In order to meet the Senate's recommendations of the last evaluation (below in *italics*; cf. Senatsstellungnahme zum Leibniz-Institut für Molekulare Pharmakologie; 22 November 2007; pp. B-12/13), FMP has reacted as follows:

MISSION, TASKS, WORK FOCUS

1. *To sharpen its research profile, the institute should set some principal themes bridging the sections. The questions being subject to research should be better interconnected and should be thoroughly and in its full range investigated with regards to a few select biological systems.*

In recent years, FMP has witnessed a period of considerable turnover. This has allowed several topical research areas to be established, each of which spans more than one section of FMP. Specifically, these include:

a) Membrane biology, e. g. analysis of receptors and ion channels, membrane dynamics

b) Molecular neurobiology including synaptic function

c) Protein homeostasis

d) Bio-imaging

2. *To improve coherence of research at FMP, the integrated FMP Projects are considered an extremely important measure. They should therefore be further extended.*

Collaboration and networking is encouraged and supported, where possible. The instrument of integrated projects to provide an incentive for devising projects across sections is continued.

3. *The independent research groups 'Molecular Cell Physiology' and 'Biochemical Neurobiology' should increase their productivity.*

When compared to the previous evaluation period, the 'Biochemical Neurobiology' group has substantially improved its scientific output of papers by about 20 % up to the retirement of the group leader. The 'Molecular Cell Physiology' group also increased its productivity continuously. Compared with the last evaluation, it doubled the number of publications with an impact factor above seven as well as the number of research projects funded. Amongst other funding, the group leader shares the EU consortium JUST-BRAIN and has been awarded by the BMBF the € 1.1 million project EASYPERM.

4. *Regarding staffing developments of the independent research group 'Synthetic Organic Biochemistry', it is recommended to keep organic chemical synthesis expertise at the institute.*

Today, FMP regards synthetic chemistry as a cornerstone of its research. During the reporting period, FMP has established two synthetic chemistry groups. Furthermore, together with the *Humboldt-Universität zu Berlin*, FMP is in the process of filling the position of Head of Department "Chemical Biology I" and the "Chemical Biology" section.

5. *The junior research group 'Biophysics of Membrane Proteins' seems somewhat isolated within the institute. The group should aim at a stronger networking with other groups of FMP.*

The head of this group left the institute with his group in autumn 2009, accepting an offer for a tenure-track assistant professorship at the University of Kaiserslautern.

STRUCTURE AND ORGANISATION

6. *FMP should check whether a better homogeneity in structure, financing, and staffing of research groups throughout the institute could be achieved.*

Based on discussions between the group leaders and the director(s), all research groups at FMP have received written statements regarding the allocation of space, funding, and staff that allows for mid-term planning. These commitments in general reflect the overall performance of research groups with respect to publications in international peer-reviewed journals and third-party funding among other measures of performance.

7. *Regarding communication between institute management, heads of groups, and employees, it should be checked whether communication of relevant decisions could be improved.*

The director(s) and management of the institute have made intense efforts to ensure optimal communication with the group leaders, but also with all other FMP staff.

8. *Measures to ensure gender equal opportunity at FMP should be intensely developed and implemented. The institute's Equal Opportunities Commissioner should be involved in procedures for appointing group leaders.*

FMP has made substantial efforts at all levels to promote gender equality and to improve the work-family balance of its staff.

FINANCING, USE OF FUNDS, AND STAFF

9. *Regarding its investment requirements, the FMP should write clear and focussed applications to first be discussed with the Scientific Advisory Board. Then, necessary investments should be discussed with the funding institutions.*

It has been good practice for many years to discuss larger investments with the Scientific Advisory Board (SAB) before proceeding propositions to the supervisory board of the *Forschungsverbund Berlin*, to the Senate of Berlin and to the Federal Ministry of Education and Research (BMBF). The goals and planning for the next year are always

written down in the *Programmbudget*, which forms a part of the topics to be decided on at the annual SAB meetings.

10. FMP should try to rectify shortcomings regarding online literature access for institute employees by cooperating with Berlin universities.

Access to online literature for FMP scientists is possible via several routes. Students, postdocs, and faculty affiliated with one of the Berlin universities have access to online journals via their account at the respective university. Furthermore, FMP is in the process of joining Leibniz consortia contracts to gain access to scientific journals.

In addition, FMP has contacted the local Friedrich Althoff Consortium of libraries in Berlin-Brandenburg, bundling subscription efforts of universities and non-university institutions in Berlin-Brandenburg.

Finally, FMP supports efforts to develop an effective non-profit open access publishing system and encourages FMP researchers to publish in open access journals such as eLife or the PLOS journal family.

Promotion of Junior Researchers, and Cooperation

11. Regarding graduate student training, the implementation of thesis committees is recommended.

Thesis committees are standard in the course of graduate studies at FMP. Within the new FMP Graduate School, thesis committees are a central element in advising and guiding PhD students through their thesis work (cf. Chapter 5).

12. Regarding its collaborations with MDC, FMP should try and improve its own visibility.

FMP scientists enjoy a number of close and successful collaborations with their MDC colleagues, many of which have resulted in joint publications. Furthermore, FMP has intensified its efforts with respect to public relations, including a revamped institute webpage, press releases, and publication of suitable printed materials. It also engages in teaching, training of teachers, visitors, and public events such as "*Lange Nacht der Wissenschaften*" (cf. Chapter 2).

13. The number of guest scientists should be increased.

Today, FMP is an attractive destination for a growing number of guest scientists. Every year, about 50 guests are hosted at the institute. These also include post-doctoral scientists who join FMP with a stipend. In 2013, seven post-doctoral scholarship holders have been working at the institute.

Research Results and Scientific Impact

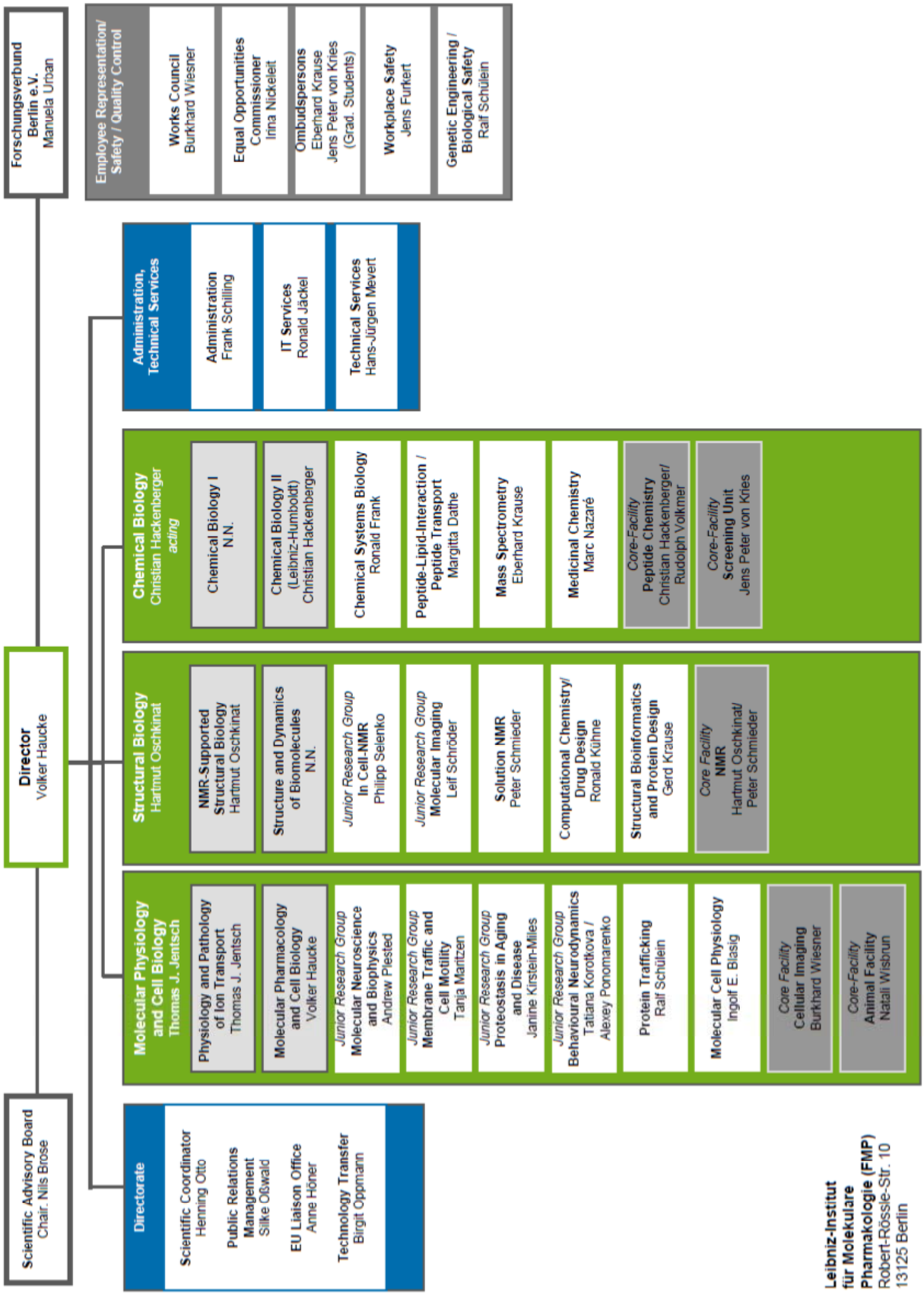
14. The number of publications, particularly in journals with high impact factor should be further increased.

The number of publications has increased considerably compared to the previous evaluation period (to 145 %: 219 publications for 2004 – 2006; 322 publications for 2010 – 2012). The fraction of publications in high-impact journals (impact factor ≥ 7)

increased from 19 % to 26 % (corresponding to a rise from 41 to 85 publications in high-impact journals).

Appendix 1

Organisational Chart



Appendix 2

Publications and patents

	Period		
	2010	**2011**	**2012**
Total number of publications			
Monographs	0	0	0
Individual contributions to edited volumes	4	1	9
Articles in peer-reviewed journals [1)]	119 (13)	103 (8)	133 (12)
Articles in other journals	4	0	0
Working and discussion papers	4	1	1
Editorship of edited volumes	0	2	1
Number of publications per full-time equivalent (FTE) in 'research and scientific services' (not including doctoral candidates)	1.7	1.3	1.8

Industrial property rights	**2010**		**2011**		**2012**	
	granted	registered	granted	registered	granted	registered
Patents	1	30	27	35	27	24
Other industrial property rights	-	-	-	-	-	-
Exploitation rights / licences	3		4		5	

[1] Including reviews (numbers in brackets)

Appendix 3

Revenue and Expenditure

Revenue		2010			2011			2012		
		k€	% [2]	% [3]	k€	% [2]	% [3]	k€	% [2]	% [3]
Total revenue (sum of I., II. and III.; excluding DFG fees)		**23,326.6**			**20,798.9**			**21,329.1**		
I.	**Revenue (sum of I.1.; I.2. and I.3)**	**22,705.5**	100 %		**19,768.8**	100 %		**20,880.9**	100 %	
1.	Institutional funding (excluding construction projects and acquisition of property)	14,182.5	62 %		14,637.1	74 %		15,052.8	72 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and *Länder* governments according to AV-WGL	14,182.5			14,637.1			15,052.8		
1.1.1	*Proportion of these funds received through the Leibniz competitive procedure (SAW procedure)* [4]	*797.5*			*666.5*			*341.0*		
1.2	Institutional funding (excluding construction projects and acquisition of property) not received in accordance with AV-WGL	0.0			0.0			0.0		
2.	Revenue from project grants	8,523.0	38 %	100 %	5,131.7	26 %	100 %	5,828.1	28 %	100 %
2.1	DFG	2,510.4		29 %	1,962.0		38 %	2,316.2		40 %
2.2	Leibniz Association (competitive procedure) [4]	0.0		0 %	171.8		3 %	334.9		6 %
2.3	Federal, *Länder* governments	1,918.4		23 %	888.5		17 %	215.8		4 %
2.4	EU	3,234.4		38 %	1,269.3		25 %	1,742.1		30 %
2.5	Industry *(if applicable, break down by source)*	70.0		1 %	10.8		0 %	23.2		0 %
2.6	Foundations *(if applicable, break down by source)*	102.9		1 %	25.1		1 %	291.8		5 %
2.7	*If applicable: other sponsors (break down by source)*	686.9		8 %	794.2		15 %	894.1		15 %
3.	Revenue from services	0.0	0 %		0.0	0 %		0.0	0 %	
3.1	Revenue from commissioned work									
3.2	Revenue from publications									
3.3	Revenue from exploitation of intellectual property for which the institution holds industrial property rights (patents, utility models etc.)									
3.4	Revenue from exploitation of intellectual property									
II.	**Miscellaneous revenue** (e.g. membership fees, donations, rental income, funds drawn from reserves)	**621.1**			**1,030.1**			**448.2**		
III.	**Revenue for construction projects** (institutional funding by Federal and *Länder* governments, EU structural funds, etc.)	**0.0**			**0.0**			**0.0**		

Expenditures		k€	k€	k€
Expenditures (excluding DFG fees)		20,350.46	20,592.00	21,042.54
1.	Personnel	10,468.26	10,538.53	10,862.39
2.	Material resources	5,485.14	6,152.38	6,083.48
2.1	*Proportion of these expenditures used for registering industrial property rights (patents, utility models etc.)*	53.50	53.00	82.80
3.	Equipment investments and acquisitions	2,719.94	3,283.20	3,129.30
4.	Construction projects, acquisitions of property	0.00	0.00	0.00
5.	"Reserves" (e.g. cash assets, unused funds)	561.90	137.30	177.70
6.	Miscellaneous items	1,115.22	480.59	789.67

DFG fees (2.5 % of revenue from institutional funding)	364.00	354.20	367.20

[1] Preliminary data: no

[2] Figures I.1, I.2 and I.3 add up to 100 %. The information requested here is thus the percentage of "Institutional funding (excluding construction projects and acquisition of property)" in relation to "Revenue from project grants" and "Revenue from services".

[3] Figures I.2.1 to I.2.7 add up to 100 %. The information requested here is thus the percentage of the various sources of "Revenue from project grants".

[4] Competitive procedure of the Leibniz Association: until 31 December 2010, funds allocated through this procedure were designated as institutional funding. Since 1 January 2011, the Leibniz Association has granted these funds as project grants.

Appendix 4

Staff

(as of 31. December 2012)

	Full time equivalents		Employees		Female employees	
	Total	on third-party funding	Total	on fixed-term contracts	Total	on fixed-term contracts
	Number	Percent	Number	Percent	Number	Percent
Research and scientific services	**101.5**	51 %	**124**	80 %	**44**	78 %
Professors / Directors (C4, W3, or equivalent)	3.0	0 %	3	0 %	0	
Professors / Directors (C3, W2, A16, or equivalent)	0.0		0		0	
Academic staff in executive positions (A16, A15, E15, or equivalent)	9.0	0 %	9	0 %	1	0 %
Junior research group leaders / junior professors / post-doctoral fellows (C1, W1, A14, E14, or equivalent)	4.0	50 %	4	100 %	1	100 %
Scientists in non-executive positions (A14, A13, E14, E13, or equivalent)	57.4	47 %	64	80 %	26	85 %
Doctoral candidates (A13, E13, E13/2, or equivalent)	28.1	77 %	44	100 %	16	100 %
Service positions	**51.0**	23 %	**59**			
Laboratory (E9 to E12, upper-mid-level service)	28.0	21 %	33			
Laboratory (E5 to E8, mid-level service)	12.5	48 %	14			
Animal care (E5 to E8, mid-level service)	3.0	0 %	3			
Workshops (E5 to E8, mid-level service)	4.0	0 %	4			
Information technology - IT (E9 to E12, upper-mid-level service)	3.0	0 %	4			
Technical (large equipment, service) (E5 to E8, mid-level service)	0.5	0 %	1			
Administration	**14.3**	0 %	**16**			
Head of administration	1.0	0 %	1			
Staff positions (E9 to E12, upper-mid-level service)	1.0	0 %	1			
Internal administration (financial administration, personnel) (E9 to E12, upper-mid-level service)	1.8	0 %	3			
Internal administration (financial administration, personnel) (E5 to E8, mid-level service)	8.8	0 %	9			
Building service (E1 to E4)	1.8	0 %	2			
Student assistants	**1.8**	33 %	**6**			
Vocational trainees	**1.0**	0 %	**1**			
Scholarship recipients at the institution	**13.0**	100 %	**13**		**5**	
Doctoral candidates	8.0	100 %	8		3	
Post-doctoral researchers	5.0	100 %	5		2	

2 September 2014

Annex B: Evaluation Report

Leibniz-Institut für Molekulare Pharmakologie (FMP) within the Forschungsverbund Berlin e. V.

Contents

1. Summary and main recommendations

The Leibniz-Institut für Molekulare Pharmakologie (FMP) conducts extremely successful basic research with a focus on identifying new bioactive molecules and characterising their interaction with their biological targets in cells and organisms. Since the last evaluation, the institute has developed very positively. In the preceding few years, some excellent senior scientists, including the Director, had accepted appointments at other distinguished institutions, whilst some of the other research group leaders had reached retirement age. This led to considerable changes in personnel, some of which involved positions remaining vacant for an extended period. The institute has turned these staffing changes to its advantage in line with its strategic objectives.

The overall strategy, which emphasises bottom-up basic science, is very convincing. Interdisciplinary cooperation within the institute has been intensified and has proven successful. Bundling expertise from the three sections "Molecular Physiology and Cell Biology", "Structural Biology", and "Chemical Biology" clearly generates added value. The combination of this with systematically applying highly advanced techniques, particularly biophysical and chemical methods, to biological questions has given the institute a unique profile. For the future, FMP should continue to ensure that opportunities for the translational exploitation of outcomes are followed up, possibly with external collaborative partners.

The publication level is very high and has been raised yet further since the previous evaluation. Internationally, FMP and its work are clearly visible and recognised. The performance of the 24 units assessed (departments, research groups, junior research groups, and core facilities) is rated as "excellent" in eight cases, "very good to excellent" in three cases, "very good" in seven cases, and "good to very good" in three cases; two groups that have only recently been established could not yet be evaluated. In the core facility, "Animal Facility", essential services for the entire institute are undertaken (see Chapter 3 for details).

In addition to research, services are provided, in some cases for external partners. By agreeing to coordinate the EU-OPENSCREEN Network, FMP has adopted an important role on behalf of the European research community. Given its expertise, the institute is ideally positioned to take on this role on a permanent basis, as is indeed planned, and should, therefore, be supported in its efforts to do so.

FMP cooperates intensively and productively with the universities in Berlin. At the time of the evaluation visit, all five heads of department held joint professorships; a sixth head of department position will be filled in the context of a joint appointment in 2014. The most important non-university partner is the Max Delbrück Center for Molecular Medicine (MDC), which is located in the immediate vicinity on the Berlin-Buch Campus. The research work conducted at MDC and FMP is complementary, which generates extremely productive, intensive collaboration and joint use of infrastructure. FMP's strategic planning for the future is convincing.

The promotion of junior researchers at FMP is excellent. All doctoral candidates are integrated in graduate schools. Postdocs also have outstanding opportunities to continue qualifying. By offering a binding agreement to employ junior researchers on a five-year fixed-term contract, which can be extended by a further four years based on a positive interim evaluation, FMP has developed an exceptionally appealing tool for attracting excellent junior researchers to the institute.

Special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

GENERAL CONCEPT AND PROFILE

1. It is welcomed that FMP is trying to implement building measures which would allow projects and infrastructure related to EU-OPENSCREEN to be funded in the context of the European Strategy Forum on Research Infrastructures (ESFRI).
2. FMP's list of requirements with regard to additional funding for expanding facilities and infrastructure should be prioritised in consultation with the Scientific Advisory Board and the Board of Trustees of *Forschungsverbund Berlin*. Subsequently, the feasibility of various sources of financing should be examined and, if appropriate, the relevant evaluation procedures initiated. This should include an analysis of potential participation by the institute's closest collaborative partners.

SUBDIVISIONS OF FMP

3. It is recommended to make the expansion of animal experimentation capacity a major priority and to coordinate closely with the relevant bodies in order to find ways of establishing sufficient capacity and the required hygiene standard, either at FMP itself or at one of the collaborative partners.

STAFF DEVELOPMENT AND PROMOTION OF JUNIOR RESEARCHERS

4. FMP must keep striving to increase the proportion of women in the scientific sector and especially at leadership level.

QUALITY ASSURANCE

5. The "integrated projects" programme, which supports cross-sectional research, has proven very effective. FMP should consider using this tool on a larger scale.

2. General concept and profile

Development of the institution since the last evaluation

The Leibniz-Institut für Molekulare Pharmakologie (FMP) conducts extremely successful basic research with a focus on key biological processes on the molecular level, one of the objectives being to gain a better understanding of the causes of disease. Since the last evaluation, the institute has developed very positively and managed the changes in leadership personnel (see Status Report, p. A-4f and A-23 for details) with excellent outcomes.

The overall strategy is convincing. The institute concentrates on bottom-up basic science in the run-up to drug research. It is encouraged to continue fostering basic science, but

to be alert to recognising promising translational avenues if they arise. In order to retain a systematic overview of the potential for exploiting results and, if appropriate, pursuing them together with collaborative partners, it might be worth considering assigning dedicated personnel to this task.

FMP's interdisciplinary approach has proven its merit. By combining expertise from the three departments, "Molecular Physiology and Cell Biology", "Structural Biology", and "Chemical Biology", integrating highly advanced techniques, and systematically applying biophysical and chemical methods to biological questions, the institute has developed a unique profile. The combination of solid-state and solution NMR has also led to significant scientific progress in the last few years and should continue to be pursued.

In addition to research, services are provided, in some cases for external partners, which are partly responsible for the institute's very good level of networking. By agreeing to coordinate the EU-OPENSCREEN Network, FMP has undertaken an important task on behalf of European chemical biology, which should now be continued and extended (see below).

Results

Research, additional research-based results

In the last few years, FMP has conducted high-quality research work. This has included investigations into the molecular and cellular mechanisms of pharmacologically relevant pathways and key proteins as well as their selective manipulation using a broad spectrum of methods. A further focus has been on the development of new MRT methods and other imaging approaches (see Chapter 3 and the FMP Status Report, Chapters 2 and 3 for further details).

The publication level is very high and has been raised yet further since the previous evaluation. In accordance with the institute's objective to showcase its research at the highest international level, results are largely published in peer-reviewed, English-language journals. The interlinking of themes within the various research units is already very successful, as demonstrated by cross-sectional publications; it should, however, be intensified.

Infrastructure tasks, scientific consultancy, knowledge and technology transfer

FMP's Screening Unit provides important, high-quality services both internally and for external users. The spectrum of screening assays is impressive; the compound collection is comprehensive and is continually being developed.

By agreeing to coordinate the EU-OPENSCREEN Network, FMP has adopted an important role on behalf of the European research community. Given its expertise, the institute is ideally positioned to take on this role on a permanent basis, as is indeed planned, and should, therefore, be supported in its efforts to do so.

Even though FMP quite rightly concentrates on basic research, it actively pursues an exploitation and transfer strategy. Patents and other industrial property rights are regularly registered. However, in the last three years, the institute has not generated any in-

come from these rights. In the future, the institute should continue to ensure that any potential transfer of research outcomes is systematically checked with regard to economic feasibility and sustainability and, in promising cases, implemented.

FMP's efforts to share its findings with as broad an audience as possible are remarkable. Different target groups, ranging from school and university students via politicians to the public in general, are appropriately addressed using various media.

Strategic work planning for the next few years

FMP's strategic planning for the future is convincing. In the last few years, outstanding appointments at leadership level have paved the way for very successful research. The institute's three sections cover the entire spectrum of molecular pharmacology.

FMP has excellent expertise in structural biology. In particular, the institute has steered the application of solid-state NMR to biological questions to the highest international level. The institute's efforts to ensure that it can continue to drive developments at the cutting-edge by investing significantly in equipment make sense (see the following section on Appropriateness of facilities, equipment, and staffing).

Chemical biology will continue to gain in importance as a research area. It is, therefore, plausible that FMP intends to establish a second department in the Chemical Biology section. Once the imminent appointment of a new head of department has taken place, the relationship between the three sections will be well-balanced. In the medium-term, the institute should try to establish a junior research group in Chemical Biology, as has already happened in the two other sections.

Another core component of planning is the development of the screening facility and FMP's leadership in the EU-OPENSCREEN Project (European Infrastructure of Open Screening Platforms for Chemical Biology), which involves institutions in nine countries as well as the European Molecular Biology Laboratory (EMBL, Heidelberg). FMP was appointed coordinator for the preparatory phase (2010 to 2013), which received funding of 3.5 million EUR under the EU's 7th Research Framework Programme. It would be a much welcomed asset if the institute were able to continue this role in the operative phase, which is just beginning and which is also initially being funded by the EU. This would allow FMP and the entire research location of Berlin to establish itself as a key player in European chemical biology on a permanent basis. By including the project in the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI), the Federal Government has indicated its clear intention to provide support and has created an important precondition for its successful continuation. **It is welcomed that FMP is currently trying to implement building measures which would allow projects and infrastructure related to EU-OPENSCREEN to be funded in the context of ESFRI.**

Appropriateness of facilities, equipment, and staffing

FMP's facilities are adequate to fulfil its current mission. It has modern buildings and infrastructure on the Berlin-Buch Campus in the immediate vicinity of the Max Delbrück Center for Molecular Medicine (MDC). Looking to the future, FMP would like to acquire a considerable volume of new equipment and extend its facilities (see Status Report, pp. A-

8f.). In particular, it envisions the purchase of a 1.1-GHz wide-bore NMR spectrometer for structural biology investigations (approx. 15 million EUR). In September 2013, the Scientific Advisory Board strongly recommended the purchase on scientific grounds, but the question as to how this investment should be financed is still open. At the time of the evaluation, no vote had been taken by the funders or the supervisory body on the financial feasibility of such a large investment.

In the opinion of the Review Board, acquiring the equipment mentioned and extending the institute's infrastructure would have a very positive impact on research at FMP. The collaborative partners, particularly the universities and MDC, would also benefit very significantly. On a national comparison, Berlin-Buch is a very appropriate location for conducting research projects of this kind and has outstanding scientific expertise in the field of structural biology.

FMP's list of requirements with regard to additional funding for expanding facilities and infrastructure should be prioritised in consultation with the Scientific Advisory Board and the Board of Trustees of *Forschungsverbund Berlin*. Subsequently, the feasibility of various sources of financing should be examined and, if appropriate, the relevant evaluation procedures initiated. This should include an analysis of potential participation by the institute's closest collaborative partners.

3. Subdivisions of FMP

Section 1: Molecular Physiology and Cell Biology

DEPARTMENT OF "PHYSIOLOGY AND PATHOLOGY OF ION TRANSPORT"

(5.0 FTE in research and scientific services, 6.9 FTE doctoral candidates, 10.0 FTE service staff)

In this department, which is headed by an internationally eminent scientist, extremely interesting and relevant research on ion channels is conducted using innovative methods. In the last few years, many new compounds and reverse mechanisms have been identified. Taking a world view, this has generated excellent results which have been published in the leading journals. The department's acquisition of third-party funding is also excellent. In 2011, the head of department was awarded an ERC Advanced Grant allowing him to intensify his research on ion transport and its significance for the function of cells and the whole organism.

In summary, the department is rated as "excellent".

DEPARTMENT OF "MOLECULAR PHARMACOLOGY AND CELL BIOLOGY"

(15.0 FTE in research and scientific services, 9.8 FTE doctoral candidates, 3.8 FTE service staff)

In this department, which has been headed by the Director of FMP since 2012, an impressive palette of methods is used to conduct internationally competitive research on mechanisms of membrane traffic. Apart from carrying out his duties as the new Director, the head has managed to organize activities in his department so successfully that the

group has developed exceptionally well. Its excellent results have been published in the leading journals. The department's acquisition of third-party funding is also outstanding.

In summary, the department is rated as "excellent".

Research Group on "Protein Trafficking"

(2.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 2.0 FTE service staff)

This research group conducts interesting work on G protein-coupled receptors which has produced very good results of particular relevance to the medical field. The publication performance is convincing, although the group's potential to publish in higher-ranking journals is not being exploited to the full. It is recommended that this should change in the coming years. Furthermore, the proportion of third-party funding should be increased.

In summary, the research group is rated as "good to very good".

Research Group on "Molecular Cell Physiology"

(3.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 2.0 FTE service staff)

This research group successfully combines physiological and biochemical approaches. The phenomena investigated are of great relevance to understanding the efficacy of drugs. Significant basic research is conducted on the functioning of the blood-brain barrier. The quality of its steady publication performance is convincing, although the group should try to publish in higher-ranking journals in the future. The volume of third-party funding raised is remarkable.

In summary, the research group is rated as "very good".

Junior Research Group on "Molecular Neuroscience and Biophysics"

(5.6 FTE in research and scientific services, 2.0 FTE doctoral candidates, 1.0 FTE service staff)

Based on exceptionally innovative methods, this junior research group addresses highly relevant issues relating to glutamate receptors. By developing excellent tools for manipulating glutamate receptors, the group has assumed an important and very productive bridging position within FMP. Its outstanding results are published in leading journals, and the group is also exceptionally successful in acquiring third-party funding. The group should, therefore, press for more working space.

In summary, the junior research group is rated as "excellent".

Junior Research Group on "Membrane Traffic and Cell Motility"

(2.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This junior research group, which was granted funding in the Leibniz Competition, addresses very interesting issues relating to membrane traffic. Its research results have been very well published, but have not so far adequately reflected the scientific independence of the group leader. She is encouraged to continue pursuing the path she has taken by developing a research profile of her own, and to emphasise, in particular, her research on cell migration. In addition, a larger volume of third-party funding should be acquired.

In summary, the junior research group is rated as "very good".

Junior Research Group on "Proteostasis in Aging and Disease"

(since 09/2013; 2.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This junior research group, which was only established a few months before the evaluation visit, works on decidedly original and interesting issues relating to proteostasis. This is a highly competitive scientific environment in which the group cooperates very successfully and productively with the leading research groups in the field. Thus, there is every reason to believe that the path chosen will lead to excellent results. Some articles featuring the head of the group as lead author have already been published in high-ranking journals.

A definitive evaluation of this junior research group cannot be undertaken at present. However, the group has excellent potential to achieve international recognition in the future.

Junior Research Group on "Behavioural Neurodynamics"

(2.0 FTE in research and scientific services, 2.0 FTE doctoral candidates, no service staff)

The particular strength of this junior research group is the cutting-edge electrophysiological expertise of the two leaders. They have developed extremely innovative and focussed optogenetic methods which benefit the entire institute. The group's publication record is very good, although in terms of quantity it does not quite reach the level of most of the other groups. The group is recommended to increase its publication output and be more ambitious in acquiring third-party funding. Furthermore, with regard to the two leaders' academic careers, more attention should be paid to each developing a clearly differential research profile and ensuring that their respective work becomes visible in its own right, particularly by producing individual publications.

In summary, the junior research group is rated as "very good".

CORE FACILITY: "CELLULAR IMAGING"

(3.2 FTE in research and scientific services, no doctoral candidates, 1.8 FTE service staff)

This core facility provides very good scientific services for the entire institute as well as for external users. The Review Board recommends them to use their considerable potential to conduct their own research, to develop the relevant methods, and to publish independently in high-ranking journals. The acquisition of a structured illumination microscope (SIM) would complement the existing light microscopic capabilities and round off the spectrum of available imaging methods.

In summary, the core facility is rated as "very good".

CORE FACILITY: "ANIMAL FACILITY"

(1.0 FTE in research and scientific services, no doctoral candidates, 2.0 FTE service staff)

This core facility fulfils its mission extremely professionally and purposefully, although its quantitative capacity is too small and its hygiene standard too low to be able to completely satisfy the scientific demands, particularly of the "Molecular Pharmacology and Cell Biology" department, but also of the "Molecular Cell Physiology" and "Membrane Traffic and Cell Motility" groups.

Experimental research with animals is of enormous importance to the institute as a whole and a crucial precondition for the successful implementation of the research programme in the "Molecular Physiology and Cell Biology" section. Thus, the plans to increase capacity and to introduce a higher hygiene standard are explicitly endorsed. It is welcomed that, thanks to its excellent collaborative relations with MDC and Charité, FMP is able to conduct experiments in their animal facilities. Furthermore, it is very pleasing that, in the talks with collaborative partners, the MDC representative indicated that additional participation opportunities were in the pipeline. **It is recommended to make the expansion of animal experimentation capacity a major priority and to coordinate closely with the relevant bodies in order to find ways of establishing sufficient capacity and the required hygiene standard either at FMP itself or at one of the collaborative partners.**

Section 2: Structural Biology

DEPARTMENT OF "NMR-SUPPORTED STRUCTURAL BIOLOGY"

(11.0 FTE in research and scientific services, 3.9 FTE doctoral candidates, 3.8 FTE service staff)

This department uses cutting-edge solid-state NMR for structural biology investigations of biomolecules such as membrane proteins. In the past few years, the head of department has made seminal contributions to developing this still young research area and is recognised as a world authority in the field. The outstanding research outcomes are regularly published in high-ranking journals, and the level of third-party funding is also excellent.

The acquisition of a 1.1-GHz wide-bore NMR spectrometer (see Chapter 2, "Appropriateness of facilities, equipment, and staffing") would allow the department to continue its

work at the forefront of international research. This would benefit not only the institute as a whole, but also the research location of Berlin in general. The purchase of a gyrotron for the 800-Mhz NMR spectrometer would also be important to allow the planned structural research on proteins in native environments using dynamic nuclear polarisation (DNP) methods at an internationally competitive level and to provide this structural tool as a service.

In summary, the department is rated as "excellent".

Research Group on "Solution NMR"

(4.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This research group uses solution NMR to investigate challenging biomolecular systems. Apart from the group's own research work, productive collaborative relations exist, in particular with external partners. Past research on photoactive proteins generated good publications. Now, the group is concentrating on examining the dynamics of biomolecules. The results to date are promising and should be published in high-ranking journals. Apart from a qualitative upgrade in publication performance, it is expected that the volume of third-party funding should increase.

In summary, the research group is rated as "good to very good".

Research Group on "Computational Chemistry/Drug Design"

(6.0 FTE in research and scientific services, 2.0 FTE doctoral candidates, 1.0 FTE service staff)

This long-established research group works on computer-aided drug design. The results have regularly been very well published. The group plays a very important role at FMP in hosting and maintaining the screening library. There is room for improvement in the acquisition of third-party funding.

In summary, the research group is rated as "very good".

Research Group on "Structural Bioinformatics and Protein Design"

(3.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This research group is very successful in its investigations of structure-function relationships of membrane proteins. It combines modelling with experimental activities. The results have been published regularly in high-ranking journals. The acquisition of third-party funding is excellent.

In summary, the research group is rated as "very good to excellent".

Junior Research Group on "In-Cell NMR"

(3.0 FTE in research and scientific services, 0.7 FTE doctoral candidates, 1.5 FTE service staff)

This junior research group develops innovative methods of in-cell NMR and is exceptionally successful at applying them to extremely interesting biological questions. Its out-

standing results, for example on protein aggregation in neurodegenerative disorders, have gained the group international recognition. It is to be expected that further outstanding insights will be acquired in the future.

In summary, the junior research group is rated as "excellent".

JUNIOR RESEARCH GROUP ON "MOLECULAR IMAGING"

(4.0 FTE in research and scientific services, 3.3 FTE doctoral candidates, no service staff)

This junior research group is developing a xenon reporter for magnetic resonance imaging, which will significantly enhance the sensitivity of in vivo detection. The techniques are being applied very successfully to biological questions such as analysing membrane fluidity.

In what is an exceptionally competitive area, the group has established itself as one of the world leaders. The head, who joined the institute as a DFG Emmy Noether Fellow in 2009, was awarded an ERC Starting Grant for Biosensor Imaging in the same year.

In summary, the junior research group is rated as "excellent".

CORE FACILITY: "NMR"

(3.0 FTE in research and scientific services, no doctoral candidates, 1.8 FTE service staff)

This core facility provides very important NMR services, excellently combining solution and solid-state methods. Such an innovative approach, which not only greatly benefits other groups at FMP, but also external partners, is one of the institute's unique features. The organisation and performance of the core facility are outstanding.

In summary, the core facility is rated as "excellent".

Section 3: Chemical Biology

DEPARTMENT OF "CHEMICAL BIOLOGY II"

(5.5 FTE in research and scientific services, 7.2 FTE doctoral candidates, 0.8 FTE service staff)

This department, which was established in 2012, is extremely successful in developing various highly innovative methods for modifying biologically relevant peptides and proteins. Its outcomes have been excellently published. The head of department, for whom a Leibniz-Humboldt Professorship was created, is actively involved in continuing the development of research in chemical biology. The department's expertise is of major significance to FMP as a whole. The group is also very well connected with external partners.

In summary, the department is rated as "excellent".

RESEARCH GROUP ON "CHEMICAL SYSTEMS BIOLOGY"

(6.0 FTE in research and scientific services, no doctoral candidates, 3.5 FTE service staff)

This research group is developing high-throughput methodology for the chemical synthesis of membrane compounds. Its innovative approaches have generated very well-

published results. Particular mention should be made of the new assay systems (chemical microarray technology). Chemical methods have also been successfully utilised for investigating protein networks regulated by calmodulin, for example. The research is rated as "very good".

In addition to its own scientific work, the group carries out exceptionally successful infrastructure and coordination tasks, such as building up FMP's compound collection. It is, furthermore, responsible for coordinating the EU-OPENSCREEN initiative (European Infrastructure of Open Screening Platforms for Chemical Biology). The establishment of EU-OPENSCREEN at FMP is not only an enormous bonus for the institute itself, but for Germany as a whole. The service provided by this group is rated as "excellent".

Research Group on "Peptide-Lipid-Interaction/Peptide Transport"

(1.8 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This research group investigates the interesting topic of cell-penetrating peptides with a special focus on the blood-brain barrier. Its publication performance has been enhanced in the last few years and, in terms of quantity, is now very good. The group should, however, try to publish more regularly in high-impact journals. There is also room for improvement in the acquisition of third-party funding.

In summary, the research group is rated as "good to very good".

Research Group on "Mass Spectrometry"

(1.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This research group plays an important role in the section. It has a broad spectrum of cutting-edge methods for mass spectrometry and proteome analysis at its disposal which it constantly continues developing. In terms of research, the group is strongly involved in the work of other units at FMP as well as that of external partners, which also generates interesting projects of its own. The publication record is very good. A significant growth in third-party funding should be sought in order to increase the volume of independent research.

In summary, the research group is rated as "very good".

Research Group on "Medicinal Chemistry"

(since 06/2013; 4.0 FTE in research and scientific services, no doctoral candidates, 3.8 FTE service staff)

This research group, which was established in June 2013, complements FMP's portfolio very well. The research projects are interesting and promising. A definitive evaluation of the group's performance is not yet possible, but it does have very great potential to make significant, valuable contributions to FMP.

CORE FACILITY: "PEPTIDE CHEMISTRY"

(1.0 FTE in research and scientific services, no doctoral candidates, 1.0 FTE service staff)

This core facility provides very good services. The quality of the synthetic peptides on offer is very good. It is of great importance for research at FMP as a whole that a broad spectrum of peptide modifications is available in which, for example, exotic building blocks are also incorporated in peptides.

In summary, the core facility is rated as "very good".

CORE FACILITY: "SCREENING UNIT"

(1.0 FTE in research and scientific services, 1.3 FTE doctoral candidates, 1.0 FTE service staff)

This extremely well-equipped core facility provides an impressive range of screening assays which are continually developed and adapted to contemporary needs. The substantial compound library is an excellent infrastructure which can already be seen as a significant unique feature of the institute. The chance to develop a central, Europe-wide infrastructure in collaboration with the head of the "Chemical Systems Biology" research group in the context of the EU-OPENSCREEN initiative and thus to ensure FMP a pivotal position in European chemical biology should be grasped.

In summary, the core facility is rated as "very good to excellent".

4. Collaboration and networking

Collaboration with universities

FMP fosters intensive and fertile collaborative relations, particularly with Humboldt-Universität (HU) and Freie Universität (FU) in Berlin, but also with Charité – *Universitätsmedizin Berlin*, an independent joint institution of these two universities. Two heads of department, including the Director, hold joint appointments with FU and another with Charité. Shortly before the evaluation visit, the head of department position in the "Structural Biology" section was refilled in the context of a joint professorship with HU. The new incumbent is an internationally recognised scientist. Another vacant professorship involving a head of department position in the "Chemical Biology" section is due to be refilled in combination with HU in 2014. The sixth head of department holds a Leibniz-Humboldt Professorship at HU.

FMP's involvement in various research projects at the partner universities is extremely impressive. It is not only part of the NeuroCure Cluster of Excellence, funded by DFG and acquired jointly by FU and HU, but also of five ongoing Collaborative Research Centres (SFB). It is pleasing that, on top of this, the institute is involved in numerous smaller joint research projects with local universities and contributes to teaching and promoting junior researchers in many different ways.

Collaboration with other institutions in Germany and abroad

FMP's most important local non-university partner is the Max Delbrück Center for Molecular Medicine (MDC, member of the Helmholtz Association), which is located in the immediate vicinity on the Berlin-Buch Campus. The research work conducted at MDC and FMP is complementary, which generates extremely productive, intensive collaboration and joint use of infrastructure as well as regular joint publications. The "Physiology and Pathology of Ion Transport" department actually belongs to both MDC and FMP. It should be mentioned that the head of this group was awarded an ERC Advanced Grant in 2011. It is welcomed that the amount of collaboration between the two institutes will probably increase with the establishment of the EU-OPENSCREEN project. FMP's commitment to the development and coordination of this European network (see Status Report, p. A-22) is remarkable and underlines the institute's leading position at European level.

Within the Leibniz Association, too, FMP is very active, participating in the Leibniz Research Networks on "Pharmaceutical Agents and Biotechnology" and "Healthy Ageing".

Other joint projects with numerous local research institutions as well as with other institutions in Germany (see Status Report, pp. A-21f.) and abroad – for example in the United States – witness FMP's excellent reputation and international visibility.

FMP collaborates with companies on technology development or the synthesis and design of novel chemical approaches of interest to the pharmaceutical industry. These activities are welcomed.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

The level of personnel at FMP is appropriate for fulfilling its mission. By bundling administrative duties in the *Forschungsverbund Berlin e. V.*, the use of resources for administration is efficient.

Since the last evaluation, significant changes have occurred, particularly at FMP's management level. At the time of the evaluation visit, only two heads of department who had held these positions at the previous evaluation were still active. The 2006/2007 Director became head of MDC in 2009, but his position at FMP was only refilled in 2012. In the same year, the new head of the "Chemical Biology II" department and Leibniz-Humboldt Professor joined the institute. Shortly before the evaluation visit, the head of department position in "Structure and Dynamics of Biomolecules" was refilled in the context of a joint professorship with HU. Once the vacant position as head of the "Chemical Biology I" department has been filled (professorship at HU combined with directorship at FMP) in 2014, the task of appointing new managerial staff should have been completed for the next few years. It is greatly welcomed that FMP will then have two departments headed by professors in each of the three sections.

The changes in management-level personnel that FMP had effected up to the time of the evaluation visit promote its strategic interests very successfully. Once the process of ap-

pointing new personnel has been completed, the institute should be ideally positioned to continue its successful development.

Promotion of gender equality

It is welcomed that FMP managed to be awarded "berufundfamilie" accreditation in 2013. Measures to improve equal opportunities are essential because the personnel structure, especially in the scientific sector, was found to be very unbalanced. At 36 %, the proportion of women amongst doctoral candidates was comparatively low; amongst postdocs the proportion was somewhat higher, at 41 %. Of the 13 scientists with managerial responsibility, two were female (15 %). There were no women scientists at the level of institute management, nor heading departments.

In the course of the recently completed and ongoing appointment procedures for vacant professorships in combination with Humboldt-Universität zu Berlin (heads of department for "Structure and Dynamics of Biomolecules" and "Chemical Biology I" combined with a directorship), FMP actively approached outstanding female researchers and encouraged them to apply. The first position was filled shortly before the evaluation visit with an internationally recognised male researcher after an eminent female scientist from the United States had turned down the offer. FMP informed the Review Board that there are both male and female candidates on the short list for the second vacant professorship.

FMP must keep striving to increase the proportion of women in the scientific sector and especially at leadership level.

Promotion of junior researchers

The promotion of junior researchers at FMP is excellent. The institute manages to select outstanding junior researchers and to promote them effectively.

It is welcomed that all doctoral candidates are integrated in the FMP Graduate School programme, which was awarded funding in the Leibniz Competition, and that they are promoted in numerous collaborations with local partners, particularly MDC and the universities. Doctoral supervision by thesis committees is effective and conforms to international standards.

Postdocs also receive excellent support. By offering a binding agreement to employ junior researchers on a five-year fixed-term contract, which can be extended by a further four years based on a positive interim evaluation, FMP has developed an exceptionally appealing tool for attracting first-rate junior researchers and offering them excellent opportunities to continue qualifying. Thus, FMP has managed to recruit junior researchers who had already acquired third-party funding to finance their positions (e.g. Emmy Noether Programme [DFG], ERC Starting Grant, etc.). The fact that many scientists received interesting job offers after their qualification period at FMP is indicative of the success of promotion measures.

Vocational training for non-academic staff

It is welcomed that non-scientific staff are regularly able to profit from further training. By contrast, it is unfortunate that despite the fact that 76 individuals were employed in the non-scientific sector on the reporting date (31 December 2012), there were only two trainees. It should be examined whether and how the Leibniz Association's undertaking to train apprentices can be fulfilled in the future.

6. Quality Assurance

Internal quality management

The mechanisms for internal quality assurance (see Status Report, p. A-24) and the various incentives are effective and well-received by staff. The criteria for the in-house distribution of funding and the composition of the decision-making bodies should be laid down clearly and transparently and communicated more effectively. **The "integrated projects" programme, which supports cross-sectional research, has proven very effective. FMP should consider using this tool on a larger scale.**

Cost-performance accounting has been established as an internal control element. Economic planning is based on the programme budget and ensures convincing dovetailing of scientific planning and resource management.

Quality management by the Scientific Advisory Board and Supervisory Board

The mentoring and critical support of the institute by the Scientific Advisory Board (SAB) is first-rate. The SAB is very well-informed, and its constructive recommendations contribute recognisably to the positive development of the institute.

Together with seven other Leibniz institutions, FMP is a member of the *Forschungsverbund Berlin e. V.* (FVB). FVB's Board of Trustees carries out its tasks as FMP's supervisory body on the basis of its statutes. According to the AV-WGL[1], decisions made by the institutions' supervisory bodies on important research and science-policy matters, that have significant financial implications, or that refer to the institutions' managerial staff require the agreement of the representatives of the Federal Government and the *Land*. It is commendable that FVB's Board of Trustees is in the process of changing the wording of the FVB statutes to bring them in line with the respective formulations in the AV-WGL.

Implementation of recommendations from the last external evaluation

The institute has to a very large extent implemented the recommendations made at the last evaluation (see Status Report, p. A-25ff.). Only the goals with regard to gender equality could not be achieved, despite obvious efforts. FMP is expected to use any appointment procedures to ensure that, in the future, women will hold leadership positions at the institute.

[1] Administrative Agreement between the Federal and *Länder* Governments with regard to the joint funding of member institutions of the Leibniz Association

Appendix

1. Review Board

Chair (Member of the Leibniz Senate Evaluation Committee)

Stefan **Meuer**	Institute for Immunology, Heidelberg University Hospital

Deputy Chair (Member of the Leibniz Senate Evaluation Committee)

Reinhard **Krämer**	Institute for Biochemistry, University of Cologne

Reviewers

Amparo **Acker-Palmer**	Institute for Cell Biology and Neuroscience, Goethe University Frankfurt/Main
Martin **Blackledge**	Institute of Structural Biology, Grenoble (F)
Anja **Böckmann**	Institute of Biology and Chemistry of Proteins, CNRS/University of Lyon (F)
Chiara **Cabrele**	Department of Molecular Biology, University of Salzburg (A)
Ralf **Erdmann**	Department of System Biochemistry, Ruhr-University Bochum
Veit **Flockerzi**	Experimental and Clinical Pharmacology and Toxicology, Saarland University, Homburg
Stephan **Grzesiek**	Focal Area Structural Biology and Biophysics, Biozentrum, University of Basel (CH)
Andreas H. **Jacobs**	European Institute for Molecular Imaging, University of Münster and Department of Geriatrics, Johanniter Hospital Bonn
Norbert **Sewald**	Department of Chemistry, University of Bielefeld
Felix **Wieland**	Heidelberg University Biochemistry Centre

Representative of the Federal Government

Anke **Aretz**	Federal Ministry of Education and Research, Bonn

Representative of the Länder *Governments*

absent with apologies

2. Guests

Representative of the relevant Federal government department

Nicola **Scholz**	Federal Ministry of Education and Research, Bonn

Representative of the relevant Land *government department*

Björn **Maul**	Berlin Senate Department for Economics, Technology and Research

Representative of the Scientific Board

Nils **Brose**	Max Planck Institute of Experimental Medicine, Göttingen

Representative of the Leibniz Association

Rolf **Horstmann**	Bernhard-Nocht-Institut für Tropenmedizin, Hamburg

Representative of the Joint Science Conference Office (GWK-Büro), Bonn

Tobias **Hoymann**

3. Representatives of partner institutions (one hour with review board and guests)

Peter-André **Alt**	President, Freie Universität Berlin
Jan-Hendrik **Olbertz**	President, Humboldt-Universität zu Berlin
Annette **Grüters-Kieslich**	Dean, Charité Universitätsmedizin Berlin
Walter **Rosenthal**	Scientific Director, Max Delbrück Center for Molecular Medicine, Berlin-Buch

24 September 2014

Annex C: Statement of the Institution on the Evaluation Report

Leibniz-Institut für Molekulare Pharmakologie (FMP)
within the Forschungsverbund Berlin e. V.

The Leibniz-Institut für Molekulare Pharmakologie (FMP) highly appreciates the efforts of the review board and of the members of the Division Senate Evaluation Committee in taking the time to evaluate the institute and for their helpful and constructive comments. We were pleased to learn that research at the FMP was rated as "extremely successful" and the overall strategy was viewed as "very convincing" evidenced by the "high publication level" and the international recognition and visibility of FMP research. We feel encouraged to continue the path taken and will make all efforts to strive for the best of science in Molecular Pharmacology and to implement all recommendations made by the review board.

The FMP specifically welcomes the encouragement and support for FMP's efforts to implement the ESFRI-research infrastructure EU-OPENSCREEN in Berlin to position the institute at the forefront of Chemical Biology Research in Europe. We were also delighted that the review board supports the need to secure additional funding for expanding facilities and infrastructure and encourages the institute to prioritize these needs. The FMP will work closely together with its Scientific Advisory Board, the Forschungsverbund Berlin, and with its funders, the Senate of Berlin and the Federal Ministry of Education and Research (BMBF), to tailor such investments to the needs of the institute. The FMP will continue to explore additional funding sources including funds from its collaboration partners. The FMP was happy to see that the review board also specifically recommends the expansion of its capacity for animal experiments and to raise its standard further, ideally in collaboration with its partners on campus. We will explore these possibilities and aim for their implementation at the earliest possible time point.

The institute agrees with the review board that continued efforts are required to increase the proportion of women scientists at the leadership level. The FMP has already succeeded in significantly raising the proportion of women scientists at the independent group leader level compared to the end of the review period at the end of 2012 and is in the process of recruiting a female scientist at the W3/Director level. We will continue the taken path in the future.

The FMP welcomes the suggestion of the review board to continue and possibly expand the use of its established internal measures for quality control and cross-sectional research, which are recognized as being "already quite effective".

Finally, the FMP wishes to express its gratitude to its scientific and non-scientific staff, the past and present members of its Scientific Advisory Committee, the Forschungsverbund Berlin, the Senate of Berlin and the Federal Ministry of Education and Research (BMBF) for financial support, and last not least the Division Senate Evaluation Committee of the Leibniz Association for guiding the evaluation process.