

**Stellungnahme zum
Mathematischen Forschungsinstitut Oberwolfach (MFO)**

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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 außerhalb einer Hochschule 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 04. und 05. Mai 2023 das MFO in Oberwolfach. Ihr stand eine vom MFO 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 MFO nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 19. März 2024 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. Das Mathematische Forschungsinstitut Oberwolfach (MFO) ist ein international hoch angesehenes *Institute for Advanced Studies*.² Als soziale Forschungsinfrastruktur mit eigenen Tagungsräumen und Gastunterkünften leistet es einen herausragenden Beitrag für die Vernetzung der mathematischen Fachgemeinschaft. Das MFO bietet Wissenschaftlerinnen und Wissenschaftlern die Möglichkeit, Veranstaltungen unter eigener Federführung durchzuführen bzw. daran teilzunehmen oder als Fellow in Oberwolfach zu arbeiten. Die hervorragenden Arbeitsbedingungen sind auch von der ausgezeichneten mathematischen Bibliothek geprägt, die den Gästen zur Verfügung steht.

Die wesentliche **Aufgabe** des Instituts ist es, adäquate Veranstaltungsformate zu entwickeln, bereitzustellen und die wettbewerbliche Auswahl exzellenter Anträge dafür zu gestalten. Diese Steuerungsleistung verantworten die ehrenamtlich tätige Wissenschaftliche Kommission mit 25 international ausgewiesenen Mitgliedern und die nebenamtlich arbeitenden Direktoren, unterstützt von wenigen Beschäftigten. Jährlich besuchen knapp 3000 Gäste das MFO; 70 % davon kommen aus dem Ausland.

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

² Wissenschaftsrat: Entwicklungsperspektiven von Institutes for Advanced Studies (IAS) in Deutschland. Köln 23.04.2021.

Das Institut bietet Antragsmöglichkeiten in drei jeweils als „exzellent“ bewerteten **Programmlinien**. Programmlinie 1 umfasst einwöchige Workshops und Mini-Workshops (78 % der MFO-Kapazitäten). Die Anträge werden von Forschenden ausgearbeitet, die eine Veranstaltung organisieren möchten. Neben dem Thema schlagen sie dabei auch vor, wen das MFO zur Teilnahme einladen sollte. Etwa die Hälfte der Anträge ist erfolgreich. Diese Erfolgsquote gilt auch für Programmlinie 2, die Fellows längerfristige Aufenthalte in Oberwolfach von bis zu drei Monaten ermöglicht (11 % der Kapazitäten). Programmlinie 3 ist für einwöchige Seminare und Arbeitsgemeinschaften gedacht (11 % der Kapazitäten), wobei sich die Seminare an den wissenschaftlichen Nachwuchs richten und die Arbeitsgemeinschaften auch arrivierte Forschende adressieren. Zur Dokumentation der Veranstaltungsergebnisse stellt das MFO verschiedene Publikationsorgane mit *Abstracts*, *Preprints* und *Lecture notes* aus seinen Veranstaltungen bereit, die überwiegend kostenfrei digital zugänglich sind. Unabhängig davon publizieren die Teilnehmenden Ergebnisse, die auf ihren Aufenthalt in Oberwolfach zurückgehen, nach eigener Entscheidung in Fachzeitschriften oder auf anderen Wegen.

Die Corona-Pandemie beeinträchtigte den Veranstaltungsbetrieb 2020 bis 2023 erheblich. In dieser Zeit etablierte das MFO innovative hybride Formate. Hierzu zählen auch gemeinsame Workshops mit Partnern wie dem *Research Institute for Mathematical Sciences* in Kyoto. Das MFO richtet nun wieder überwiegend Präsenzveranstaltungen aus. Es entwickelt diese Veranstaltungsarten weiter, zum Beispiel organisiert es inzwischen gemeinsam mit dem Warschauer *Mathematical Research and Conference Center* Seminare in Polen. Es wird begrüßt, dass das Institut auch künftig geeignete digitale Formate anbieten möchte, u. a. um Reisetätigkeiten zu vermindern und Personen zu entlasten, für die die Umstände einer persönlichen Anreise schwierig wären.

Entsprechend einer Empfehlung der letzten Evaluierung hat das MFO Maßnahmen ergriffen, um eine noch größere Bekanntheit seiner Angebote zu erreichen, u. a. durch regelmäßige Newsletter und einen überarbeiteten Internetauftritt. Auf der MFO-Homepage sind zudem mittlerweile eine Vielzahl an weiteren Informationen zur Antragstellung verfügbar, wobei künftig auch die Bewertungskriterien für die wettbewerbliche Auswahl von wissenschaftlich exzellenten Vorhaben online dargestellt werden sollten. In den vergangenen Jahren nahm das MFO in seinen Veranstaltungen neben den Kerngebieten der Mathematik auch wichtige anwendungsorientierte Themen in den Blick (z. B. mathematische Modelle in der Klimaforschung). In welchem Umfang die verschiedenen Fachgebiete der Mathematik durch Veranstaltungen am MFO abgedeckt werden sollen, sollte ebenfalls auf der Website in einem *mission statement* für Antragstellende transparent dargestellt werden.

Der Anteil von Wissenschaftlerinnen stieg seit der vergangenen Evaluierung von durchschnittlich 13,5 % (2013–2015) auf 21 % (2020–2022). Das Institut sollte diesen positiven Trend fortsetzen. Der Senat begrüßt, dass das MFO die Hinweise der Sachverständigen zur personellen Diversifizierung – z. B. mit Blick auf Teilnahmen aus dem Globalen Süden – in seinen Programmen berücksichtigen wird. Angesichts der hohen Reputation des MFO in der internationalen Mathematik ist das Institut in einer ausgezeichneten Position, eine Vorreiterrolle wahrzunehmen. Für die Teilnahme an Workshops ermöglicht

das MFO Promovierenden bereits Initiativbewerbungen; diese Möglichkeit sollte auf alle Karrierestufen ausgeweitet und aktiv beworben werden. Außerdem sollte das MFO vermeiden, dass dieselben Personen innerhalb weniger Jahre wiederholt Workshops verantworten, und insgesamt eine noch breitere Beteiligung der *Community* erreichen. Der Senat empfiehlt, die verschiedenen Aspekte in Bezug auf Inhalte und Mitwirkende der Veranstaltungen für die weitere Verbesserung der internen Steuerung gut zu dokumentieren.

Die Auswahl der Anträge verantworten die Wissenschaftliche Kommission (s. u.) und die **wissenschaftliche Leitung**. Der amtierende Direktor wurde gemeinsam mit der Universität Tübingen berufen, der derzeitige Stellvertreter ist Professor an der TU Darmstadt; sie treten spätestens 2028 bzw. 2029 in den Ruhestand ein. Die Regelung, dass beide im Nebenamt für das MFO tätig sind, ist sachgerecht. Beide Positionen sollten weiterhin mit Professuren an Universitäten in der Region verbunden sein. Wissenschaftliche Kommission und Direktoren werden von einem Wissenschaftler, einer Verwaltungsleiterin und 35 weiteren Angestellten in Verwaltung, Bibliothek, Hauswirtschaft und Technik ausgezeichnet unterstützt. Die **Beschäftigten** tragen in erheblichem Maße zum Erfolg des Instituts bei.

Das MFO ist seit 2005 rechtlich als gGmbH verfasst. Gesellschafterin ist der Verein *Gesellschaft für Mathematische Forschung e. V. (GMF)*, der zuvor das Institut unmittelbar trug. Mit dem Wechsel der Rechtsform wurden alle für das Institut relevanten Organe (Direktoren, Beirat, Aufsichtsgremium) in die gGmbH überführt mit Ausnahme der **Wissenschaftlichen Kommission**. Auch sie sollte nun in der MFO gGmbH statt in der GMF verankert werden. Dabei sollen auch die weiteren Hinweise im Bewertungsbericht zur Kommission (Berufung durch das Aufsichtsgremium, Dauer der Mitgliedschaft, Bindung des Vorsitzes an die Mitgliedschaft) und zum Beirat (kein Stimmrecht im Aufsichtsgremium) berücksichtigt werden. Der Senat regt an, im Zuge der geplanten Änderung des Gesellschaftsvertrags auch die Mitgliedschaft des MFO in der Leibniz-Gemeinschaft im Institutsnamen erkennbar zu machen. Das Aufsichtsgremium des MFO wird gebeten, dem Senat den aktualisierten Gesellschaftsvertrag der gGmbH bis 1. Dezember 2025 zukommen zu lassen.

2. Zur Stellungnahme des MFO

Der Senat begrüßt, dass das MFO 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 MFO als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur, die in erheblichem Umfang wissenschaftliche Infrastrukturaufgaben wahrnimmt, auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

Annex A: Status report

Oberwolfach Research Institute for Mathematics, Oberwolfach (MFO)

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1. Key data, structure and tasks

Key data

Year established:	1944
Admission to joint funding by Federal and <i>Länder</i> Governments:	2006
Admission to the Leibniz Association:	2005
Last statement by the Leibniz Senate:	2017
Legal form:	gGmbH (non-profit corporation)
Responsible department at <i>Länder</i> level:	Ministry of Science, Research and the Arts of Baden-Württemberg (MWK)
Responsible department at Federal level:	Federal Ministry of Education and Research (BMBF)

Total budget (2022)

- € 3,4m institutional funding
- € 0,3m revenue from project grants
- € 0,1m revenue from services

Number of staff (2022):

- 24,5 full time equivalents (FTE) with
 - 3 individuals in “research and scientific services”,
 - 6 individuals in “science supporting staff (technical support etc.)”,
 - 27 individuals in “science supporting staff (administration)”.

Mission and structure

Mission (Statutes §2):

- „The purpose of the Society is the
- a. intensification of research in mathematics;
 - b. improvement of scientific cooperation;
 - c. continuing education and training in mathematics and related areas;
 - d. encouragement of young scientists.“

Organisation

The MFO gGmbH is a non-profit corporation with the *Gesellschaft für Mathematische Forschung e. V.* (GMF, a non-profit association of mathematicians) as the single shareholder (see appendix 1). The MFO runs three scientific programmes for guests: a programme for short-term research stays, a programme for longer-term stays and a third with training activities for early-career researchers.

2. Overall concept and core results

Overall concept

The MFO strives to bring together excellent senior and junior scientists of a given research area and to provide them with optimal working conditions for a very intensive exchange of ideas, free from distractions and administrative duties. Almost 3000 researchers meet annually at MFO; about 70% come from abroad. The Institute operates during 50 weeks of the year and the programmes cover the entire spectrum of the field of mathematics including its applications in science and technology. With its selection of topics and organizing teams, the institute aims to continuously initiate and drive a broad range of new developments in mathematical research. The selection based on scientific excellence is the core responsibility of the MFO that has no permanent research positions and no long-term research projects of its own.

Scientific excellence of the research programmes at the MFO is based on a step-by-step bottom-up approach starting with the applications and initiatives from the worldwide scientific community. All programmes of the MFO are advertised as explicit calls with links to application guidelines, deadlines and contact addresses. They are advertised in the electronic biannual newsletter of the MFO (ca. 4000 registered recipients), on the website of the MFO (redesigned in 2017–2018 and constantly adapted) and in a poster campaign newly designed in 2017 and reaching about 700 institutes worldwide. The posters cover the annual workshop schedule.

All parts of the MFO's scientific programme are then determined in a selection process by the *Scientific Committee*, an international academic committee of 25 experts, in cooperation with the directors. Members of the *Scientific Committee* are European researchers selected by scientific excellence, broad coverage of research fields and diversity. Members serve at most two terms of four years; maximally two additional terms can be served by the chair and co-chair of the committee. Following the determination of programmes and organizers, invitations to participants are then issued by the director on suggestion of the organizers of a programme.

Research stays for guests are offered in three programmes (for details see chapter 7):

1. Short-term research stays (Oberwolfach Workshops and Mini-Workshops)

The workshop programme forms the main part of activity of the MFO (78% of the MFO's capacity, see appendix 2) consisting of 40 week-long workshops with about 50 participants. The workshops concentrate on a specific field, comprising presentations of new developments, discussion sessions, bottom-up interactions and collaborations. In addition, there are 12 week-long Mini-Workshops per year in four reserved weeks, each with about 16–17 participants. The Mini-Workshops allow proposals to react to recent developments, since they are submitted only half a year before the Mini-Workshops take place.

2. Longer-term research stays (Oberwolfach Research Fellows [OWRF] and Oberwolfach Leibniz Fellows [OWLF])

The programme fills 11% of the MFO's capacity and supports individual researchers or small groups of 2–4 persons. The OWRF programme supports research stays of 2–4 weeks for working on a particular problem. The OWLF programme addresses postdoctoral researchers to carry out a project individually or in small groups for a period of 2–3 months.

3. Training activities (Oberwolfach Seminars and *Arbeitsgemeinschaften*)

Training activities use 11% of the MFO's capacity. The Oberwolfach Seminars are week-long events taking place six times a year and address PhD students as well as postdocs. The three *Arbeitsgemeinschaften* (study groups) aim for early career as well as senior researchers. Their goal is to investigate a new active topic guided by leading international experts. Each *Arbeitsgemeinschaft* meets once a year.

For the publication of the results of these activities, the MFO provides different publication outlets for the scientific community but also for a broader public:

- **Oberwolfach reports (OWR)** for publishing the talks of the Workshops, Mini-Workshops and *Arbeitsgemeinschaften* (available on the website of the MFO as open access)
- **Oberwolfach Seminars (OWS)**, a book series for lecture notes of the “Oberwolfach Seminars” (with the organizers of Oberwolfach Seminars as authors)
- **Oberwolfach Preprints (OWP)** for preliminary preprint containing the results of the longer-term stay of guest researchers in the OWRF and OWLF (includes the Oberwolfach lecture, a special talk on the occasion of the annual meeting of the GMF).
- **Snapshots of modern mathematics from Oberwolfach** with essays by workshop participants (8–12 DIN A5 pages long in English or German) on aspects of research fields discussed in Oberwolfach for a general scientifically interested public (e. g. mathematics teachers, science journalists, undergraduates, advanced high school students).

Besides, the MFO publishes its Annual reports (since 2005) including lists of participants of all activities. The complete publication figures can be found in appendix 2.

Results

Programmes

Workshops cover core mathematics areas as well as interdisciplinary fields. The MFO highlights its activities e. g. in Arithmetic Geometry, Topology, Differential Geometry, Partial Differential Equations, Mathematical Relativity, Quantum-Physics, Cryptography, Stochastic Analysis with organizers including e. g. P. Bühlmann, M. Dafermos, J. De Jong, B. Farb, G. Faltings, M. Hairer, S. Goldwasser, R. Schoen, P. Scholze, P. Teichner, E. Viehmann, W. Werner, B. Wilking.

Knowledge transfer to scientists from neighbouring disciplines is achieved through interdisciplinary workshops especially on topics under current discussion in society, for ex-

ample concerning climate models, machine learning, quantum physics, mathematical finance or mathematical biology, e. g. “Moist processes in the Atmosphere” organized by B. Khouider, R. Klein and L. Smith in 2019 or “Computation and learning in high dimensions (hybrid)” organized by A. Cohen, W. Dahmen, R.A. DeVore and A. Kunoth in 2021. In July 2021, the MFO hosted a symposium on “Mathematical Epidemiology: Coronavirus and Communication” organized jointly with the Leopoldina by G. Huisken, S. Müller, F. Otto, L. Székelyhidi. An additional example is the “European Lab for Learning and intelligent Systems (ELLIS)” on machine learning in earth and climate sciences in 2020. Workshops in these interdisciplinary areas are attended by a substantial number of scientists from institutes in disciplines other than mathematics and the *Scientific Committee* makes an effort to identify areas of science where new mathematical methods are likely to have a major impact.

During the pandemic new hybrid forms of workshops became necessary to allow online participation of scientists prevented from travelling to the MFO due to travel and quarantine restrictions (see chapter 3; hybrid components were also enabled in the other programmes). Exemplary highlights include the workshop on “Arithmetic Geometry” organized by G. Faltings, P. de Jong and P. Scholze, and the workshop “Calculus of Variations” organized by A. Figalli, R. Kohn, T. Toro and N. Wickramasekera, where 40–60% of participants were online to engage in lectures and discussions.

Training opportunities for early career researchers were expanded in several ways: A broad range of Oberwolfach Seminars for graduate students could be offered, both through external applications and direct recruiting through the *Scientific Committee*. In collaboration with the *Banach Center Institute* at Bedlewo (Poland), two additional Oberwolfach Seminars could be held in areas including Geometry and Machine Learning. For postdoctoral and senior researchers there are now each year three instead of two Oberwolfach “Arbeitsgemeinschaften” offering an active “learning by doing” environment for hot current mathematical topics under the guidance of experts. They are coordinated by M. Hairer, P. Scholze and A. Thom. Exemplary recent highlights are Oberwolfach Seminars on “Convex Integration” by D. Faraco, S. Modena and L. Székelyhidi, on “Mathematics of deep learning” by G. Kutyniok and D. Grohs as well as an Arbeitsgemeinschaft on “Higher Rank Teichmüller Theory” by F. Kassel, B. Pozzetti, A. Sambrino and A. Wienhard.

The number of female organizers and participants has increased since 2016: In 2013–2015, the number of female participants and organizers at the MFO was \emptyset 13.5% p. a.; in 2020–2022, it was \emptyset 21% p. a. (further details on gender and diversity in chapter 5).

Outreach

Between 2016–2018, the former MFO outreach project **IMAGINARY** funded by the Klaus Tschira Foundation used funds from a successful application in the Leibniz competition to turn itself into a non-profit spin-off company. In the IMAGINARY gGmbH the MFO is now a minor shareholder. IMAGINARY is supporting MFO in distributing the *Snapshots of modern Mathematics* (see above) worldwide (more than 120 snapshots have been published) and helps to maintain educational software on touchscreens at the MiMa museum (see below). IMAGINARY is also a partner in the NFDI-consortium MaRDI (see chapter 4).

In 2017 and 2018, the **mathematics exhibition at the Museum for Minerals and Mathematics (MiMa)** was extensively revised and new exhibits were introduced. The museum is run in cooperation with the *Association for Minerals and Mining* in Oberwolfach and the municipality of Oberwolfach. It shows a collection of minerals from all over the Black Forest, curated by the *Association*, and a permanent mathematical exhibition curated by the MFO. The number of visitors has remained stable at about 5000–6000 p. a. in recent years (4000 resp. 3000 in 2020/2021, when the museum had to be closed for several months due to the pandemic). In 2017 and 2018, hardware and software for all 5 interactive mathematical exhibits have been renewed. In 2023, the municipality of Oberwolfach started to build an extension to the museum. For the re-opening the MFO in cooperation with IMGINARY plans to expand the mathematical exhibition with interactive programmes showing mathematical foundations of artificial intelligence.

The publicly available **Oberwolfach Photo Database** includes over 22.000 pictures of mathematicians. The MFO registers around 300 inquiries p. a. from journalists, publishers, mathematicians, historians, museum curators and teachers who would like to use images from the collection in publications or educational material.

The *Scientific Committee* of the MFO regularly decides on the **Oberwolfach Prize** in rotating mathematical subjects and the **John Todd Award** in Numerical Analysis, both jointly awarded with the Oberwolfach Foundation. In 2022, the former winner of the Oberwolfach Prize H. Duminil-Copin (who has joined the Scientific Committee in 2023) became a recipient of the Fields medal. It was the second time that the *Oberwolfach Prize* turned out to be an early recognition of a future Fields medalist (following current SAB member Ngô Bảo Châu in 2010). The *Scientific Committee* of the MFO is also responsible for selecting the recipient of the **Staudt-Prize** awarded at Erlangen University, most recently in 2021 (B. Wilking).

3. Changes and planning

The **pandemic** forced the closure of the Institute between March 16 and June 20 of 2020, during which time only few online workshops were possible while the timeout was used to make several building renovations that are impossible during normal institute operation. New hybrid forms were developed for the workshops. Combined with an officially authorized hygiene concept, this enabled the MFO from June 2020 on to remain open continuously with an almost complete range of on-line and on-site research activities in all three subdivisions throughout the pandemic. It is planned to only maintain a small hybrid component of workshops (around 10% of participants) to cater for exceptional needs (e. g. pregnancy, family care, government restrictions).

The further development of the three **programmes** is explained in chapter 7. In 2021, electronic registration was successfully introduced for guests; future improvements for guests will include the possibility to upload documents for common use within an MFO programme and easy electronic feedback opportunities. Besides, a streamlined web-based upload and evaluation of proposals will be provided for staff and the *Scientific Committee* (for further IT improvements see chapter 4).

In accordance with its term limits, the *Scientific Committee* has been continuously renewed with scientists from all over Europe agreeing to take on this major responsibility on a completely honorary basis, including two recent Fields-medallists (A. Figalli and H. Duminil-Copin) and plenary speakers of the International Congress of Mathematicians (C. Lubich, A. Guionnet, N. Anatharaman).

As international travel has to be well justified in the context of climate change and personal international contacts remain on the other hand crucial, the MFO is exploring ways to find **synergies to minimize impacts of travelling**. For example, grants of the Simons Foundation support scientists who combine a visit to MFO with a research cooperation at other science institutes in Europe and the Tandem-Workshops (see chapter 7). The “Oberwolfach Foundation Fellow (OWFF)” grants (see chapter 4) can be used partially for this purpose, too. The Institute intends to also use a small part of its regular budget for this purpose.

Building technology has been improved. Among **renovation and modernisation activities** since the last evaluation, the MFO lists in particular a handicap accessible main entrance door in the guest house (2016), the installation of an air condition in the library building (2017), renovation of the long-term researcher’s apartments and the installation of an emergency power aggregation (2022). The renovation of the library created new discussion areas in addition to the areas created in the guest house and around new outdoor blackboards (further information on facilities in chapter 4).

4. Controlling and quality management

Facilities, equipment and funding

Funding

In 2022 the total budget was €3.9m, including €3.4m institutional funding, €0.3m project grants, €0.1m revenues from services (see appendix 3). Furthermore, MFO received €0.6m miscellaneous revenues mainly because of no-cost extensions due to the COVID pandemic.

In 2020 the MFO’s institutional funding was reduced by a total amount of €40.6k due to the COVID pandemic. In accordance with the Administrative Council, further parts of reduced expenditure for energy costs, travel reimbursements, food or external cleaning services could be rededicated and used for some special renovation measures, the audio- and video conference system and the implementation of the necessary hygienic measures and investments.

In the context of socio-economic diversity (see chapter 5) the MFO considers an increase in the institutional funding’s flexibility as helpful in order to allow MFO to support more scientists with their travel or childcare costs. At this stage such support can only be financed from donations of third parties.

Since the MFO, as a social infrastructure, does not conduct research itself, the MFO cannot apply for most third-party funding. Since 2021, the MFO has been receiving funding from the DFG via the NFDI consortium MaRDI with a total of €17k in 2021–2022. Most of the

additional funds are received from foundations: Ø €81k p. a. (2019–2022) from foundations linked with the institute (Oberwolfach Foundation, Friends of Oberwolfach, *Gesellschaft für Mathematische Forschung e. V.*), Ø €60k p. a. from the Carl Friedrich von Siemens Foundation, Ø €192k p. a. from the Simons Foundation and the National Science Foundation (NSF).

With the funding from the foundations, the MFO offers several grants covering travel expenses: Due to the COVID pandemic the number of supported US Junior Oberwolfach Fellows funded by the National Science Foundation (NSF) and Simons Visiting Professors (funded by the Simons Foundation) was reduced severely for almost 2.5 years. The NSF approved a no cost extension for one year until the end of August 2022, the Simons Foundation from December 2022 until December 2024. Some of the Oberwolfach Seminars, supported by the Carl Friedrich von Siemens Foundation, could not take place or only with a very reduced number of participants in presence. The Carl Friedrich von Siemens Foundation approved MFO's request for a no cost extension until 2023. New proposals are not yet approved.

Facilities

The **conference and library building** houses three lecture halls (equipped with professional audio-video system, with anteroom and coffee area), four offices for scientific administration, the library areas including compact storage facility, library office and technical support for printing, copying and scanning. Besides, there are several discussion and reading areas with blackboards, and recreational rooms for fitness and music.

The **guest house** includes the dining hall (kitchen, housekeeping and storage rooms as well as a laundry), the reception, an administrative area with three offices and the engineering rooms. At the first to third floors there are 50 guest rooms for week-long stays and 8 apartments for long term researchers, a large dividable and fully equipped conference room as well as discussion corners. Four blackboards with discussion areas are outside. The MFO is currently planning an extension to the dining hall to enable a buffet.

Furthermore, the MFO has 5 **bungalows** with 19 rooms differently equipped, that might be used either for a longer stay or for participants with accompanied persons (partners or children). Two rooms are equipped for handicapped people.

The MFO continued to invest in **sustainable facility improvement**. Earlier modernisations included woodchip heating, the photovoltaics and the solar heating for hot water now reducing energy bills. Now, they are complimented by a complete renovation of MFO's own fresh water springs, the adjustment to LED lighting and the renovation of guest house, bungalows and library including new windows and roof insulation on the library building.

Library

The **library** is a central resource for the annually more than 2800 guest researchers of the MFO and adapts in different ways to changes in publication patterns and visitor needs. A large compact storage facility for printed journals was completed in 2016 with funds

from the VolkswagenStiftung and the Friends of Oberwolfach as part of a major renovation, freeing up space for the monograph collection. While the move to e-journals is almost complete, hardcopies of books are considered essential by users at the MFO. In addition, the library could make use of savings from a cancellation of Elsevier journals and favourable offers of several other publishers to acquire a substantial collection of e-books that can be used and kept for personal use by all MFO guest researchers. Acquisitions of the library take into account new interdisciplinary developments such as machine learning and climate modelling.

Since 2021, **access for guests to e-journals and e-books** is allowed not just during the actual presence at the MFO, but also during one week before and two weeks after their meetings. In this context, number of downloads of accessible e-books and e-journals rose from an average of 24 719 p. a (2019–2020) to an average of 40 357 p. a. (2021–2022).

Long-term preservation of the electronic holdings is a continuing task for the MFO. Since 2017 the institute is operating the *Oberwolfach Repository* containing all publications of the MFO and providing open access. To help preserve digital journals long term, the MFO together with the Leibniz Information Centre for Science and Technology (TIB) in Hannover runs a closed digital archive called *Oberwolfach Leibniz Archive for Mathematics (OLAM)*. It operates as a *dark archive* where the content will be made available to the scientific community only in case of special trigger events to ensure that scholarly content will always remain available to the scientific community independently of the publisher.

Since 2021, the MFO is part of the “**Mathematical Research Data Initiative**” (**MaRDI**) **NFDI-consortium**, coordinated by the Berlin *Weierstrass Institute for Applied Analysis and Stochastics* (WIAS). The MFO through its library (one 20% staff position funded by MaRDI) will disseminate information about MaRDI to the mathematical community and collect feedback by the community directly and via surveys, providing a service to the mathematical infrastructure in Germany. Beginning in October 2021 the consortium is funded by the DFG over a period of 5 years.

IT Equipment

The **IT equipment** consists of two separately functioning server rooms in combination with a solid multi-step back-up system with distributed storage provide a fully redundant setup ensuring IT security and data protection. The institute’s own database software “owconf” is used for all tasks of guest administration. Commercial packages are used for financial accounting and human resources. The IT section maintains a windows based PC pool for administrative staff. Guest scientists are provided with guest accounts, WLAN and Ethernet connection, SMTP server, scan/print facilities and a range of mathematical software. WiFi is available throughout the institute including guest rooms and lecture halls, catering for multiple mobile devices of guests both through an MFO network and via eduroam.

The **website** provides next to information on research programmes especially open access to all publications of the Institute in collaboration with the MFO library. Website tools are provided to the directors and the Scientific Committee to allow efficient registration and evaluation of all applications and proposals.

All three lecture rooms are equipped with enhanced **video- and audio-conferencing tools** including special ceiling microphones with matrix mixers and cameras capable of automatic tracking of blackboard speakers. At the beginning of each workshop, IT staff advises video conference assistants of the workshop on usage of the video-conferencing systems. All technical details were made available on the MFO website, which was modernized in 2019 and is now barrier free.

MFO has a multi-level **backup strategy** (different backup media, spatially distributed, staggered backup intervals) and a commercial backup software tailored to virtual machines. Regular hardware replacements and upgrades of operating systems for servers and clients are made. Standard measures (firewall, virus scanner, network segmentation, user training, etc.) are constantly further developed with redundant monitoring added in 2017.

In October 2022, the MFO entered contracts for **support and advice with an external company** to strengthen existing defences against cyber-attacks and to modernize major aspects of the data bases of the MFO. It is planned to maintain external support for the long term in order to allow continuous access for the IT group to new developments and to have back-up external knowledge in case of unforeseen events.

The **database-supported web services** were increased by three dspace instances: one for the Institute's own publications, one for the Oberwolfach Digital Archive and one for press articles. MFOcloud was introduced in 2018, first as a separate owncloud server, then as a service of the TU Berlin via DFN, supporting mainly the *Snapshots*.

Organisational and operational structure

The director and vice director can both legally represent the Institute and are responsible for the operation of the MFO. The directors support the *Scientific Committee* in determining the scientific programme. Furthermore, the director is responsible for inviting suggested guests of the approved events.

On the administrative side there are small teams in the library, the IT-group and the office for guest coordination supporting directly the scientific activities. The reception office and the housekeeping/kitchen teams attend to the daily needs of guests related to food, lodging and local travel. Major renovations and improvements are planned between director and head of administration taking into account input from all sections of the Institute. Technical maintenance and regular upkeep of buildings and their surroundings is coordinated and carried out by the housekeeper under supervision of the head of administration. The IT section is supporting the “Snapshots of modern Mathematics from Oberwolfach” as well as the implementation of outreach material at the MiMa museum. The database for the Oberwolfach Photo Collection is also maintained by the IT section.

Quality Management

Quality management is carried out by the selection process (see chapter 2) and several **feedback mechanisms**: Each week director and vice director are available for personal

approach during some days of the week including a joint meal between director and organizers where all issues related to a current workshop are discussed. The guest office is continuously collecting suggestions from all guests. Systematic feedback is especially collected from organizers by an email survey. It is planned to implement an automatic feedback mechanism with the modernization of the electronic database.

Guidelines for applications and programmes are published on the MFO website and emphasized to all organizers to ensure compliance with **good scientific practice** as stipulated by the Leibniz association and all German science organizations. An ombudsperson in the Scientific Committee is available for questions concerning the scientific programme. In the institute itself an ombudsperson is available for all concerns of visitors and employees. In addition to the central ombuds-committee of the Leibniz Association, an external contact possibility also exists with the “Anti-discrimination office – Network for equal treatment” in Freiburg, set up as an anti-discrimination centre by the state of Baden-Württemberg.

The quality of the MFO edited **publications** is assured primarily through the selection process for visitors to the MFO (see chapter 2), as only these visitors are authors in MFO publications. A second control mechanism is provided by the organizers of workshops selecting the speakers at workshops who write the “Oberwolfach Reports” and, in the case of preprints, the Scientific Committee approving all preprints submitted by long term visitors. Finally, all publications undergo editing and final control by the MFO itself.

Additional quality control of the non-scientific administration is performed on the one hand by the annual examination of the where-used list and the annual report by an external auditor followed by the examination of the reports by the Ministry of Science, Research, and the Arts of Baden-Wuerttemberg.

Quality management by advisory boards and supervisory board

The *Gesellschaft für Mathematische Forschung e. V.* is the single shareholder of the MFO. The Shareholders’ Meeting is responsible for all matters concerning the MFO unless these have been assigned to another body of the MFO.

The **Administrative Council** appoints the director and vice director as well as the Scientific Advisory Board (SAB) and is responsible for major strategic and budgetary decisions of the MFO. It consists of up to nine members, chaired by the representative of the Ministry of Science, Research and the Arts of Baden-Württemberg. The representative of the Federal Ministry of Education and Research (BMBF) holds the deputy chair. Furthermore, the Council is composed of a representative of the Joint Science Conference (GWK), the chair of the Board of Directors of the *Gesellschaft für Mathematische Forschung e. V.*, the chair of the MFO’s *Scientific Committee*, the chair of the *Scientific Advisory Board* as well as up to three more external personalities. The members are elected by the Shareholder’s Meeting.

The **Scientific Advisory Board (SAB)** consists of six to eight external scientists, who are appointed by the Administrative Council. The Directors and the Scientific Advisory Board can make recommendations. Members are appointed for a term of four years with the

possibility of one re-election. The SAB advises the Administrative Council and the directors of the MFO with regard to basic professional and interdisciplinary issues of the scientific and technical work programme and the national and international cooperations. The SAB holds a regular annual meeting at the MFO. Meetings of the Scientific Advisory Board are attended with advisory vote by the directors of the MFO and the chairman of the Scientific Committee unless, in a particular case, the SAB otherwise decides.

5. Human Resources

The MFO has a total of 35 employees, three in the area of "Research and scientific services" and 32 among "Science supporting staff" (most of the building service, see appendix 4).

Leading positions

Since 2013 the Scientific Director is jointly appointed with the University of Tübingen with 50% of his working hours delegated to his appointment as a director at MFO.

In April 2020, the position of the vice director was newly filled in joint appointment with the Technical University of Darmstadt. He has a 20% secondary employment at MFO.

The Directors are supported by a senior scientific administrator, the head of administration and an assistant scientific administrator.

Early career researchers

Because of its structure, there are no employed graduate or doctoral students at MFO. The MFO offers different kinds of special programmes and grants for early career scientists (see chapter 7).

Science supporting staff

Of the 32 employees, 26 are part of the administration and 6 are among technical support. Most of MFO's positions are permanent so there is only a small staff turnover. But due to the shortage of skilled workers in Germany, in particular in the countryside, MFO has difficulties in finding staff especially for the IT department and for the kitchen/housekeeping. Training seminars and courses on various topics are being accessed several times per year by the staff. In addition, once a year a "general further-education-day" takes place for all employees.

Since 1987, the MFO has offered an apprenticeship in housekeeping. So far, 12 apprentices have successfully completed their training. Since 2017, the institute also offers an apprenticeship for specialists in media and information services in the field library. One apprentice has finished in 2020, the second trainee started in September 2021.

Equal opportunities and work-life balance (concerning staff and guests)

In its work and offers, MFO considers a broad range of diversity aspects from gender equality to scientific age, geographic diversity, socio-economic diversity to people with disabilities or special needs. A **guideline for equality, diversity and inclusion** (EDI) has been developed that comprises a range of measures addressing visitors and staff. The

standards and measures are communicated to staff members, organizers and participants of the various research programmes, members of the boards as well as further stakeholders and visitors of the Institute.

Since 2007 the MFO has a **gender equality** plan which is updated every two years and is presented and discussed in the Administrative Council. It contains measures to promote gender equality among the workshop participants as well as regarding MFO employees. The MFO received the “Total E-Quality Certificate” with regard to employees and guests first time in 2014. Since October 2020, the certificate is extended to the “Certificate for Equality and Diversity”.

Organizers of a workshop suggesting an invitation list with less than 20% women as participants are contacted by the director in order to possibly identify further qualified female invitees respectively to explain why they have less than eight women as participants on their list. Besides, virtual participation cannot replace a participation in presence, the new audio- and video system at the MFO might allow more female scientists to take part even in cases where travelling is impossible (e. g. because of pregnancy).

In order to promote a **work-life balance**, the MFO offers different kinds of work time models, flexible working hours and the possibility of home-office or mobile working. Concerning the employees, additional laptops for mobile working were bought during the COVID pandemic to enable almost all administrative employees to work mobile.

In cooperation with the “Friends of Oberwolfach” the MFO partially reimburses childcare costs since the year 2014, thus supporting research stays of scientists and families. Since the Corona pandemic, organizing childcare in Oberwolfach is more difficult as there is only a small number of day nannies and no possibility to bring children from outboard to the local kindergarten.

Concerning **geographic diversity**, the MFO records the institutional affiliation of participants rather than nationality. From January 2016 till September 2022, 13.924 researchers from 69 countries have participated in workshops, which cover about 80% of all guest researchers of the MFO. Germany and USA both account for close to a quarter, another 40% come from other European countries and the rest spread over the remaining world. The MFO keeps contact to scientists from countries affected by crises – like for example natural disasters, epidemics or political disruption – and tries to stay responsive to the special needs arising from those. In order to raise the number of participants from developing countries, the MFO engages as the German partner centre for the CIMPA-ICTP Fellowships programme “Research in Pairs” (see chapter 7). Since several years the MFO also collaborates with the Heidelberg Laureate Forum.

The enhancement of **socio-economic diversity** is addressed by dedicated funds, with which the institute aims to assure that everyone who is invited to Oberwolfach can afford the travel. While the OWLG, NSF, and Siemens grants are supporting junior researchers in Oberwolfach for more than a decade now, they were supplemented in 2019 by a grant financed by the Oberwolfach Foundation (Oberwolfach Foundation Fellows OWFF). This

new fund allows to support in particular researchers from places with insufficient furtherance. On average, before and after the pandemic a total of about 450 grants was approved annually.

The **scientific age** ranges from very experienced researchers to recent PhDs. For instance, the PhD age of the first three workshops in 2023 was 18.9 years on average, 32% of the participants had a PhD age of at most 10 years (which is the definition of an early-career researcher by the US National Science Foundation).

6. Cooperation and environment

Three leading staff members are employed at **universities**: The joint appointment of the MFO's Director between the University of Tübingen and the MFO from April 2013 as a tenured full professor at Tübingen University and as director of the MFO (delegated on a 50% position) has recently been further extended for a third term from April 2023 till March 2028. The cooperation agreement contains financial compensation for Tübingen University including support for the research group of the director located at Tübingen University.

Furthermore, there is a connection to the Technical University of Darmstadt, where the MFO's vice director (appointed at the MFO with 20 % of his working capacity) is head of the Applied Analysis group. Another link exists to the University of Mainz and the Karlsruhe Institute of Technology (KIT), as the MFO's scientific administrator is adjunct professor in Mainz since 2011, gave in 2016 and 2018 specialized seminars at KIT and organized together with a colleague from KIT a Banach-Center Oberwolfach Graduate Seminar in 2022.

MFO has several cooperations within the **Leibniz Association**. There is a regular exchange of ideas and information with the *Leibniz Center for Informatics (LZI)* in Schloss Dagstuhl. Concerning the publications and the OLAM initiative for deep archive storage of library content (see chapter 3), the MFO cooperates with the *Leibniz Information Centre for Science and Technology (TIB)* in Hannover. Furthermore, especially the MaRDI consortium connects the MFO with the *Weierstrass Institute for Applied Analysis and Stochastics (WIAS)* in Berlin. The institute is also active in the *Leibniz Network Mathematical Modeling and Simulation* and hosts summer schools of this network. Further cooperation in Germany concerns the German training for the international mathematical Olympiad, which the MFO is hosting for the *Bundeswettbewerb Mathematik*

On an **international level**, MFO is cooperating with European mathematical research institutes that are organized in *ERCOM – European Research Centres for mathematics Association*. Intensive cooperations exist with the Mathematical Research and Conference Center in Bedlewo (PL) in co-organizing the Banach Center – Oberwolfach Graduate Seminars. Besides, with the CIMP and the ICPT concerning their “Research in Pairs” Programme, with the *Research Institute for Mathematical Sciences (RIMS)* in Kyoto and the *MatriX – Mathematics Research Institute in Melbourne*.

Institution's status in the specialist environment

In **Germany** the MFO is recognized as a “social research infrastructure for mathematics”, a terminology established by the Leibniz Association and the German Science Council (*Wissenschaftsrat*), which also recognizes the MFO as an “Institute for Advanced Study (IAS)”. Apart from research centers at universities, several other mathematical research institutes and centers in Germany run special workshops and summer schools as part of their longer-term activities, often linked to research projects of tenured researchers at these institutions: the *Max Planck Institute for Mathematics in Bonn*, the *Max Planck Institute for Mathematics in the Sciences* in Leipzig, the *Fraunhofer Institute for Industrial Mathematics* in Kaiserslautern, the *Fraunhofer Institute for Algorithms and Scientific Computing* in Sankt Augustin, the WIAS in Berlin and the *Hausdorff Center for Mathematics* in Bonn.

Among **international** non-university mathematical research institutes the MFO has a special status as one of only very few institutes with a similar structure and mission as the MFO: the *Centre International de Rencontres Mathématiques* (CIRM) in Luminy (FR), the *Leibniz Center for Informatics* in Schloss Dagstuhl/Wadern (DE), the *American Institute of Mathematics* in Palo Alto (US), the *Mathematical Research and Conference Center* (MRCC) in Bedlewo (PL), the *Banff International Research Station* (BIRS) in Banff (CA) and the *Tsinghua Sanya International Mathematics Forum* in Hainan (CN).

7. Subdivisions of MFO

Subdivision 1: Short term research stays

This programme forms the core of the MFO activities and provides in total 2200 person weeks (covering about 75% of the capacity of the MFO, see appendix 2). All the events have in common that the emphasis is not primarily on lectures, but on a mix of presentation and discussion of new results, brain-storming of new ideas and start of new interactions and collaborations.

Workshops

There are 40 week-long Workshops with in total about 50 participants. Proposals for the year after next are submitted once a year in July with a provisional list of invitees. Apart from the main workshops there may be also more strongly focused half-workshops with about 25 participants taking place in parallel to the Workshops.

The Workshops are selected by the Scientific Committee of the MFO once a year from worldwide applications of international teams consisting of experts in the field of their workshop. The success rate is about 50%. The participants are then personally invited by the director following recommendations of the successful organizing teams. The bottom-up application process and broad expertise of the Scientific Committee shall ensure that all mathematical research areas are covered and new hot topics can quickly be part of the MFO programme.

After the short closure in spring 2020, up to half of the participants were able to come to the hybrid workshops in person during summer of 2020 and 2021, while participation

was in majority online during winter pandemic waves. After experiments with new formats such as *Tandem Workshops* (two workshops taking place in parallel at different locations, e. g. in Oberwolfach and at RIMS in Kyoto) and *Small Collaborations* (groups between 7 and 12 participants in week-long interactive mini-workshops or seminars in hybrid format jointly between the MFO and their own institution) allowing joint research activities across long distances, it became quickly clear for the institute that hybrid workshops could not provide the same level of interaction as workshops with full in person participation. It is planned to continue and explore the concept of tandem workshops beyond the pandemic, also with a view to sustainability issues in relation to long distance travel.

The MFO is closely following the developing mathematical aspects of artificial intelligence and machine learning and received applications in this direction also in the regular programme, some of which were already realized (see for results chapter 2, e. g. ELLIS).

Mini-Workshops

There are 12 week-long Mini-Workshops with in total 16–17 participants. Proposals are submitted half a year before the Mini-Workshop takes place. The selection process is the same as for the workshops. The success rate is below 40%.

The Mini-Workshops allow proposals to react to recent developments. The small number of participants typically makes Mini-Workshops rather focused and intense with most participants deeply and actively involved in discussions and presentations. A typical focus would be the understanding of a new development, the verification of a long proof of an important result or the common work on specific interrelated open problems.

Subdivision 2: Longer term research stays

In total, the programme provides 320 person weeks. The longer-term research stays used to be divided into the individual “Oberwolfach Leibniz-Fellows (OWLF)” spending up to three months at the MFO while typically supported by a full scholarship and the “Research in Pairs” visits of small groups of 2–4 persons visiting the Institute for 2–4 weeks. In 2020 the pandemic required a more flexible approach allowing combinations of the two formats and quick adaptation to changing government rules affecting possibilities for travel and MFO capacity. The institute responded by combining the two programmes into the “Oberwolfach Research Fellows (OWRF)”. There is now one streamlined decision process and major support from the *Scientific Committee* providing timely evaluations made it possible to process many ad hoc applications during the pandemic that allowed cooperation of researchers at the MFO often unable to find another venue to meet. At the same time, it allowed the MFO to make adequate use of its capacity when many other guests had to cancel their visit due to travel and quarantine restrictions. The new format was much in demand with many applications both from senior and junior researchers. This included successful applications from geographic areas such as South America and Africa that are underrepresented in other programmes. Together with the SAB it was therefore decided to keep the new joint format of OWRF and the streamlined evaluation process beyond the pandemic.

Until 2016, there existed a common postdoctoral programme of ten ERCOM members (European Research Centers on Mathematics) in the “European Post-Doctoral Institute”. The MFO took part in it with OWLF. Within the OWRP programme, the MFO has now decided to join as German partner the CIMPA-ICTP Fellowship programme “Research in Pairs” launched by the *Centre International de Mathématiques Pures et Appliquées* (CIMPA) and the International Center for Theoretical Physics (ICTP). The CIMPA-ICTP programme makes it possible for researchers in mathematics based in a developing country to come to Europe to collaborate with a colleague, mainly in the institute of the European colleague. The laureate and his/her colleague may propose to carry out part of their collaboration during a week at one of the partner centers located in the host’s country. MFO has already approved two such visits in 2023 for researchers from Sri Lanka and Brazil and their German hosts, where the MFO covers the local expenses. The preprint series of the MFO is open to this programme.

Oberwolfach Research Fellows (OWRF)

This programme is aimed at small groups of 1-4 researchers from different institutions working together at the MFO for 2-4 weeks on a specific project. Applicants send a proposal to the vice director. The decision with members of the *Scientific Committee* which are near to the subject usually takes about 6 weeks. The acceptance rate is about 70%. Synergies with the workshop programme are sometimes possible in this format when a one-week extension to a workshop invitation is used for a specific collaboration.

Oberwolfach Leibniz Fellows (OWLF)

This is a special programme in OWRP existing since 2022 and addressing postdoctoral, early-career researchers. They can apply to carry out a research project, individually or in small groups. Applicants send a proposal to the vice director, including especially a detailed description of the research project and intended interaction with Oberwolfach programmes. The decision is made by members of the *Scientific Committee* which are near to the subject. The acceptance rate is about 50%.

Subdivision 3: Training activities

In total, the programme provides 300 person weeks. Training activities consist mainly of the Oberwolfach Seminars and the *Arbeitsgemeinschaften*.

Oberwolfach Seminars

The Seminars address postdocs and PhD students and are week-long events with 25 participants taking place six times a year. The vice director decides together with the Scientific Committee on suggestions for topics and possible organizers. Suggestions can come from inside and outside the Scientific Committee. A sub-committee finally selects the Seminars taking into account recent important developments. After scheduling the seminars by the MFO, PhD students and postdocs can apply for participation until deadline. The selection of the participants is done by the organizers in cooperation with the vice director. The participants are invited 2–3 months in advance of the seminar. Since 2017 a larger fraction of these seminars than previously came from outside applications rather than

solicitation by the Scientific Committee. Carl Friedrich von Siemens Foundation and National Science Foundation support travel expenses, contributing crucially to the support of early career researchers.

To intensify scientific relations with Germany's neighbour Poland and following a recommendation of the SAB to increase offerings for graduate students, the MFO has initiated together with the *Banach Center* in Warsaw an additional series of *Banach Center – Oberwolfach Graduate Seminars (BOWS)* for PhD students and postdoctoral researchers. In 2019 and 2022 two such graduate seminars were realized. Two further graduate seminars with the Banach Center planned for 2020 and 2021 had to be postponed and will take place in 2023.

Arbeitsgemeinschaften

The second part of the training activities concerns the three *Arbeitsgemeinschaften* with coordinators appointed by the Scientific Committee in coordination with the directors for three years, with the possibility of reappointment. The coordinators do not have to be members of the scientific committee and are responsible for defining the topics and finding organizers. The organizers then plan the programme of the *Arbeitsgemeinschaft*, select the participants from applications received and distribute lectures and tasks to the participants.

The *Arbeitsgemeinschaften* are aimed for early career as well as senior researchers. The goal is to investigate a new active topic guided by leading international experts. This programme originally started as an opportunity for senior mathematicians to learn a new subject “by doing” (i.e. by presenting a recent research development themselves under the guidance of a team of experts) and became popular amongst postdoctoral researchers during the last few years. A third *Arbeitsgemeinschaft* was initiated in 2020 and aims more in analytical and applied directions of mathematics. Its start was planned for 2021, but could only be realized in 2022 due to the pandemic.

Further activities

Participating in the Leibniz network *Mathematical Modelling and Simulation (MMS)* (see chapter 6), the MFO hosted in 2018 and 2019 the Leibniz MMS summer school for junior research scientists from more than 15 Leibniz institutes in parallel to its regular programme, using external food and accommodation arrangements. A third school was planned for 2020 but had to be cancelled due to the pandemic.

In a long-standing cooperation with “*Bundeswettbewerb Mathematik*” every summer the MFO is hosting the final training and selection camp of the German candidates for the *International Mathematics Olympiad (IMO)*. Each camp ends with the selection of 6 out of the 20 participants for participation in the Olympiad which usually takes place in a different international place each year. In 2020 and 2021 the training could only be realized in on-line seminars of “*Bundeswettbewerb Mathematik*” because of the pandemic while the Olympiad itself was realized in a parallel internationally distributed online format at special venues in each country. The MFO was chosen as the official venue for Germany in 2020 and 2021 in view of its enhanced video conference facilities.

8. Handling of recommendations from the previous evaluation

MFO responded as follows to the three recommendations of the last external evaluation (highlighted in italics, see also statement of the Senate of the Leibniz Association issued on 9 March 2017, page B-3):

1) *“MFO’s publications, reports, and programmes are well communicated to previous year’s participants and the longtime friends of the MFO. The institute should, however, continue to improve the **communication of the valuable opportunities** it offers, making them available to the entire international mathematical community, including an enhanced online presence, and wider calls for proposals to its weekly work-shops and other programmes. This will also further enhance MFO’s global visibility.”*

On the different ways of advertising the programmes see chapter 2. Newly designed webpages list all programmes together with guidelines for applications, grants available for participants and information concerning diversity and family support measures, a news section highlights all new calls such as the recent calls for Tandem Workshops and workshops with a networking component. The MFO also makes use of other channels such as the websites of the German and the European Mathematical Societies who regularly publish news from Oberwolfach in their news sections.

Further visibility has been achieved through the spin-off of the IMAGINARY non-profit company, where MFO is a minor shareholder. IMAGINARY distributes the “Snapshots of modern mathematics from Oberwolfach” and further information about the MFO at many of its worldwide exhibitions, for example at a special booth at the *International Congress of Mathematics* in Rio de Janeiro 2018.

2) *“The **proportion of women** amongst programme participants and organisers has essentially stayed the same since the last evaluation, and still ranges between 12 and 15 per cent. The gender imbalance observed in mathematics is international, and efforts are being made at schools, universities and institutes to address this issue. Given that MFO is an institution with an outstanding international reputation, it should aspire to lead the way in this respect, too. It should therefore make even greater efforts to implement concrete measures to increase the proportion of women, as has also been recommended by the Scientific Advisory Board.”*

The MFO has raised the fraction of women amongst participants minimally required in workshop proposals first from 6 to 8 participants and now to 10 corresponding to a minimum fraction of 20%. The fraction of female participants has to be transparent in proposals and is taken into account by the Scientific Committee in its decisions. The requirement is clearly communicated in the proposal guidelines that also strongly encourage the inclusion of at least one woman in an organizing team.

The MFO has used funds from the Friends of Oberwolfach and the Oberwolfach Foundation to pay for babysitting costs or for the accommodation of an accompanying care person. During the pandemic babysitters were not available, but the second support option was available even during the pandemic.

As a further new initiative in support of women in mathematics the MFO has made a call for workshops including a networking activity in 2022 that however did not yet yield a successful application. This measure will be tried again and fine-tuned in the new round of calls 2023.

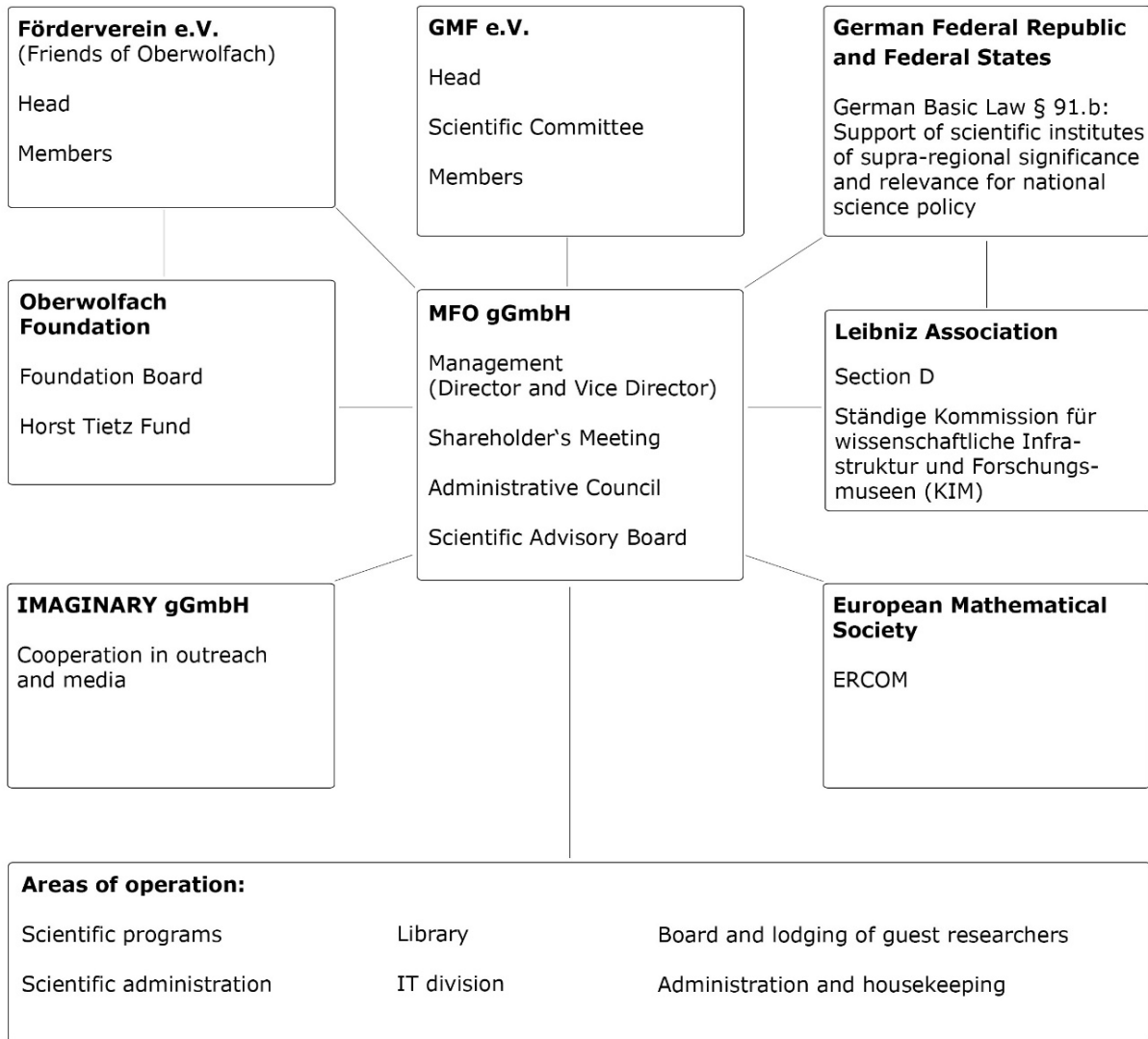
The measures described above were successful in lifting the participation of women gradually towards and beyond 20%. A level of 25% for organizers was achieved in 2022 without making a women in organizing teams mandatory.

*3) "The **members of the Scientific Committee (SC)** are elected at the suggestion of the SC by the board of the Gesellschaft für Mathematische Forschung e. V. (GMF) for a four-year term with a maximum of two terms of office. This limitation should also pertain to the Chair and Deputy Chair who at present can be re-elected an unlimited number of times. Furthermore, the proportion of women on the Scientific Committee is currently only 20 per cent and should be increased, as has successfully been accomplished with the current composition of the Scientific Advisory Board, 50 per cent of whom are women."*

The Scientific Committee (SC) and the Gesellschaft für Mathematische Forschung e. V. (GMF) have followed this recommendation in their annual meeting 2017 and adopted the rule that members of the Scientific Committee can have at most two four year terms in a function as chair or deputy chair additional to terms served as ordinary members of the committee. This was then also recognized by the Administrative Council in its meeting in 2018. The number of women members of the Scientific Committee has increased from 20% to between 30% and 35% in the last three years.

Appendix 1

Organisational Chart



Appendix 2

Scientific Programme and Publications

The capacity of the MFO programmes is measured in terms of person weeks. The annual total capacity of about 2.820 person weeks is distributed to the programmes as follows:

Subdivision	Programme	Number/ y.	Person Weeks/y.	Rate of capacity
1	Workshops	40	2,000	70.9%
1	Mini-Workshops	12	200	7.1%
2	OWRF	100	220	7.8%
2	OWLF	10	100	3.5%
3	Oberwolfach Seminars	6	150	5.3%
3	Arbeitsgemeinschaften	3	150	5.3%
Total		171	2820	100%

	Period			
	2019	2020	2021	2022
Total number of publications	52	36	26	38
Oberwolfach Reports	4	4	4	4
Oberwolfach Seminars	-	-	-	(2)
Oberwolfach Preprints	26	22	10	18
Snapshots of modern mathematics	21	9	11	13
Annual reports	1	1	1	1

Appendix 3

Revenue and Expenditure

Revenue		2019			2020			2021			2022		
		k€	%	%	k€	%	%	k€	%	%	k€	%	%
Total revenue (sum of I., II. and III.; excluding DFG fees)		4.250,0			4.026,0			4.163,0			4.501,0		
I.	Revenue (sum of I.1.; I.2., and I.3.)	3.920,0	100 %		3.509,0	100 %		3.652,0	100 %		3.866,0	100 %	
1.	<u>Institutional Funding (excluding construction projects and acquisition of property)</u>	3.246,0	83 %		3.270,0	93 %		3.359,0	92 %		3.414,0	88 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and Länder governments according to AV-WGL	3.246,0			3.270,0			3.359,0			3.414,0		
1.2	Institutional funding (excluding construction projects and acquisition of property) not received in accordance with AV-WGL	0,0			0,0			0,0			0,0		
2.	<u>Revenue from project grants</u>	577,0	15 %	100 %	198,0	6 %	100 %	233,0	6 %	100 %	340,0	9 %	100 %
2.1	DFG MaRDI	0,0		0 %	0,0		0 %	3,0		1 %	14,0		4 %
2.2	Carl Friedrich v. Siemens Foundation (Seminars)	150,0		26 %	0,0		0 %	0,0		0 %	30,0		9 %
2.3	Carl Friedrich v. Siemens Foundation (Library)	15,0		3 %	15,0		8 %	15,0		6 %	15,0		4 %
2.4	National Science Foundation (USA)	203,0		35 %	14,0		7 %	0,0		0 %	67,0		20 %
2.5	Simons Foundation (USA)	119,0		21 %	119,0		60 %	115,0		49 %	129,0		38 %
2.6	Oberwolfach Foundation	35,0		6 %	20,0		10 %	20,0		9 %	20,0		6 %
2.5	Friends of Oberwolfach	55,0		10 %	30,0		15 %	80,0		34 %	50,0		15 %
2.6	Gesellschaft fuer mathematische Forschung e.V.	0,0		0 %	0,0		0 %	0,0		0 %	15,0		4 %
3.	<u>Revenue from services</u>	97,0	2 %		41,0	1 %		60,0	2 %		112,0	3 %	
3.1	Revenue from publications	30,0			10,0			27,0			28,0		
3.2	other services	67,0			31,0			33,0			84,0		
II.	Miscellaneous revenue (e. g. membership fees, donations, rental income, funds drawn from reserves)	330,0			517,0			511,0			635,0		
III.	Revenue for construction projects (institutional funding by Federal and Länder governments, EU structural funds, etc.)	0,0			0,0			0,0			0,0		
Expenditures		k€			k€			k€			k€		
Expenditures (excluding DFG fees)		4.250,0			4.026,0			4.163,0			4.501,0		
1.	Personnel	1.700,0			1.753,0			1.823,0			1.851,0		
2.	Material expenses	385,0			215,0			227,0			309,0		
2.1	<i>Proportion of these expenditures used for registering industrial property rights (patents, utility models, etc.)</i>	0,0			0,0			0,0			0,0		
3.	Equipment investments	273,0			165,0			217,0			124,0		
4.	Construction projects, acquisition of property	0,0			0,0			0,0			0,0		
5.	Other operating expenses (if applicable, please be specific)	1.618,0			1.446,0			1.339,0			1.667,0		
6.	Other expenses	274,0			447,0			557,0			550,0		
DFG fees (if paid for the institution - 2.5 % of revenue from institutional funding)		0,0			0,0			0,0			0,0		

Appendix 4

Staff

Basic financing and third-party funding / proportion of women (as of 31 December 2022)

	Full-time equivalents		Employees		Female employees		foreigners
	Total	on third-party funding	Total	on temporary contracts	Total	on temporary contracts	Total
	Number	Percent	Number	Percent	Number	Percent	Number
Research and scientific services	1,7	0,0	3	1,3	0	0,0	0
1 st level (scientific directors)	0,7	0,0	2	2,0	0	0,0	
Further academic staff in executive positions	1,0	0,0	1	0,0	0	0,0	

Science supporting staff (laboratories, technical support etc.)	6,2	3,2	6
Workshops (E5 to E8, mid-level service)	1,8	0,0	2
Library (E9 to E12, upper-mid-level service)	0,6	0,0	
Library (E5 to E8, mid-level service)	1,0	20,0	1
Information technology - IT (E9 to E12, upper-mid-level service)	2,8	0,0	3

Science supporting staff (administration)	15,6	0,0	26
Head of administration	1,0	0,0	1
Internal administration (financial administration, personnel, etc.) (from E13, senior service)	1,6	0,0	2
Building Service (E5 to E())	3,0	0,0	3
Building service (E1 to E4)	10,0	0,0	20

Trainees	1,0	0,0	1
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Annex B: Evaluation Report

Oberwolfach Research Institute for Mathematics, Oberwolfach (MFO)

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Appendix:

Members of review board

1. Summary and main recommendations

The Oberwolfach Research Institute for Mathematics (MFO) is an excellent social research infrastructure facility (classified as an *Institute for Advanced Studies*¹) with a high international reputation. Its main role is to bring together national and international mathematicians for a concentrated exchange of ideas, thereby promoting the generation of new ideas and research work. To this end, it offers a range of event formats that vary in terms of their duration and number of participants. The weeklong workshops with around 50 participants are the key element. Proposals for these include the topic and a provisional list of participants and are assessed in a competitive procedure. The *Scientific Committee* (SC) is responsible for selecting the proposals alongside the MFO Directors. The SC consists of 20 to 25 mathematicians with international credentials and is the central steering committee for the MFO's activities. The selection process is organised well and efficiently. The great success of the MFO can also be seen in the fact that, since it was founded in 1944, it has served as a model for similar institutes in Germany and abroad.

The activities are organised into three programme lines, which are all rated as 'excellent': the weeklong workshops and mini-workshops (programme 1; 78% of the MFO's capacity), longer-term fellowships of up to three months (programme 2; 11% of the capacity) and weeklong training activities, primarily for early-career researchers (programme 3; 11% of the capacity). Events at the MFO are extremely important for national and international mathematical scientists (70% of organisers and participants come from abroad). Leading mathematicians from a range of different disciplines regularly take part in MFO events, including a number of Fields medallists. Many novel approaches in mathematics can be traced back to Oberwolfach. The content of the events is documented e.g. in the publication outlets of the MFO as abstracts and lecture notes. Independently of these, results from research visits to Oberwolfach are published by the individual scientists in specialist journals.

The MFO's development in recent years has been very convincing. In particular, its management of the challenges associated with the pandemic was outstanding. A short closure between March and June 2020 was used for building renovations. At the same time, the institute developed innovative hybrid formats that permitted a fruitful combination of online and on-site interactions. The new *tandem workshops*, which take place simultaneously at two different locations, are particularly commendable. These also represent an attractive option for the future from a sustainability perspective. In addition to its activities in the core areas of mathematics, the MFO also organised interdisciplinary events and addressed important topics of social relevance, e.g. mathematical models in climate research.

The MFO is managed by a Director and a Vice Director, who work very closely and well together. They are supported by a senior scientific administrator and the head of administration. The entire executive level performs outstanding work. Also worth

¹ German Science and Humanities Council: Developmental Perspectives of Institutes for Advanced Studies (IAS) in Germany. Cologne 23 April 2021.

highlighting is the extremely dedicated work of the science-supporting staff (e.g. in administration, housekeeping, kitchen and building services).

In summary of the above, the MFO operates as a finely-tuned mechanism, consistently delivering excellent results in its current endeavours. That being said, the review board sees room for improvement concerning the documentation of the various processes and of the interactions between the various boards. This would not only bolster transparency towards outsiders, but might also be instrumental internally, particularly in light of the upcoming change in leadership. The review board is aware of the delicate balancing act between preserving the institute's very high level of functionality and embracing a broader spectrum of research areas and researchers.

In these regards, special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

Overall concept (chapter 2)

1. In future, the MFO should set out transparently in a **Mission Statement** which research areas it would like its events to address. In doing so, it should clarify to what extent the events programme should include applied fields alongside the pure mathematics disciplines.

Changes and planning (chapter 3)

2. Nearly 3,000 **researchers** meet at the MFO each year, with about 70% coming from abroad. Despite the huge interest in staying at the institute, there are workshop series with similar titles and from the same organisers. The MFO should define an upper limit for how often scientists can act as organisers within a specified period.

It is understandable that a list of participants is a key element of a workshop proposal and therefore must be drawn up by the organisers. Currently, only doctoral researchers have the possibility to submit an unsolicited application. The MFO should create a possibility for people at all career stages to apply to take part, and communicate this clearly on the website.

The institute was able to increase the proportion of female organisers and participants from \varnothing 13.5 % p. a. (2013–2015) to \varnothing 21 % p. a. (2020–2022). Even if this roughly reflects the proportion of women in the community, the MFO should take on a pioneering role due to its high reputation and achieve a higher-than-average proportion of women in its activities.

Controlling and quality management (chapter 4)

3. The website contains a wealth of information, including guidelines for writing a proposal. In future, it should also include more transparent information about the **evaluation criteria**.
4. The MFO should define **targets** for the aspects relevant to its future development and check them regularly, e.g. with regard to the proportion of women among the participants, and the proportion of participants from the Global South. Targets should also be set regarding the number of events in each research area. As well as recording

the approval rate for the individual programmes, the MFO should in future also record these numbers for the individual research fields so that the Director and SC can respond to any imbalances, if necessary.

5. For a long time, the institute was run directly by the *Gesellschaft für Mathematische Forschung e. V.* (GMF). When the federal and *Länder* governments included the institute in their joint funding programme in 2005, the GMF set up a company (*MFO gGmbH*) to run the institute, with the GMF as its sole shareholder. The GMF retained ownership of the land and real estate. At that time, the Director and the Supervisory Board were sensibly made organs of the company, as was the new SAB. However, the **Scientific Committee** (SC) remained under the purview of the GMF.

In future, the members of the SC should, like the Director, be appointed by the Supervisory Board. The term of office for all members should be the same, i.e. a maximum of two successive 4-year terms. Election to the chair of the SC should not be a reason to extend an individual's term of office as a member of the SC, as it is at present. The MFO is advised to extend the right to nominate new members beyond the SC and to include the SAB. To implement the recommendations, the SC needs to be enshrined in the company's articles of association (*Gesellschaftsvertrag*). The GMF statutes (*Satzung*) should also be amended in line with this new rule.

With regard to the composition of the SC, it is good to see that, in line with recommendations, the proportion of female scientists has now risen to 32%. The institute should achieve a further increase here, as it has already done for the SAB (57%). In addition, the number of members from countries outside the German-speaking world should also be increased.

6. Currently, the **chair of the Scientific Advisory Board** is a full member of the *Supervisory Board*. According to the standards of the Leibniz Association, the chairperson of the SAB should only take part in the Supervisory Board in an advisory capacity. This should be changed and enshrined in the statutes accordingly.

2. Overall concept, activities and results

Overall concept

The Oberwolfach Research Institute for Mathematics (MFO) is an excellent social research infrastructure facility (classed as an *Institute for Advanced Studies*) with a high international reputation. Its main role is to bring together national and international mathematicians for a concentrated exchange of ideas, thereby promoting the generation of new ideas and research work. To this end, it offers a range of event formats that vary in terms of their duration and number of participants. The weeklong workshops with around 50 participants are the key element. Proposals for these include the topic and a provisional list of participants and are assessed in a competitive procedure. The MFO also offers the opportunity to apply for research residencies of up to three months and participation in other programmes, e.g. as part of its support for early-career researchers.

Decisions on all parts of the MFO's **scientific programme**, including applications, are taken by the directors in consultation with the *Scientific Committee* (SC). The SC consists of 25 mathematicians, who are selected based on scientific excellence, broad coverage of research fields and diversity within the committee. The assessment of the proposals is well organised and efficient (for details see chapter 7). Once the activities have been decided on, the director is responsible for inviting the participants.

Results

Programme

The total capacity of the institute amounts to 2,800 person-weeks. The activities are organised into **three programme lines** (for details see chapter 7), which are all rated as 'excellent':

- With a total of 2,200 person-weeks (i.e. 78% of the total capacity), the weeklong workshops and mini-workshops form the majority of the MFO's activities. In recent years, the MFO has again succeeded in attracting world-leading scientists as organisers and participants in this programme. Potential organisers can submit a proposal including a topic and a provisional list of participants; the acceptance rate is 40–50%.
- Longer-term stays of two to four weeks are offered through the *Oberwolfach Research Fellows* (OWRF) programme for small groups of up to four people. The programme is highly attractive and comprises 320 person-weeks (i.e. 11% of the total capacity); the acceptance rate is 70%. Early-career fellows can additionally apply for the *Oberwolfach Leibniz Fellows* (OWLF) programme to extend their stay to up to three months; the acceptance rate for this is 50%.
- For early-career researchers in particular, the MFO organises weeklong training activities amounting to 300 person-weeks (i. e. 11% of the total capacity). The *seminars* are held six times a year and are aimed at PhD students and postdocs. The *Arbeitsgemeinschaften* (study groups) are also aimed at senior researchers. They introduce the participants to new hot topics under the guidance of leading international experts.

Events at the MFO are extremely important for national and international mathematical scientists. Leading mathematicians from a range of different disciplines regularly take part in MFO events, including a number of Fields medallists. Many novel approaches can be traced back to Oberwolfach. The great success of the MFO can also be seen in the fact that, since it was founded in 1944, it has served as a model for similar institutes in Germany and abroad.

In future, the MFO should set out transparently in a *Mission Statement* which research areas it would like its events to address. In doing so, it should clarify to what extent the events programme should include applied fields alongside the pure mathematics disciplines.

Publication outlets

Results from research visits to Oberwolfach are published by the individual scientists in specialist journals. To document the MFO events, the institute provides several

publication outlets: the content of workshops, mini-workshops and *Arbeitsgemeinschaften* is published in the *Oberwolfach Reports* (OWR). The *Oberwolfach Preprints* (OWP) serve as preliminary preprints of the results in the OWR programme. The *Snapshots of modern mathematics from Oberwolfach* contain essays by workshop participants on aspects of research fields discussed in Oberwolfach. These address a broader audience, but are also of value to junior researchers. In addition to these three journals, which are already accessible via open access on the MFO's website, it is commendable that the MFO also publishes the lecture notes of the seminars in a separate publication series called the *Oberwolfach Seminars* (OWS). The institute should examine whether this series too can be made available through open access.

Outreach

Through various outreach activities, the MFO's visibility extends beyond the mathematical community. One very successful project is IMAGINARY, an online open-source platform for sharing mathematics knowledge with an interested public. It received funding from the *Klaus Tschira Stiftung* until 2016 and was then spun off into a separate foundation with funds from the Leibniz Competition programme. The MFO is now a minor shareholder of the company.

The *Oberwolfach Photo Database* makes approximately 22,000 pictures of mathematicians available online. The MFO and its SC are also involved in awarding various prizes.

In addition, the MFO is very active in further developing the *Museum for Minerals and Mathematics* in Oberwolfach, a cooperation with the *Association for Minerals and Mining* in Oberwolfach and the municipality. In the last few years, new hardware was provided and the software was renewed. The municipality started building an extension in 2023.

3. Changes and planning

Development since the last evaluation

The MFO has developed very convincingly. The core of the **scientific programme** continues to be the three programme lines, which have been modified in a convincing manner (see chapter 7). Overall, the MFO achieved a greater awareness and visibility of its programmes, in line with a recommendation from the last evaluation, in part through newly designed web pages, a regular newsletter and a global poster campaign. The Institute should examine how external channels (e.g. newsletters of appropriate associations) can be used even more intensively for this purpose. In addition to its activities in the core areas of mathematics, the MFO also organised interdisciplinary activities and addressed important topics of social relevance, e. g. mathematical models in climate research.

The institute's management of the challenges associated with the **pandemic** was outstanding. A short closure between March and June 2020 was used for building renovations. At the same time, the institute developed innovative hybrid formats that permitted a fruitful combination of online and on-site interactions, and gradually increased the proportion of on-site events. The new *tandem workshops*, which take place

simultaneously at two different locations, are particularly commendable. They combine intensive local engagement with online joint lectures and discussions. By exercising great care, the institute managed to remain open during the rest of the pandemic and ran most of its planned events. Normal operations have now resumed.

The institute places a high value on **sustainability**. Besides the building works, major successful measures include designing the programmes to reduce travel. It is good to see that there are plans to keep and expand the *tandem workshops* (see above). The institute should, as planned, look for additional partners for this, alongside its existing collaborations with institutes like the *Research Institute for Mathematical Sciences* (RIMS) in Kyoto and the *MatriX – Mathematics Research Institute* in Melbourne. In addition, the institute is heavily committed to generating synergy effects, combining visits to the MFO with other research activities in Germany and the rest of Europe. In this context, for instance, it awards grants funded by the *Simons Foundation* to scientists who combine a visit to the MFO with research cooperation at another European institute.

Strategic planning for the coming years

Nearly 3,000 researchers meet at the MFO each year, with about 70% coming from abroad. Despite the huge interest in staying at the institute, there are workshop series with similar titles and from the same organisers. The MFO should define an upper limit for how often scientists can act as organisers within a specified period.

It is understandable that a list of participants is a key element of a workshop proposal and therefore must be drawn up by the organisers. Currently, only doctoral researchers have the possibility to submit an unsolicited application. The MFO should create a possibility for people at all career stages to apply to take part, and communicate this clearly on the website.

Regarding participants, the MFO has already taken various measures to increase gender equality. For example, organisers of a workshop suggesting an invitation list with less than 20% women as participants are contacted by the director in order to possibly identify further qualified female invitees. Hybrid formats will also continue to be used, for example to make it easier for parents of young children to participate. In this way, **the institute was able to increase the proportion of female organisers and participants from Ø 13.5 % p. a. (2013–2015) to Ø 21 % p. a. (2020–2022). Even if this roughly reflects the proportion of women in the community, the MFO should take on a pioneering role due to its high reputation and achieve a higher-than-average proportion of women in its activities.**

It is good to see that the institute also takes account of other diversity aspects when selecting guests, i.e. socio-economic and geographic backgrounds. Like other research institutes, the MFO faces the challenge of working with people from different political systems and legal frameworks (e.g. in relation to handling research data).

4. Controlling and quality management

Facilities, equipment and funding

The MFO is adequately endowed with institutional **funding** for its tasks (€3.4m in 2022). Besides this, the institute received €0.3m from project grants as well as €0.1m in revenues from services. Most of the additional funds were received from foundations and are mainly used to cover guests' travel expenses. It is very good to see that the MFO has successfully applied for future funding from the *National Science Foundation* (NSF) to support 100 early-career researchers p.a. so they can visit the MFO, and the *Carl Friedrich von Siemens Foundation* to support travel costs and accommodation for the *Oberwolfach Seminars* with €75k p.a.

The MFO's **facilities** create an ideal environment for the scientific activities. Improvements and renovations are being carried out all the time and with a view to sustainability. The conference and library building houses in particular three lecture halls, the library areas as well as discussion and reading areas. The guest house includes the dining hall as well as 50 guest rooms and 8 apartments, a conference room and discussion corners. Furthermore, the MFO has 5 bungalows with 19 rooms, that can also be used for participants with accompanying guests, along with two rooms for people with disabilities.

The MFO's **library** is internationally renowned. A large, compact storage facility for printed journals was completed in 2016. The institute is also increasingly focusing on the acquisition of digital media. Since 2021, access for guests to e-journals and e-books has been expanded and is now allowed one week before and two weeks after the meetings. This has led to an increase in downloads, which rose from \emptyset 24,719 p.a. (2019–2020) to \emptyset 40,357 p.a. (2021–2022).

Concerning the long-term preservation of digital journals, the MFO together with the *Leibniz Information Centre for Science and Technology* (TIB) in Hannover runs a digital archive. The review board notes with satisfaction that, since 2021, the MFO is part of the Mathematical Research Data Initiative (MaRDI), an NFDI consortium. It disseminates information about MaRDI to the mathematical community and also collects feedback from the community. The MFO's own electronic publication outlets are available in the *Oberwolfach Repository*.

The MFO has a multi-step back-up system with distributed storage, providing a fully redundant setup and ensuring **IT security** and data protection. In 2022, the MFO signed support contracts with an external specialist company to strengthen existing defences against cyber-attacks and to modernize major aspects of the MFO databases.

Quality management

The MFO follows the guidelines of the Leibniz Association concerning good scientific practice. An ombudsperson has been elected from among the MFO staff. It is welcomed that the MFO has set itself a code of conduct in a *Statement for Respect and Collegiality*.

The website contains a wealth of information, including guidelines for writing a proposal. In future, it should also include more transparent information about the evaluation criteria.

The MFO should define targets for the aspects relevant to its future development and check them regularly, e.g. with regard to the proportion of women among the participants, and the proportion of participants from the Global South. Targets should also be set regarding the number of events in each research area. As well as recording the approval rate for the individual programmes, the MFO should in future also record these numbers for the individual research fields so that the Director and SC can respond to any imbalances, if necessary.

Organisational and operational structure

As required at Leibniz institutes, the MFO has positions and boards for management, advice and supervision: the director is responsible for the institute's management in consultation with the SC. This management structure fits the institute's specific tasks. The *Scientific Advisory Board (SAB)* and the *Supervisory Board (Administrative Council)* perform their roles very effectively.

For a long time, the institute was run directly by the *Gesellschaft für Mathematische Forschung e. V. (GMF)*. When the federal and *Länder* governments included the institute in their joint funding programme in 2005, the GMF set up a company (*MFO gGmbH*) to run the institute, with the GMF as its sole shareholder. The GMF retained ownership of the land and real estate. At that time, the Director and the Supervisory Board were sensibly made organs of the company, as was the new SAB. However, the *Scientific Committee (SC)* remained under the purview of the GMF.

In future, the members of the SC should, like the Director, be appointed by the Supervisory Board. The term of office for all members should be the same, i. e. a maximum of two successive 4-year terms. Election to the chair of the SC should not be a reason to extend an individual's term of office as a member of the SC, as it is at present. The MFO is advised to extend the right to nominate new members beyond the SC and to include the SAB. To implement the recommendations, the SC needs to be enshrined in the company's articles of association (*Gesellschaftsvertrag*). The GMF statutes (*Satzung*) should also be amended in line with this new rule.

With regard to the composition of the SC, it is good to see that, in line with recommendations, the proportion of female scientists has now risen to 32%. The institute should achieve a further increase here, as it has already done for the SAB (57%). In addition, the number of members from countries outside the German-speaking world should also be increased.

Currently, the chair of the *Scientific Advisory Board* is a full member of the *Supervisory Board*. According to the standards of the Leibniz Association, the chairperson of the SAB should only take part in the Supervisory Board in an advisory capacity. This should be changed and enshrined in the statutes accordingly.

5. Human resources

Research and scientific services

The MFO is managed by a director and a vice director. Since 2013, the director has been jointly appointed with the University of Tübingen and devotes 50% of his working time to the MFO. In April 2020, the position of the vice director was filled in a joint appointment with Technische Universität Darmstadt (TU Darmstadt). He also works part-time, devoting 20% of his working time to the MFO. The director will retire in 2028, and the vice director in 2029 at the latest. It is important that the *Supervisory Board* initiates succession procedures in good time. The directors are supported by a senior scientific administrator.

Science-supporting staff

Next to the three persons among the scientific staff (see above), there are six people working in the library, IT and other technical support roles. Three people work in administration. It is good to see that the head of administration is budget officer (*Haushaltsbeauftragte*). 23 people work in building services, housekeeping and other services for guests. The important work of the employees responsible for the infrastructure and for hosting the guests makes a considerable contribution to the MFO's international success.

It is commendable that the MFO has been successfully running apprenticeships for years and, since 2017, has also been offering an apprenticeship in the library for specialists in media and information services.

Because of the MFO's remote location, finding enough staff is very challenging. The *Supervisory Board* should continue to support the MFO in making the most of the small margin for manoeuvre allowed by the collective wage agreement (*Tarifvertrag*).

Equal opportunities and work-life balance

For information regarding the proportion of women among organisers and participants see chapter 3. It is welcomed, that the MFO has had a gender equality plan in place for staff and seminar guests since 2007. It received the *Total E-Quality* Certificate for employees and guests for the first time in 2014. Its certification was extended to incorporate diversity in October 2020, when it was awarded a Certificate for Equality and Diversity.

6. Cooperation and environment

The MFO has links to the University of Tübingen and TU Darmstadt through joint appointments to professorships. At **national level**, it also collaborates with several institutes within the Leibniz Association. There is a regular exchange of ideas and information with a second social infrastructure facility, the *Leibniz Center for Informatics* (LZI) in Wadern. Concerning the publications and the digital archive (see chapter 4), the MFO cooperates with the *Leibniz Information Centre for Science and Technology* (TIB) in Hannover. Furthermore, the MFO is connected to the *Weierstrass Institute for Applied Analysis and Stochastics* (WIAS) in Berlin, particularly through the MaRDI consortium. The

MFO participates in the *Leibniz Research Network for Mathematical Modelling and Simulation* and hosts summer schools of this network.

The MFO also has fruitful connections at **international level**. It is involved in important exchanges with the European mathematical research institutes in *ERCOM*, the *European Research Centres on Mathematics*. And it managed to realise new, attractive additions to its workshop and seminar programme in collaboration with the *Mathematical Research and Conference Center* in Bedlewo (Poland), the RIMS in Kyoto and the MatriX in Melbourne (see chapters 3 and 7). In addition, the MFO has joined a programme run by the *Centre International de Mathématiques Pures et Appliquées* (CIMPA) in Nice and the *International Center for Theoretical Physics* (ICTP) in Trieste to support guests from developing countries and enable them to stay at the MFO together with a European colleague.

7. MFO programme lines

7.1 Short-term research stays

The one-week, short-term research stays form the majority of the events at the MFO and, with 2,200 person-weeks planned, utilise about 75% of the institute's total capacity. Every year, the MFO organises 40 workshops (with about 50 participants each) and 12 mini-workshops (with about 16 participants each). In recent years, the MFO has again succeeded in attracting world-leading scientists as organisers and participants in this programme.

Selection takes place through a bottom-up process, with potential workshop organisers submitting proposals by July each year, so that the SC can make a decision at its annual meeting in October. The accepted workshops (acceptance rate approximately 50%) are scheduled for the year after next. Specific weeks are earmarked for the organisation of mini-workshops, which are announced in good time on the website. Proposals for these workshops can be submitted no later than six months before the planned weeks (acceptance rate approx. 40%). Since this format is intended to enable a timely response to recent developments, a decision on acceptance is made within approximately three weeks following the deadline.

In response to the pandemic, the MFO started developing *tandem workshops* (see chapter 3). Three such workshops have been held so far and the MFO is encouraged to continue these workshops and extend the program. In addition, *small collaborations* were tested. These were hybrid mini-workshops or seminars organised between the MFO and the home institution of the organisers. Because of the effort involved in these, and the limited exchange of ideas they generated, it is understandable that this format will not be continued.

The programme for short-term research stays is rated as 'excellent'.

7.2 Longer-term research stays

Groups of two to four scientists can apply to spend two to four weeks at the MFO to work on a specific research project, as part of the *Oberwolfach Research Fellows* (OWRF) programme. The fellowships are highly attractive and comprise 320 person-weeks (approx. 11% of the MFO's capacity). Applicants send proposals to the Vice Director of the MFO. A decision is

made by members of the SC from closely related disciplines within six weeks. The acceptance rate is 70%. Early-career researchers who come to Oberwolfach through the OWRP programme also have the opportunity to extend their stay to up to three months as *Oberwolfach Leibniz Fellows* (OWLF). The acceptance rate for this programme is 50%.

The programme for longer-term research stays has been successfully improved. Two previously separate programmes for longer stays have been merged in a convincing manner. The alignment speeds up the decision-making process. Moreover, the new programme allowed for greater flexibility in response to changing travel restrictions during the pandemic. Plans to maintain this format due to positive experiences are supported.

It is good to see that the MFO has joined a fellowship programme launched by CIMPA and ICTP (see chapter 6) aimed at researchers in mathematics who are based in a developing country, helping them come to Europe to collaborate with a colleague.

The programme for longer-term research stays is rated as ‘excellent’.

7.3 Training activities

The internationally renowned training activities comprise week-long events totalling 300 person-weeks (approx. 11% of the MFO’s capacity). They are divided into the *Oberwolfach Seminars*, which take place 6 times a year with 25 participants each, and three *Arbeitsgemeinschaften* with 50 participants each.

The *seminars* are targeted at PhD students and postdocs and aim to introduce the participants to a particular topic. Possible topics are suggested by the whole mathematical community. The SC decides on topics and possible organisers. Upcoming seminars are announced on the website and early-career researchers can apply. In addition to the regular programme, in 2019, the MFO established the *Banach Center – Oberwolfach Graduate Seminars (BOWS)*, which take place in Będlewo in Poland in collaboration with the *Institute of Mathematics (Banach Center)* in Warsaw. Two such seminars have been held so far.

The MFO’s highly regarded *Arbeitsgemeinschaften (AGs)* are aimed at early-career researchers as well as senior researchers. The aim is to investigate a new active topic guided by leading international experts. The high-profile coordinators (two of them currently Fields medallists), who are responsible for defining the topics and finding organisers, are appointed by the SC in collaboration with the Directors for a period of three years. The upcoming AGs are announced on the MFO’s website and are open for applications. The planning of an AG and selection of the participants from the applications received is done by the organisers. In 2020, a third AG was established with a focus on analytical and applied mathematics.

The programme for training activities is rated as ‘excellent’.

8. Handling of recommendations of the last external evaluation

The MFO has partially implemented the three recommendations made by the Leibniz Association Senate in 2017 (see Status Report, p. A-18–20). Concerning the recommendation on the proportion of women (recommendation 2), the success achieved should be continued.

The recommendation concerning the terms of office of the chairs of the *Scientific Committee* (recommendation 3) still applies and is now embedded in a wider perspective.

Appendix

1. Review Board

Chair (Member of the Leibniz Senate Evaluation Committee)

Hannah **Bast** Department of Computer Science,
University of Freiburg

Deputy Chair (Member of the Leibniz Senate Evaluation Committee)

Sabine **Gless** Faculty of Law, University of Basel

Reviewers

Maria **Axenovich** Institute of Algebra and Geometry,
Karlsruhe Institute of Technology

Alexander **Bockmayr** Chair of Mathematics in Life Sciences, Freie
Universität Berlin

Claudia **Czado** Department of Mathematics and Munich
Data Science Institute, Technical University
of Munich

Sandra **Di Rocco** Department of Mathematics, KTH Royal
Institute of Technology, Stockholm (SE)

Heike **Faßbender** Institute for Numerical Analysis,
Technische Universität Braunschweig

Pascal **Hubert** Centre International de Rencontres
Mathématiques, Marseille (FR)

Stefan **Müller-Stach** Institute of Mathematics, University of
Mainz

Graham **Niblo** School of Mathematical Sciences,
University of Southampton (GB)

Ozgur **Yilmaz** Pacific Institute for the
Mathematical Sciences, Vancouver (CA)

Representative of the federal government (Member of the Leibniz Senate Evaluation Committee)

Michael **Stötzel** Federal Ministry of Education and
Research, Bonn

Representative of the Länder governments (Member of the Leibniz Senate Evaluation Committee)

Babett **Gläser** Saxon State Ministry for Science, Culture
and Tourism, Dresden

16 November 2023

Annex C: Statement of the Institution on the Evaluation Report

Oberwolfach Research Institute for Mathematics, Oberwolfach (MFO)

The Mathematisches Forschungsinstitut Oberwolfach (MFO) is delighted by the evaluation report judging all three of its scientific program lines as excellent and welcomes the praise of the institute staff and leadership. The MFO wishes to thank the evaluation group, its guests, and the evaluation office of the Leibniz Association for conducting a thorough and professional evaluation.

The MFO is grateful that its efforts to increase women participation in workshops beyond the community average have been recognized by the evaluation group and accepts the challenge to stay at the forefront of efforts promoting gender equality and diversity. The MFO appreciates the recommendation to enhance the communication and documentation of scope and character of its scientific programs to internal and outside communities with a mission statement and a list of evaluation criteria. It will cooperate with the Scientific Advisory Board (SAB) to monitor more closely the aims and targets concerning participants and research fields (recommendations 1,3 and 4). To reach an even broader community, the MFO will ensure a timely renewal of organizing teams in workshop series and enable expressions of interest in workshop participation for researchers from all career stages on its website (recommendation 2).

The MFO will give careful consideration to the structural recommendations of the report in discussions with the SAB and the supporting society *Gesellschaft für Mathematische Forschung*. The advisory role of the chair of the SAB in the Administrative Council will be set down in the statutes (recommendation 6). In light of the excellent assessment in the evaluation report of the scientific accomplishments achieved in cooperation between the MFO and the Scientific Committee, it will be crucial to guard the independence and functionality of the Scientific Committee when modernizing the statutes of the MFO (*Gesellschaftsvertrag*) and of the Society for Mathematical Research (*Satzung*) in relation to term limits and appointment procedures. The success of the MFO certified in the evaluation substantially relies on its ability to attract the most outstanding international mathematicians to the Scientific Committee who offer their knowledge, experience and time voluntarily and without payment when guiding the scientific planning of the MFO and independently evaluating the numerous program proposals received each year (recommendation 5).

The institute is thankful to the MFO's SAB, the Scientific Committee and the Administrative Council that have provided excellent advice and guidance over the past reporting period. We are grateful to the institute's governing association "Gesellschaft für Mathematische Forschung", the "Oberwolfach Foundation" and "Friends of Oberwolfach", the state and federal funding agencies as well as external foundations for their continued strong support of the Mathematisches Forschungsinstitut Oberwolfach.