

28. November 2017

**Stellungnahme zum  
Leibniz-Institut für Arbeitsforschung  
an der Technischen Universität Dortmund (IfADo)**

**Inhaltsverzeichnis**

1. Beurteilung und Empfehlungen .....	2
2. Zur Stellungnahme des IfADo .....	4
3. Förderempfehlung .....	4

Anlage A: Darstellung

Anlage B: Bewertungsbericht

Anlage C: Ablehnung des Antrags des IfADo auf erneute Befassung der Bewertungsgruppe mit dem Bewertungsbericht

Anlage D: Stellungnahme der Einrichtung zum Bewertungsbericht

## Vorbemerkung

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

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 13. und 14. Februar 2017 das IfADo an der Technischen Universität Dortmund. Ihr stand eine vom IfADo 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). Ein Antrag des IfADo auf erneute Befassung der Bewertungsgruppe mit dem Bericht wurde abgelehnt (Anlage C). Das IfADo nahm zum Bewertungsbericht Stellung (Anlage D). Der Senat der Leibniz-Gemeinschaft verabschiedete am 28. November 2017 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 Leibniz-Institut für Arbeitsforschung an der TU Dortmund (IfADo) befasst sich mit den Herausforderungen moderner Arbeitsumwelten. Im Zentrum der Arbeiten stehen die Erforschung grundlegender Lebensfunktionen und -prozesse, die Einschätzung gesundheitlicher Risiken sowie die leistungs- und gesundheitsförderliche Gestaltung und Optimierung von Arbeitsaufgaben und Arbeitsumgebungen.

Das IfADo erbringt Leistungen von hoher wissenschaftlicher und praktischer Relevanz. Die **Arbeitsergebnisse** werden sehr gut publiziert und fließen in beachtlichem Umfang in Richtlinien und Regelwerke ein. Von besonderer Sichtbarkeit sind die Beiträge zur Ständigen DFG-Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe (MAK-Kommission). Im Einzelnen werden die zehn Arbeitseinheiten des IfADo einmal als „exzellent“, dreimal als „sehr gut bis exzellent“, fünfmal als „sehr gut“ und einmal als „gut bis sehr gut“ bewertet.

Empfehlungsgemäß wurde nach der letzten Evaluierung die Institutsatzung des IfADo reformiert und ein Strategieprozess durchgeführt. Mit der ruhestandsbedingten Neube-

---

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

setzung von Leitungspositionen nahm das Institut personelle, inhaltliche und organisatorische Weichenstellungen vor, die zu einer positiven **Weiterentwicklung** führten.

Das **Gesamtkonzept** des IfADo ist nunmehr auf eine sogenannte ‚Gehirn-Leber-Immunsystem‘-Achse ausgerichtet. Es werden die in Arbeitsumwelten zentralen psychologischen, neurobiologischen, ergonomischen, immunologischen und toxikologischen Faktoren sowie deren Wechselwirkungen untersucht. Daran anschließende Überlegungen, den Bereich der Datenerhebung und -analyse sowie die Systemmodellierung weiter zu stärken und dafür zusätzliche Mittel bei Bund und Ländern zu beantragen, sind überzeugend und sollten unter Beachtung der im Bewertungsbericht angeführten Hinweise weiterverfolgt werden. Dies würde auch zu einer weitergehenden Vertiefung der interdisziplinären Zusammenarbeit über die Abteilungen hinweg beitragen. Vor dem Hintergrund des demographischen Wandels bei der erwerbstätigen Bevölkerung könnte es lohnend sein, das Thema „Altern“ stärker als bisher zur Profilierung des Instituts zu nutzen. Geeignete Verbindungen innerhalb des Leibniz-Forschungsverbunds „Gesundes Altern“ sind bereits vorhanden. Zu klären ist, welche Rolle zukünftig biomechanischen Arbeiten, die eine lange, erfolgreiche Tradition am Institut haben, zukommen soll. Das IfADo sollte nach der Prüfung bzw. Umsetzung dieser Empfehlungen seine grundlegenden Ziele in einem prägnanten und gut kommunizierbaren *Mission statement* zusammenfassen.

Das IfADo arbeitet eng und erfolgreich mit der TU Dortmund zusammen. Die Verbindungen zur Ruhr-Universität Bochum wurden, wie bei der letzten Evaluierung empfohlen, gestärkt. Das Institut pflegt eine große Anzahl erfolgreicher wissenschaftlicher **Kooperationen**. Außerdem gelingt es ihm in hervorragender Weise, Partner aus dem nichtwissenschaftlichen Bereich, z.B. Behörden, Verbände und weitere Interessensvertretungen in seine Arbeiten einzubeziehen und Arbeitsergebnisse an diese zu vermitteln. Daraus resultiert eine insgesamt beachtliche Vernetzung im nationalen und internationalen Umfeld. Das Institut sollte prüfen, wie die Einwerbung von Drittmitteln der Industrie erhöht werden kann, selbstverständlich unter Berücksichtigung etwaiger Interessenskonflikte.

Die **Ausstattung** mit Mitteln der institutionellen Förderung ist zur Erfüllung seiner derzeitigen Aufgaben auskömmlich. Auch erzielte das Institut bei der Einwerbung von Drittmitteln gute Erfolge. In seinen Arbeitseinheiten verfügt es über beeindruckende wissenschaftsunterstützende Infrastrukturen.

Die Belegschaft des IfADo ist erfreulich international. Zur dynamischen **Personalentwicklung** hat sowohl die Flexibilisierung des Stellenplans als auch die Reduktion der unbefristeten Beschäftigungsverhältnisse beigetragen. Im technischen Bereich sollte das IfADo jedoch nach wie vor unbefristete Stellen für hoch spezialisiertes technisches Personal vorsehen. Ebenso wird empfohlen, die Verträge der Drittmittelbeschäftigten stärker an den Laufzeiten der bearbeiteten Projekte zu orientieren.

Wie empfohlen, hat das IfADo die Rahmenbedingungen und Strukturen zur Förderung des **wissenschaftlichen Nachwuchses** erheblich verbessert. Beim *Mentoring* sollten zukünftig auch Fragen der Karriereplanung im Anschluss an die Promotion stärker einbezogen werden. Mit der Einrichtung von sechs Nachwuchsgruppen hat das IfADo auch auf der Ebene der Förderung von Postdocs bemerkenswerte Fortschritte erzielt.

Zu verbessern ist nach wie vor die **Gleichstellung der Geschlechter**. Im Bereich der Promovierenden und des wissenschaftlichen Mittelbaus ist der Frauenanteil hoch. Auf der obersten wissenschaftlichen Leitungsebene ist jedoch keine Wissenschaftlerin vertreten.

Das IfADo spannt einen beeindruckenden Bogen von der Grundlagenforschung über anwendungsorientierte Arbeiten bis hin zu vielfältigen und sehr gut nachgefragten Beratungsleistungen. Die Kombination arbeitswissenschaftlicher, lebens- und verhaltenswissenschaftlicher Zugänge und Methoden ist in Europa singulär. Die Erfüllung der Aufgaben des IfADo ist in dieser Form an einer Hochschule nicht möglich. Eine Eingliederung des IfADo in eine Hochschule wird daher nicht empfohlen. Das IfADo erfüllt die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischen Interesse zu stellen sind.

## 2. Zur Stellungnahme des IfADo

Der Senat weist die Auffassung, eine Nachwuchsgruppe sei zu kritisch bewertet worden, ausdrücklich zurück. Das Institut setzt sich in der Stellungnahme zum Bewertungsbericht mit zwei Empfehlungen konstruktiv auseinander. Der Senat begrüßt die Ankündigung, dass so auch mit den übrigen Hinweisen im Bewertungsbericht verfahren werden soll.

## 3. Förderempfehlung

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

## Annex A: Status report

### Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo)

#### Contents

1. Structure, Tasks and Institutional Environment .....	A-2
2. General concept and profile.....	A-4
3. Subdivisions of IfADo.....	A-8
4. Collaboration and networking.....	A-16
5. Staff development and promotion of junior researchers.....	A-18
6. Quality assurance .....	A-20

#### Appendices:

Appendix 1: Organisational chart.....	A-25
Appendix 2: Publications.....	A-26
Appendix 3: Revenue and Expenditure .....	A-27
Appendix 4: Staff.....	A-28

## 1. Structure, Tasks and Institutional Environment

### Development and funding

IfADo was founded in 1912 as 'Kaiser-Wilhelm-Institute for Occupational Physiology' in Berlin. In 1929, the institute was relocated to Dortmund where it was continued as Max-Planck-Institute (MPI) in 1948. In 1969, it was split up into two independent institutes, the MPI for Molecular Physiology and the Institute for Occupational Physiology (IfADo). Joint funding by Federal and *Länder* governments commenced in 1977. In 2009, IfADo changed its name to Leibniz Research Centre for Working Environment and Human Factors.

IfADo was last evaluated in 2010. On the basis of the Senate's recommendations and a joint statement by the responsible departments at Federal and *Länder* level, in January 2011 the Joint Science Conference determined that IfADo still meets the requirements for joint funding.

Responsible department at *Länder* level: Ministry of Innovation, Science and Research of North Rhine-Westphalia

Responsible department at federal level: Federal Ministry of Labour and Social Affairs

### Mission and tasks

IfADo investigates the benefits and risks of modern work life on various levels, ranging from single cells to entire individuals and groups in their working environment. It conducts research into potentials and risks of modern labour on the basis of life and behavioural sciences. According to the Articles of Association, IfADo's research contributes to an adequate design of the working environment for the benefit and wellbeing of the working people as well as the maintenance and promotion of performance, health, and competitiveness.

### Research structure

Since 2015, IfADo is structured into **four scientific departments**: (1) Toxicology, (2) Immunology, (3) Ergonomics, and (4) Psychology & Neurosciences. Within the departments, work is conducted in **research groups, junior research groups** and **research topics**. In addition to that, collaborations between the research areas are supported and coordinated by **two networking groups**. Also, three **central units** provide and organise technical support (cf. organisational chart, appendix 1).

### Legal form and organisation

The legal entity of the institute is the 'Forschungsgesellschaft für Arbeitsphysiologie und Arbeitsschutz e. V.', a registered association with an approved non-profit status. Members of the association are representatives of twelve stakeholders.

IfADo's institutional boards are the Board of Directors, the Board of Trustees, the Scientific Advisory Board, and the General Meeting.

The **Board of Directors** (Vorstand) determines the scientific orientation and all organisational and financial matters of the institute in consultation with the Board of Trustees

and the Scientific Advisory Board. It reports to the General Meeting and the Board of Trustees. The Board of Directors consists of at least two but no more than five persons (currently: five). At least one and no more than four members use the designation “Scientific Director”, one member uses the designation “Commercial Director”. The Scientific Directors are selected by joint appointment with a university. The board members are appointed and dismissed by the Board of Trustees.

The **Board of Trustees** (Kuratorium) supervises all scientific, organisational and financial matters of the Association. It appoints the Commercial and Scientific Directors and the members of the Scientific Advisory Board.

The **Scientific Advisory Board** (Wissenschaftlicher Beirat) acts as advisor to the institute in all scientific matters and is tasked with the external quality control of the scientific work of the institute. It assesses the research results and the research plans of the institute and provides comments to the Board of Trustees.

The members of the Association hold an annual **General Meeting** (Mitgliederversammlung) in which they approve the programme budget as well as the research plan. The General Meeting also appoints the auditor of the Association to perform the annual audit of the cash assets and accounts.

### **National and international scientific environment**

According to the institute, there is no other research institution like IfADo with its focus on the working environment, using an interdisciplinary approach of life and behavioural sciences and combining applied and basic research. Several other research institutions directly supervised by ministries or within specific sections of national or European administrations address specific aspects of work related research, e.g. the Federal Institute for Occupational Safety and Health (*Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, BAuA, Dortmund/Berlin*), the Institute for Occupational Safety and Health of the German Social Accident Insurance (*Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung, IFA-DGUV, Sankt Augustin*), the Institute for Work and Health of the German Social Accident Insurance (*Institut für Arbeit und Gesundheit der Deutschen Gesetzlichen Unfallversicherung, IAG, Dresden*) and the Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (*Institut für Prävention und Arbeitsmedizin der Deutschen Gesetzlichen Unfallversicherung, Institut der Ruhr-Universität Bochum*). As the institute points out, the focus of the above-mentioned institutions fundamentally differs from IfADo, since they are primarily involved in statutory tasks directly commissioned by ministries or insurance associations. A main feature on IfADo’s own account is its specialisation to experimentally address interdisciplinary work life related basic and applied research questions.

On an international level, IfADo refers to institutes which have similar work life associated interests, such as the Finnish Institute of Occupational Health, (FIOH, Helsinki/Finland), the National Research Centre for the Working Environment (NRCWE, Copenhagen/Denmark), STAMI (*Statens arbeidsmiljøinstitutt, Oslo/Norway*), NIEHS (National Institute of Environmental Health Sciences, Research Triangle Park, NC/USA) or the National Institute for Occupational Safety and Health (NIOSH, Cincinnati, Ohio/USA). Some

of these are linked in international collaborations with IfADo, due to its status as a WHO Collaborating Centre for Occupational Health.

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

Research at IfADo aims to identify risks which lead to stress and disease at modern workplaces in order to provide recommendations for the improvement of work-related conditions. Hence, next to their scientific significance, IfADo considers the results of its research of high practical relevance at the national and international level. The institute states that, for example, test systems and recommendations have been internationally recognised and are used world-wide.

As the institute points out, its research mission requires an interdisciplinary approach with contributions from multiple disciplines usually dispersed over a number of university institutes and faculties. In bringing these disciplines together in one place, IfADo provides the research environment which is necessary to understand the multidimensional challenges of working life.

## **2. General concept and profile**

### **Development of the institution since the last evaluation**

Following its last evaluation in 2010, IfADo started a systematic strategy process over several working sessions with its scientists and the Scientific Advisory Board in order to adjust its research strategy with the goal to address current research demands in a proactive manner. Part of this process was stimulated by the retirement of two leading scientists (heads of the former Department of Psychology and the Department of Environmental Physiology).

In 2011, the Department of Immunology was established, and the Department of Psychology & Neurosciences in May 2015. The new department heads brought new research questions, adding immunological expertise as well as the expertise for the study of neuro-cognitive processes to the institute. Subsequently, new technologies were introduced, leading to additional central scientific services, e.g. cytometry, and the enhancement of the institute's methodological spectrum. Also, in its recent work, IfADo further strengthened systems modelling approaches in order to better understand the complex, time-resolved interplay among numerous components which determine behaviour, cognition, emotion, motivation or the balance of health and disease.

To enhance collaborative research between the institute's departments, IfADo established two networking groups in 2013. Also, four junior research groups were founded, two in 2013 and one in 2015 and 2016 each (for details see Chapter 3). In January 2015, the Department of Ergonomics was restructured thereby replacing former research groups by a more open and flexible platform (research topics). In the same year, the **Dortmund Vital Study** was initiated as an interdisciplinary longitudinal study on the various determinants of healthy ageing in the work-related context (see Chapter 3.9).



## Results

In the years 2013 to 2015 IfADo's staff issued a total of 123, 162 and 150 **publications**, respectively, most of these publications being articles in peer-reviewed journals (of which approx. 20 % were published in open access formats) and individual contributions to edited volumes (see appendix 2 for further details). IfADo states that basic research results are often published in journals with high visibility, such as PNAS, Journal of Hepatology, Hepatology, Current Biology, Neuropsychopharmacology and Journal of Neuroscience. Some results, as IfADo elaborates, have even been published in top-journals, such as Nature, Nature Neuroscience, Nature Genetics, Nature Communications, and Science. More specialised work with practical recommendations, such as derivation of occupational threshold values for chemicals or improved ergonomic principles of workplace environments appear on more specialised platforms, such as the Archives of Toxicology, Neurobiology of Aging, Ergonomics, Clinical Neurophysiology.

**Scientific consultancy:** IfADo scientists collaborate with different bodies of policy advice, including state and other regulatory agencies, e.g. the General Hazardous Substances Committee (AGS) or the MAK Commission – DFG Senate Commission on the Investigation of Health Hazards of Chemical Compounds – and the Medical Advisory Board of the Ministry of Labour and Social Affairs. IfADo has contributed to the re-evaluation as well as the establishment of new MAK values (maximum concentrations of chemicals at the workplace). Moreover, experimental IfADo studies of irritants were used for individual MAK values or served as model compounds for a whole group of chemicals. In the period 2013-2016, IfADo scientists were involved in the substantiation of approx. 80-90 MAK values. Furthermore, IfADo has contributed to the derivation and redefining of workers' compensation evaluation criteria. IfADo is also engaged in political consulting with published experts' opinions on evaluations of human health hazards such as bisphenol A, arsenic or uranium. Furthermore, it participated in events such as 'Leibniz im Landtag/Bundestag',

**Scientific services:** IfADo provides instrumentation and facilities for external researchers on a collaborative basis. Also, the institute performs specific research tasks for accident insurance institutions or other professional organisations.

IfADo considers the main focus of its **knowledge and technology transfer** in the provision of expert know-how. Examples given are courses in which either postgraduate students or experts from administration or regulatory bodies are trained in applied fields of IfADo's research, e.g. an Occupational Toxicology Course or courses on Alternative Testing Methods, Drug Metabolism and Toxicokinetics (three expert courses per year with approximately 30 participants per course). A series of guidelines, standards and normative technical reports have been compiled, aiming, as IfADo points out, to avoid occupational overload and evaluate health risks caused by physical exposure such as manual handling of materials, and work-related body positions or movements. IfADo also provides transfer of knowledge in terms of organisational counselling, workshops, and the development of leadership trainings to regional enterprises. Establishment of patents is not a central goal of IfADo, nevertheless, a patent for the treatment of hyperammonemia, a complication of many liver diseases, was granted in 2015. Two **spin off firms** were

founded in the field of the improvement of hearing aids in extreme deafness and training applications for older workers.

### **Academic events and public relations**

Between 2013 and 2015, IfADo organised 25 national and international conferences, symposia, and workshops as well as eight events for the general public. IfADo researchers were invited to give 19 keynote lectures.

The communication strategy of IfADo has four pillars: (i) press releases, (ii) online communication, (iii) events, and (iv) information material. The aim is to communicate the more application-oriented research to a wide public. In 2016, a re-launch of the institute's website was realised and social media channels were introduced (Facebook, Twitter). IfADo is engaged in public events with exhibits, lectures, and discussions, e.g. on the exhibition ship MS Wissenschaft, at the 'Dortmunder Wissenschaftstag', the 'Wissensnacht Ruhr', and the 'Girls' Day'. Moreover, the institute develops popular scientific information material such as posters, flyers, and brochures providing information for a broader audience, for example guidelines for computer oriented workplaces, health risks by chemicals in consumer products or working materials, or recommendations for teams of mixed ages at workplaces.

### **Strategic work planning for the next few years**

The strategic development since the last evaluation enables IfADo to address the working individual in a more holistic approach. For example: (i) Stress and ageing do not only affect the central nervous system, but also impact the immune system. (ii) Chemicals may lead to decreased expression of urea cycle enzymes and the resulting increased ammonia compromises cognitive functions. Therefore, the major goal of IfADo's future strategy is the modelling of the brain-liver-immune axis and to simulate the influence of workplace related factors.

Given the increasing relevance of the systems modelling approach for IfADo's work, the institute aims at the establishment of a **central unit 'Systems Modelling and Data Acquisition'** consisting of a sub-unit where systems modelling techniques are developed and of the instrumentation which is needed for the generation of the respective data that in the past could only be obtained by external cooperations. An essential component is magnetic resonance tomography allowing not only to obtain structural and functional activity data of the whole brain, but also to monitor concentration of neurotransmitters, and thus to explore the physiological foundation of work-related factors, which affect performance and cognition. This, as IfADo further elaborates, is relevant for the strategic work plan, because brain physiology is affected by the immune system and liver metabolism, and thus a core factor for understanding the brain-liver-immune axis. According to the institute, respective imaging data will be necessary for the envisaged systems modelling approach and functional imaging in humans will be accompanied by a research programme in mice, where interventions, such as knockouts and overexpression of factors of interest are possible, to better understand the phenomena observed in human. In order to achieve this goal, IfADo intends to apply for additional institutional funding via an

**‘extraordinary item of expenditure of a scientific-strategic nature’** (Sondertatbestand). This is supported by both, the institute’s Board of Trustees and its Scientific Advisory Board. In organisational terms, ‘Systems Modelling and Data Acquisition’ will represent a new central unit that aims to collaborate with all four Departments of IfADo and it is meant to strengthen interactions between experimental and modelling activities at the institute. According to IfADo, the new central unit will furthermore enhance the institute’s attractiveness for collaboration with external groups with complementary expertise.

For the implementation of the central unit ‘Systems Modelling and Data Acquisition’, IfADo estimates financial requirements totalling 15.7 M€ staggered over five years 2019-2023 (on average 3.1 M€ per year, including the institute’s contribution of 0.33 M€ from its core budget).

The Systems Modelling team (6 scientist positions; E13-E14) will cover expertise in the following disciplines:

- Bioinformatics and Data Mining (BDM)
- Functional and Structural Connectivity Analysis (FSCA)
- Physiologically-Based-Pharmacokinetic Modelling (PBPK)
- Spatio-Temporal modelling (STM)
- Signalling Networks and Metabolic Flux Modelling (SNMF)
- Epidemiology and Study Coordination (ESC)

The Data Acquisition team (6 scientists (E13-E14), 4 technicians (E6-E11)) will operate the following investments:

- a. Magnetic resonance imaging (planned acquisition in 2019, fMRI, 3,9 M€)
- b. Immuno-Endocrine Analytical Laboratory
  - i. Functional microscopy (planned acquisition in 2020: Medio CT scan, 0,87 M€; planned acquisition in 2021: continuum laser advanced imaging platform, 0,91 M€)
  - ii. Multi-parameter flow cytometry analysis platform (planned acquisition in 2020: 5-laser cytometer, 0,39 M€; laser microdissection device, 0,28 M€; planned acquisition in 2021: whole slide scanner, 0,19 M€)
  - iii. Sequencing and metabolite characterisation platform (planned acquisition in 2019: sequencer(NGS), 0,29 M€; bioanalyser, 0,03 M€; planned acquisition in 2020: mass spectrometer (LC-MS/MS), 0,52 M€; metabolic analyser (Seahorse), 0,13 M€; planned acquisition in 2021; multiplex immunoassay system (LUMINEX), 0,05 M€)
  - iv. Behavioural Simulation laboratory (planned acquisition in 2021: ergonomic simulator, 0,5 M€)

According to the institute, the increase in institutional funding after the completion of the central unit in 2023 will amount to 2.64 M€ per year.

## Appropriateness of facilities, equipment and staffing

In 2015, the **institutional funding** by federal and *Länder* governments totalled 10.6 M€ (see appendix 3); compared to the last evaluation in 2010, institutional funding rose by 3 M€ (2008: 7.6 M€).

IfADo's **third-party funding** contributed 2.3 M€ to its revenues in 2015; in the past three years (2013-2015) this averaged out at 22 % of IfADo's revenues (between 18 and 27 %). In the main, IfADo raised funds provided by Federal (BMBF) and *Länder* governments, the German Research Foundation (DFG), and the EU. Also, IfADo obtained funds in the competitive procedure of the Leibniz Association.

Following a recommendation of IfADo's last evaluation, the institute used part of its budgetary increases to strengthen its **investment budget**. Additionally, IfADo applied for several 'minor extraordinary items of expenditures of scientific-strategic nature' in order to improve its technical equipment and upgrade works. Since 2010 five of such items totalling 2.4 M€ were granted.

IfADo's **buildings** provide about 9,600 m<sup>2</sup> of space, with approx. 4,200 m<sup>2</sup> for the scientific area. The institute features modern laboratory space (including biosafety level 1 and 2 facilities), cell and tissue culture facilities, a radioactivity laboratory facility, a small mouse unit, brain stimulation, electroencephalography, virtual reality and behavioural simulation (e.g. 2 driving simulators) laboratories and a mechanical workshop to develop apparatuses and test environments.

**IT services** (EDP/Internet) are provided by a central service unit at IfADo, some in collaboration with the Technical University Dortmund.

## 3. Subdivisions of IfADo

### Department of Toxicology

The overall goal of IfADo's toxicology research is risk evaluation of chemicals based on precise knowledge of the molecular mechanisms that induce adverse effects. Bringing together one research group, one networking group, and two junior research groups, it aims to develop techniques and strategies for the identification of toxic compounds in working environments.

The department provides two central scientific services: 'Clinical Occupational Medicine' (ambulance, blood and tissue sampling, project coordination) and 'Analytical Chemistry' (metabolite analyses, analyses of genetic variants, expression analysis, isotope laboratory).

#### 3.1 Research Group Systems Toxicology

[19.1 FTE (50% third-party funded), thereof 8.54 FTE Research and scientific services, 2.5 FTE Doctoral candidates, and 8.06 FTE Service staff]

The research group develops and applies methods in systems biology to integrate data generated by the individual groups of the department into mathematical models. Based

on model simulations, responses at the molecular, cellular, and organ level can be predicted.

Major strategic developments during the past years include (i) the establishment of “virtual tissues”, with the possibility to perform “experiments in silico”, such as spatio-temporal models with the possibility to integrate metabolic pathways and signalling networks, (ii) state of the art techniques to analyse and model time-resolved genome-wide data, and (iii) two-photon based functional intravital imaging.

This led to new concepts on the mechanisms of action of hepatotoxic compounds, including control mechanisms of hyperammonemia, ductular reactions of the liver upon intoxication and cholestasis, analysis of the role of the small GTPase Rab 5, as well as the establishment of modelling strategies to quantitatively determine transcriptional networks of cell types and cell states. In applied research the group i.a. contributed to the prediction of hepatotoxicity (by identifying key biomarkers), the establishment of test systems for the development of neurotoxicity testing, and large international genome-wide association studies identifying fourteen genetic variants associated with increased bladder cancer risks.

Between 2013 and 2015 group members published 104 articles in peer-reviewed journals, 22 individual contributions to edited volumes, four articles in other journals as well as one monograph and one edited volume. 34 of these publications (total: 132) were co-authored with scientists from other groups of IfADo. On average, members of this research group raised third-party funds amounting to approx. 700 k€ per year; most of these funds were granted by Federal and *Länder* governments and the EU. In the same time, 20 doctoral degrees and one habilitation were completed.

Future plans include projects on modelling of the brain-liver-immune axis, the *in vitro* prediction of human hepatotoxicity and the modelling of hepatotoxicity and liver physiology. In conjunction with other groups of the department the group aims to tackle various projects contributing, e.g., functional imaging techniques, data and concepts, or tissues.

### **3.2 Junior Research Group Liver Toxicology**

[4.1 FTE (37% third-party funded), thereof 2 FTE Research and scientific services, 0.5 FTE Doctoral candidates, and 1.6 FTE Service staff]

The junior research group was established in 2013. It combines transcriptomics and bioinformatics for application on *in vivo* models of acute liver injury by hepatotoxic substances and in *in vitro* models of stem cell-derived hepatocytes.

Important achievements of the group include the establishment of models in hepatocyte plasticity applied for studying stem cell differentiation into hepatic-like cells. The discovery of WISP1 as a key hepatoprotective protein, in collaboration with the Department of Immunology, led to the investigation of its role in immune responses upon hepatotoxic injury. Furthermore, the group was involved in projects on the role of endoplasmic reticulum stress in liver pathophysiology and on stress signalling in neurodegeneration.

Between 2013 and 2015 group members published nine articles in peer-reviewed journals, as well as one individual contribution to an edited volume. All publications were co-authored with scientists from other groups of IfADo. On average, the junior research group raised third-party funds amounting to approx. 65 k€ per year; most of these funds were granted by Federal and *Länder* governments. In the same time, two doctoral degrees were completed. In 2016 an additional DFG project was obtained and starting in March 2017 the junior group will coordinate the BMBF network Stemnet.

In the next few years the group will focus, e.g., on the improvement of its *in vitro* systems of primary hepatocytes, on the characterisation of transcriptional profiles of gene networks in stem cell-derived hepatocyte-like cells (HLC), and the study of molecular markers representative of the molecular networks.

### 3.3 Junior Research Group Cellular Toxicology

[4.4 FTE (43% third-party funded), thereof 1.75 FTE Research and scientific services, 0.65 FTE Doctoral candidates, and 2 FTE Service staff]

The junior research group was established in January 2013 with the goal to obtain a better understanding of how cells respond to different types of stress. The group focuses on cellular metabolism and its alterations in several diseases as well as in response to cellular stressors. It also investigates occupational-related stress factors, such as exposure to toxic compounds and circadian misalignment due to shift-work.

The group's work on the role of lipid metabolism in connection with cancer and senescence led to the identification of previously uncharacterised enzymes. Further results include the collection of clinically-available patient datasets, and the establishment of *in vivo* and *in vitro* relevant models of fatty liver disease and cancer, as well as the generation and statistical analysis of transcriptomics data of these models for understanding cell behaviour at the transcriptional level.

Between 2013-2015 group members published fourteen articles in peer-reviewed journals, all co-authored with scientists from other groups from IfADo. On average, the junior research group raised third-party funds amounting to approx. 72 k€ per year from Federal and *Länder* governments. In the same time, four doctoral degrees were completed.

In the upcoming years the group will continue research on lipid and choline metabolisms. Furthermore, it will link changes in metabolism to cellular processes e.g. by characterising the role of key enzymes in tumour metastasis *in vivo*. In 2016, for these experiments, the group obtained third-party funding from DFG.

### 3.4 Networking group Neurotoxicology & Chemosensation

[8,71 FTE (40% third-party funded), thereof 5,5 FTE Research and scientific services, 0,5 FTE Doctoral candidates, and 2,71 FTE Service staff]

The networking group, which originated from the junior group Neurobehavioral Toxicology established in 2011, investigates interactions of chemicals in the working environment with the central and peripheral nervous system, including immunological reac-

tions resulting from chemicals that directly activate peripheral nerve fibres and thereby elicit sensory irritation.

Since its formation, the group developed and established experimental exposure studies (*in vivo* approach) that allow multi-level assessment of chemosensory effects in humans. In addition to concentration-dependent designs it conducted a series of experiments focussing on effects of repeated exposures, addressed various aspects of inter-individual differences, and also investigated combined effects of psychosocial stress and exposures to irritants. By using primary neuronal cell cultures and neurons derived from murine embryonic stem cells, the group developed cellular approaches towards a greater complexity and included functional endpoints associated with neurotransmission. Thereby, the mechanisms underlying neurotoxic and chemosensory effects could be investigated in more detail. The group contributed to national and international committees involved in the investigation of health hazards of chemical compounds in the work area (e.g. MAK-Commission, see chapter 2, scientific consultancy).

Between 2013 and 2015 group members published 20 articles in peer-reviewed journals as well as four individual contributions to edited volumes. Nine of these publications (total: 24) were co-authored with scientists from other groups of IfADo. On average, members of the group raised third-party funds amounting to approx. 290 k€ per year; most of these funds were granted by Federal and *Länder* governments and the German Social Accident Insurance (DGUV). In the same time, two doctoral degrees were completed.

The interaction of chemicals in the working environment with the nervous system will continue to be the central challenge of the networking group in the next few years. Accordingly, the group plans to intensify the investigation of relevant compounds by combining *in vivo* and *in vitro* approaches and also by extending collaborations in- and outside the institute.

### 3.5. Department of Immunology

[14.68 FTE (32% third-party funded), thereof 6 FTE Research and scientific services, 1.8 FTE Doctoral candidates, and 6.88 FTE Service staff]

The Department of Immunology investigates the molecular control mechanisms of immune cell functions and how they can be influenced by the working environment. It provides the central scientific service unit 'Cytometry', where FACS service (florescence-activated cell sorting) is provided for the entire institute.

The department was established in 2011 and started work in spring 2012. It is divided into a basic research programme (research topic 'Immunoregulation') and an applied research programme (research topic 'Immunomodulation'). In 2016, the junior research group 'Neuroimmunology' was established.

With the research topic 'Immunoregulation', the department aims to understand the regulation of human Natural Killer (NK) cells, focussing, e.g., on the examination of how the activity of these cells is regulated through signals by activating and inhibitory cell surface receptors. The group demonstrated the activity of NK cell receptors, e.g. 2B4, and

its implications for NK cell reactivity. Also, the group determined additional critical aspects for the function of activating and inhibitory NK cell receptors demonstrating the influence of pathogens on various surface receptors. Furthermore, studies on cellular cytotoxicity revealed the importance of CD107a, an integral membrane protein, for the protection of NK cells from their cytotoxic machinery.

With the research topic 'Immunomodulation', the department studies how the immune system is influenced by occupational-relevant factors which may affect the health of the working individual (e.g. stress, exposure to chemicals, ageing). The group targets the identification of relevant biomarkers that may indicate immune system's strength. For that purpose, it established technologies to measure immune parameters from blood samples. First results showed that emotional exhaustion correlates with higher pro-inflammatory cytokines and that the 'immunological age' independently of the chronological age may have an impact on cognitive performance.

Between 2013 and 2015 members of the department published 25 articles in peer-reviewed journals, ten individual contributions to edited volumes, one article in other journals as well as one monograph. Six of these publications (total: 47) were co-authored with scientists from other groups of IfADo. On average, the department raised third-party funds amounting to approx. 230 k€ per year; most of these funds were granted by the Leibniz Association (Senate's competitive procedure, SAW) and the German Research Foundation (DFG). In the same time, seven doctoral degrees were completed.

In its work planning for the next few years the department aims to combine its basic research with its applied research activities to explain the influence of work-related factors on the immune system on a molecular level. One important step in this direction was the establishment of the junior research group 'Neuroimmunology' in 2016, focusing on the influence of neurotransmitters (catecholamines) on immune cells.

### Department of Ergonomics

Cognitive aspects in man-machine environments and interactions of humans with modern technologies are the main research foci of the Department of Ergonomics. In January 2015, the department was re-structured to establish, as IfADo states, an open and flexible platform of research topics relevant for modern working environments. It now consists of three subdivisions and one networking group intended to cover questions of recent ergonomics from basic research to application.

The department facilitates the central unit "Future Lab" providing the possibility of workplace simulations, supporting the application of research topics in real world scenarios.

### **3.6 Subdivision Information Processing**

[8.91 FTE (22% third-party funded), thereof 2 FTE Research and scientific services, 1.65 FTE Doctoral candidates, and 5.26 FTE Service staff]



The subdivision investigates the prerequisites and mechanisms of conscious signal processing. Having integrated the former research groups 'Perceptual Cybernetics' and, partly, 'Individual Visual Performance', it now subsumes all basic research that relates to information uptake, temporary storage, and perception-action integration.

In the past few years the group established a cybernetic model for the investigation of competitive perception processes in the visual domain. Increasingly, the model was transferred towards applied studies, investigating the impact of external and internal factors on human information processing (healthy ageing, mental fatigue, sex, motivation, acute stress, organic solvents). In 2015, a **junior research group 'Working memory'** (Dr. Daniel Schneider) was established investigating the continuation of information processing after attentional selection. Research on eye movements in the context of information uptake was started.

Between 2013 and 2015 members of this subdivision published 21 articles in peer-reviewed journals, ten individual contributions to edited volumes, one article in other journals and also were responsible for editing one volume. Fourteen of these publications (total: 33) were co-authored with scientists from other groups of IfADo. On average, members of this research topic raised third-party funds amounting to approx. 80 k€ per year; most of these funds were granted by Federal and *Länder* governments and the German Research Foundation (DFG). In the same time, one doctoral degree was completed.

In the upcoming years the subdivision intends to include ocular and intentional behaviour to peripheral vision and to incorporate these topics in the department's eye movement research. Also, sensory-motor integration will become a main issue. The junior research group will focus on investigating the mechanisms involved in updating of visuospatial information in working memory.

### **3.7 Subdivision Human Machine Interaction**

[8.77 FTE (21% third-party funded) thereof 2 FTE Research and scientific services, 2.5 FTE Doctoral candidates, and 4.27 FTE Service staff]

The subdivision investigates cognitive functions, human information processing and performance in the context of technical environments using behavioural and neurophysiological methods. It was constituted by the former research group 'Modern Human Machine Systems' and – to some extent – 'Perceptual Cybernetics'. The common objective of the subdivision's research is to assess the user during the interaction with modern working environments and to understand to what extent he/she is supported or burdened by the environment. To this end, neurophysiological parameters were evaluated with respect to their transferability to working environments, e.g., possible electroencephalogram (EEG) markers for the estimation of user states. Results were integrated in the development of intelligent driver assistance systems, the development of a new kind of orthosis to assist patients with sensorimotor constraints in hand functions, or the development of methods to assess affective behaviour during the interaction with industrial robots.

Between 2013 and 2015 members of this subdivision published fourteen articles in peer-reviewed journals, 23 individual contributions to edited volumes, one monograph and also were responsible for editing one volume. 22 of these publications (total: 39) were co-authored with scientists from other groups of IfADo. On average, members of this subdivision raised third-party funds amounting to approx. 205 k€ per year; most of these funds were granted by Federal and *Länder* governments and the EU. In the same time, two doctoral degrees were completed.

In the upcoming years, research on human factors will be extended to measurements in real-life scenarios and recent technologies will be further integrated in order to apply work-place simulations to cognitive aspects of modern work.

### **3.8 Subdivision Designing Work**

[8.4 FTE (12% third-party funded), thereof 4 FTE Research and scientific services, and 4.4 FTE Service staff]

In continuation of the former research groups 'Biodynamic Work Design' and, partly, 'Individual Visual Performance' the subdivision addresses visual and biomechanical aspects of ergonomic research. Its work is based on individual physiological functions and includes computational modelling, laboratory and field measurements and leads to concrete practical outcomes, such as methods, rules and limits in legislative regulations, normative standards, and an internet based ergonomic consultation tool.

In the last few years, visual ergonomic research focussed on the condition of presbyopic computer users, i.e. the age-related decline of clear vision at near. For this purpose the group developed an integrated theoretical framework and new optometric test instrumentation. The focus of biomechanical ergonomic research has been changed considerably since the last evaluation, following recommendations and the retirement of leading scientists: The former movement-related research which was focused on the relation between manual handling or awkward postures in occupational life and the risk for low-back disorders has faded out. The group now investigates load, strain and risk for the total human musculoskeletal and partly also the cardiovascular system.

Between 2013 and 2015 members of the subdivision published 36 articles in peer-reviewed journals, 25 individual contributions to edited volumes, four monographs, four articles in other journals and also were responsible for editing four volumes. Six of these publications (total: 73) were co-authored with scientists from other groups of IfADo. On average, members of the subdivision raised third-party funds amounting to approx. 155 k€ per year; most of these funds were granted by the Occupational Health and Welfare Association (BGW), the German Social Accident Insurance (DGUV), and the German Research Foundation (DFG). In the same time, one doctoral degree was completed.

Due to the upcoming retirements of two principal investigators in 2017 and 2020, the subdivision will face further changes. The aim is to maintain established competence in physiological ergonomics. It is planned to include movement and posture analyses into the research portfolio focussing more strongly on office workers. Furthermore, a subsection that addresses cognitive ergonomics in the context of work design is developing.

### 3.9 Networking Group Aging

[10.82 FTE (24% third-party funded), thereof 4.89 FTE Research and scientific services, 1.15 FTE Doctoral candidates, and 4.78 FTE Service staff]

Using behavioural and neurophysiological methods, the group investigates work-relevant sensory and cognitive functions, their changes in middle and higher age, as well as underlying neural mechanisms and modulating factors. The work focuses on the consequences of age-related changes in working environments and in everyday life, on the development and evaluation of interventions to improve cognitive competences in older adults, and on work conditions suitable for older employees. In 2014/2015 a change in leadership took place due to the retirement of the group's former head.

An important goal of the networking group is to generate synergetic effects of IfADo's broad range of competences in ageing research. Examples are projects on genetic influences on executive cognitive functions (together with the Toxicology Department), a project on effects of stress and burnout on immunological parameters and their interplay with cognitive functions (together with the Immunology Department), and training interventions in combination with non-invasive brain stimulation (together with the Psychology & Neurosciences Department). In collaboration with other departments of IfADo, the group discovered a number of previously unknown modulating factors on healthy ageing.

Between 2013 and 2015 members of this group published 38 articles in peer-reviewed journals, 21 individual contributions to edited volumes, three monographs, and two articles in other journals and also were responsible for editing three volumes. 25 of these publications (total: 67) were co-authored with scientists from other groups of IfADo. On average, group members raised third-party funds amounting to approx. 490 k€ per year; most of these funds were granted by Federal and *Länder* governments and the German Research Foundation (DFG). In the same time, two doctoral degrees were completed.

In the near future, the 'Dortmund Vital Study', an interdisciplinary longitudinal study started in 2015, will play an important role in interconnecting IfADo's expertise in ageing research. Demographical, behavioural, neurophysiological, immunological, and biochemical data of a cohort of up to 800 younger, middle-aged, and older subjects will be gathered, which will allow to develop and evaluate hypotheses on the mechanisms of healthy ageing with particular focus on work-related human functions and interactions with work conditions. Follow-up measurements are intended to evaluate the progression of parameters across the life span. In addition to the 'Dortmund Vital Study', the group will focus on selected age-specific research topics, currently including mobility issues, speech comprehension, training and learning interventions for older employees.

### 3.10. Department of Psychology & Neurosciences research

[14.94 FTE (19% third-party funded), thereof 5 FTE Research and scientific services, 3.45 FTE Doctoral candidates, and 6.49 FTE Service staff]

The Department of Psychology & Neurosciences in its current form was established in 2015 with the department's new Scientific Director entering into office. It is currently

composed of two research groups, and a junior research group is envisaged to start in 2017.

The department explores the physiological foundation of work-related cognition, affect and behaviour. Its main interests encompass the association between brain physiology, psychological and behavioural processes, including the impact of work-related factors. While the research group 'Neuromodulation', substituting the former research group 'Sensimotor Functions', aims to elucidate mechanisms of physiological processes, such as neuroplasticity, cortical excitability, and functional connectivity, the research group 'Flexible Control of Behaviour' is focused on self-control mechanisms, including research on basic mechanisms, and application in work environments. The junior research group (to start in 2017) will focus on the field of extinction learning and pathological cognitions in psychiatric diseases.

Since 2015, the department has established new laboratories, including five laboratories fully equipped to conduct non-invasive brain stimulation, and two polysomnography units. The newly started projects encompass, e.g., the optimisation of non-invasive brain stimulation for induction of plasticity in the human brain, the impact of work-related neuromodulators on brain physiology, cognition and behaviour, physiological foundations of consciousness states, the exploration of the cerebral impact of cerebellar functions on blink reflexes, the investigation of eye-hand coordination during complex manual actions or the study of psychological mediators of aversive and beneficial effects of the increasing use of mobile communication devices in work-related contexts.

Between 2013 and 2015 members of the former and newly established department published 65 articles in peer-reviewed journals, 26 individual contributions to edited volumes, and one monograph. Nine of these publications (total: 92) were co-authored with scientists from other groups of IfADo. On average, members of the department raised third-party funds amounting to approx. 315 k€ per year; most of these funds were granted by the German Research Foundation (DFG). In the same time, five doctoral degrees and one habilitation were completed.

In future, the department's groups will investigate the physiological basis of learning and memory formation, i.e. neuroplasticity. Also, the groups will explore the physiological foundation of working memory, extinction learning, visuo-motor coordination, and consciousness states. Basic knowledge will be applied to explore the effect of work-relevant intrinsic and extrinsic factors, such as age, substance (ab-)use, distress, sleep deprivation, on physiology and performance. The department will also host the central unit 'Systems Modelling' (which is part of the minor extraordinary item of expenditure, c.f. chapter 2).

## 4. Collaboration and networking

### **Collaboration with universities**

IfADo collaborates with **Technical University Dortmund** which led to more than 60 mutual publications in peer reviewed journals since the last evaluation. IfADo makes its research facilities available to university scientists and, *vice versa*, IfADo has access to

various facilities there. All four Scientific Directors/department heads are jointly appointed professors at TU Dortmund.

In the past few years, IfADo states having strengthened collaborations with the **Ruhr University Bochum** (RUB) that include the use of its facilities, collaborative projects and IfADo's involvement in the International Graduate School of Neuroscience. Altogether, IfADo collaborates with more than 30 university institutes and clinics nationwide, including the neighbouring universities in Münster, Duisburg/Essen and Düsseldorf.

Together with partners from universities IfADo's scientists are involved in and coordinate large **collaborative research networks** such as the Virtual Liver Network (BMBF), its follow-up Systems Medicine of the Liver (BMBF), TRAIN-STIM (BMBF), INNOKAT I/II (BMBF), the German Center for Brain Simulation as well as UBIQUITOUS WORKING (Leibniz Association). They are active in academic teaching providing an average of almost 90 hours per semester.

### **Collaboration with other domestic and international institutions**

IfADo collaborates with 39 national and thirteen international university clinics, clinics, non-university research and service institutions. Local collaborations exist with the Leibniz Institute for Analytical Sciences (ISAS) which uses IfADo's facilities and provides expertise in proteomics and metabolomics technologies in return. Cooperations in the context of **Leibniz Association** exist with the German Institute for Adult Education – Leibniz Center for Lifelong Learning (DIE, Bonn), Leibniz Institute on Aging – Fritz Lipmann Institute (FLI, Jena, Leibniz Institute for Plasma Science and Technology (INP, Greifswald), and Leibniz Institute for Natural Product Research and Infection Biology – Hans Knöll Institut (HKI, Jena). Furthermore, IfADo participates in four Leibniz Research Alliances, 'Healthy Aging', 'Bioactive Compounds and Biotechnology', 'Nanosafety', and 'Medical Technology: Diagnosis, Monitoring and Therapy'.

In the period 2013-2016, IfADo participated in nine **EU projects** such as EU-ToxRisk (An integrated European 'Flagship' program driving mechanism-based toxicity testing and risk assessment for the 21<sup>st</sup> century), the EU FET project LUMINOUS, ESNATS (Embryonic Stem-cell based Novel Alternative Testing Strategies), and NOTOX (Large multi-scale modelling of long term toxic effects in organotypic cultures).

Between 2013 and 2015, IfADo has received eighteen **guests**, three of which stayed longer than three months. In the same period, altogether twelve scientists from IfADo stayed at research institutes abroad, among them one for longer than three months.

### **Other collaborations and networks**

IfADo researchers are involved in national and international **scientific societies** and their boards. A special interaction exists with the Society for Work Science (*Gesellschaft für Arbeitswissenschaft, GfA*). In their projects IfADo researchers collaborate with six national and six international **companies**, including Lufthansa, Evonik Industries, BASF and Audi AG.

## 5. Staff development and promotion of junior researchers

### Staff development and personnel structure

As of December 31, 2015, IfADo employed 177 people (143.5 fulltime equivalents), 75 out of which were scientists, 60 working in service position, 33 at administration and nine as trainees (see annex 4). Since the last evaluation the number of employees has increased only slightly (2008: 170 people – approx. 140 fulltime equivalents, 75 out of which were employed as scientific and/or leading personnel).

Since the last evaluation two department heads, the commercial director as well as two leading scientists have retired or left the institute. The newly appointed Scientific Directors of the Department of Immunology and the Department of Psychology & Neurosciences took office in 2011 and 2015 (joint procedures with TU Dortmund). In 2016, a new head of the administration was appointed. One of the vacant leading scientist positions was filled in accordance with the established tenure procedures at IfADo.

Beyond academic **training and qualification** IfADo offers development opportunities both for academic and non-academic staff, e.g. in in-house courses and seminars.

IfADo understands **diversity** as an appreciation of different traits of its employees. According to the framework for internationalisation, IfADo provides the requirements to comply with diversity rules. Within the reporting period 2013-2015, a total of 30 different nationalities were represented at IfADo.

### Promotion of gender equality

Since 2013, the IfADo gender equality concept has been applied on the basis of a cascade model. Thus, a ‘road map’ exists to compensate lower gender representation, considering job fluctuations, which includes target quotas for the scientific management level in the programme budget plan. Since 2014, quotas are also added for the technical and administrative level. In order to implement gender equality policies effectively, additional resources were made available and consolidated by institutional funding (e.g. for financing mentees for the Mentoring-Programme). In consultation with the Board of Directors, the equal opportunities officer and her deputy can be exempted from their regular duties in times of increased workload and can receive additional technical support.

Since the last evaluation, the **proportion of women** in research and scientific services has increased from 39% (2008) to 53 % in December 2015. Then, two out of four junior research group leaders were female (50 %); in postdoctoral as well as non-executive positions IfADo employed more female scientists than male (55-57 %), with three-fourths of doctoral candidates being women (see annex 4 for details). However, the four academic departments are headed by male Scientific Directors, even though for the succession of two of the four department heads active recruitment had led to application rates of women between 24 and 29 %. In 2016 a new Commercial Director took office; since then, the percentage of women in the Board of Directors is 20 %.

In 2010 IfADo received the ‘Total E-Quality Award’ and was recertified in 2014. Moreover, IfADo has developed a concept for **family-friendliness** introducing flexible working hours and working time sovereignty (in 2009), the establishment of a parent-child

office, and a cooperation agreement with an external service provider in order to further improve work conditions for families.

### **Promotion of junior researchers**

The **PhD programme** at IfADo currently consists of the following mandatory elements:

- An agreement between PhD student and supervisor(s) that regulates all formal elements of the interaction between them (organisational framework) following the career guidelines of the Leibniz Association.
- Discipline-specific colloquia and seminars (scientific training).
- Graduate programmes offered at the neighbouring universities, and appropriate support for the attendance of workshops or summer schools (academic embedment), e.g. the RUB Research School, the PhD programme at the Faculty for Chemistry and Chemical Biology at the TU Dortmund or the International Graduate School Neurosciences at Ruhr University Bochum. Altogether, doctoral candidates participated in seven graduate programmes/schools respectively.
- Courses in soft skills, that are mostly self-organised by the PhD students (skills training).

By the end of 2015, IfADo employed 25 doctoral candidates, 42 % of them with institutional support and 58 % third party funded. From 2013 to 2015, a total of 39 doctoral degrees were completed, as well as 21 academic degrees qualifying for doctoral work. Since the last evaluation, five employees completed their habilitation.

According to the institute, the support for **post-doctoral researchers** is comparable to the PhD-programme comprising various elements for career development, e.g. supervision by experienced scientists, meetings, the opportunity to contribute to academic teaching and to achieve postdoctoral lecture qualification (habilitation). In 2013, a group of postdocs organised additional courses to fit their needs. Since then, in-house workshops and junior leadership training together with ISAS – Leibniz Institute for Analytical Sciences have taken place. IfADo's **junior research groups** are funded for up to eight years; tenure is possible. Since 2010, six such groups were established (three of which were funded with external money) with one additional group about to start in 2017.

### **Vocational training for non-academic staff**

IfADo offers a total of ten positions for vocational training as Precision mechanic (1 position), Chemical laboratory technician (2), Commercial clerk/Office management (4), and as IT commercial clerk (1). Two Biology laboratory technicians are trained within a training alliance of four institutes in Dortmund. From 2013 to 2015, altogether nine qualifications were obtained.

## 6. Quality assurance

### Internal quality management

The **monthly institute colloquium** provides research groups a forum for discussion of work results achieved in the past year. Here, the presence of all scientists of the institute is obligatory. The colloquium's goal is to discuss quality, conceptual novelty and/or relevance for application of work presented as well as to identify possibilities for cooperation and synergies. Each colloquium is followed by a small-circle discussion of the presenting scientists and the Scientific Directors. This discussion focuses on the publication record and success of grant applications. Where necessary, support measures are taken. The meetings of **research group leaders**, aimed at fostering internal collaboration, take place once a month. **Scientific meetings** within the research departments take place at least once a week.

An important element of IfADo's rules on good scientific practice is correct documentation of data. Its quality is to be ensured on the department level. These activities are supported by an ombudsperson.

IfADo makes use of an internal research documentation system (PPM System) allowing the systematic monitoring of, e.g., publication and third party funds. The institute annually allocates 150 k€ of its budget to the research units (research groups, junior research groups and research topics) based on scientific performance of the previous year with half of the funds available being distributed based on scientific publications, 40 % based on acquired third-party funds and 10 % by considering completed academic qualification procedures.

### Quality management by the Scientific Advisory Board and Supervisory Board

The Scientific Advisory Board (SAB, see also chapter 1) meets annually for the duration of two days. Members of the SAB visit each individual research group to obtain an overview over recent results and research plans. Moreover, SAB members are involved in the review of publications and grant applications. Based on this information SAB members give recommendations and discuss them with the project leaders, leading scientists and Scientific Directors. This way, the scientific strategy process initiated after the last evaluation is continued. The board members report back to the SAB on the results that were obtained following SAB recommendations.

Approximately three years before the next external evaluation by the Leibniz Association's Senate the SAB conducts an 'audit' which is organised in a similar way as the Senate's evaluation.

### Implementation of recommendations from the last external evaluation

IfADo responded to the 12 recommendations of the last external evaluation (highlighted in italics, see also statement of the Senate of the Leibniz Association from 25th November 2010, pages B-3/B-5, in German) as follows:

- (1) *"It is recommended that the institute and its boards start a **systematic strategy process**. The goal of this process should be to define inclusion and exclusion criteria*



*about which questions will be addressed in the future basic and applied research programme. The institute is encouraged to put more effort in the development of its own and independent research program and it should be less driven by requests from outside.*

*The suggested strategic process should consider how the flexibility intended in the structure of project groups can be resurrected.*

*For the appointment of a successor for the professorship 'Occupational and Experimental Psychology' the institute currently aims to fill this position with a focus on 'Psychology: work and ageing'. This focus is plausible. However, the institute should make sure that in case such a new denomination there will still be sufficient expertise for 'experimental psychology' within the institute."*

According to IfADo, an ongoing and systematic strategy process was initiated and the results were discussed with the Scientific Advisory Board and the Board of Trustees which led to several changes within the institute (see Chapter 2): the Department of Immunology and the Department of Psychology & Neurosciences were established, the Department of Ergonomics was re-structured and in all departments junior research groups were established. In addition, new technical resources/methods were established (e.g. 'Future Lab', central scientific service 'Cytometry'). As IfADo points out, these developments resulted in an interdisciplinary, modern and flexible research structure with a bottom-up approach for new research questions.

For the professorship "Occupational and Experimental Psychology", the institute recruited a Medical Doctor and Psychologist with core interests and qualifications in human brain physiology, cognitive neuroscience, the motor system, and interventional neuromodulatory approaches, as well as aging research. The aim of this appointment was also to bridge the areas of specialisation of the different departments. In IfADo's opinion the department furthermore keeps its qualification with regard to Experimental Psychology within the research group Flexible Control of Behaviour

- (2) *"The **legal framework of the institute** is not convincing and needs reform. This legal reform should take into consideration the requirements of the Leibniz Association and of the state and federal funding bodies. The new rules should be clearly defined and enable an independent scientific development of the institute.*

*This reform should provide rules that give the institute's heads sole responsibility for finances and personnel, as it is expected for Leibniz Research Institutes. This requires that the composition of the Board of Directors needs to be re-defined.*

*According to the present rules, a Scientific Advisory Board can be formed at the institute, but is currently not mandatory. This has to be changed. To better define the responsibilities of the different boards within the association it is recommended that not the Board of Directors but the Board of Trustees appoints the members of the Scientific Advisory Board.*

*As required by the rules of the Leibniz Association, rights and obligations with respect to research- or research-political decisions with significant financial impact or with respect to the executive personnel need to be assigned to the Board of Trustees."*

As recommended, IfADo has reformed its bylaws in 2012.

- (3) *"The scientific results of the institute are of great interest for creating healthy workplaces and for the health of the working population. Therefore, the institute is encouraged to enhance its **visibility for the general public.**"*

Following the evaluation, a new communication strategy was set up, with a new web page, regular press releases, online communications, participation in public events and various information materials.

- (4) *"In order to make **collaborations with the neighbouring universities** more fruitful, the institute should follow novel paths that should be defined within the strategic process mentioned above. It could be discussed not only to intensify the collaboration with the Technical University Dortmund, but also to aim for more connections to neighbouring universities that dispose of a stronger presence in Psychology. This would also facilitate the accessibility of training opportunities for young scientists."*

As IfADo emphasises, it has continued its close collaboration with TU Dortmund. Also, the institute has intensified its collaboration with Ruhr University Bochum via joint projects and funding initiatives and participation in graduate programmes (see chapter 4).

- (5) *"The institute should make an effort to increase the **number of long-term stays of visiting scientists** at the institute and to increase the number of visits of its own scientists to (possibly foreign) research facilities."*

IfADo on its own account is involved in many international research activities. Hence, its workforce has become more and more diverse, currently representing 30 different countries. Particularly, as the institute further elaborates, the high number of EU projects led to a very active exchange of visiting scientists with the aim to learn new techniques or design joint experiments. Besides long-term stays also repeated short term visits represent a particularly efficient form of cooperation and knowledge exchange in its international cooperations.

- (6) *"Not only should the costs, but also performance data be available in a timely manner via the **cost-benefit calculation.** This should enable the institute to react more flexible to new developments by redirecting resources."*

A new computerised system was established at IfADo. This not only enables the institute to track its expenditure on a daily basis but also to efficiently track and document its performance in terms of publications, training of the next generation of scientists and the acquisition of third-party funds (see chapter 6).

- (7) *“It is welcomed that the funding agencies consider to provide more **flexibility in the spending rules**. It is recommended to establish the necessary rules quickly in order to support the institute in its strategic process.”*

These rules were implemented and IfADo welcomes the increased flexibility.

- (8) *“It is recommended that the funding bodies and the heads of the institute find ways and means to **increase the investment budget** of the institute.”*

IfADo points out, that it has not received an increase in its institutional budget for investments, but used general increases in budget to substantially enhance investments. Additionally, since the last evaluation, it has repeatedly received one time funding for special investments to modernise lab-space and to purchase expansive equipment (e.g. future lab, flow cytometry instruments, confocal two-photon microscope etc.). This led to a significant improvement of the investment backlog identified during the evaluation.

- (9) *“The institute should increase its efforts to compete for **doctoral students** and to improve and systematically structure the education, supervision and career planning as well as the funding of the doctoral students. In this respect a closer collaboration with neighbouring universities with a strong Psychology would be beneficial.”*

In 2010, IfADo implemented a PhD programme comprising various elements, i.a. an agreement between PhD student and supervisors and discipline-specific colloquia and seminars (see chapter 5). Also, doctoral candidates take part in various subject specific PhD programmes at neighbouring universities (see chapter 4). This is supplemented by further measures at IfADo such as skills training, seminars, mentoring programmes and career counselling. In addition, funding of PhD students and the number of PhD positions was increased. Two department heads became co-opted members of the psychological faculty of the Ruhr University Bochum (RUB), one of which is also member of the Graduate School Neuroscience of RUB. Collaborations were established and enhanced via a MERCUR project, including RUB, University of Duisburg-Essen and IfADo, and an application for a Collaborative Research Centre initiated by a scientist from RUB, for which IfADo anticipates the funding decision in May 2017.

- (10) *“The institute should more effectively utilise its potential for a **structured promotion of postdoctoral researchers**. It is recommended to use the strategic process to think about providing qualified postdoctoral researchers with the possibility to establish an **independent junior research group** that disposes of its own budget.”*

IfADo reformed its postdoctoral education and training programme which resulted in novel training and career development. Also, IfADo established several independent junior research groups for qualified postdoctoral researchers in all departments (see chapter 5).

- (11) *“It is recommended to further **increase the number of temporary contracts** for scientists funded by the institutional budget. The proportion of the institutional budget, which is dedicated to long-term fixed personnel costs, is currently too high. In order to execute decisions made in the strategic process, the proportion of long-term*

*fixed personnel resources should be decreased in favour of less long-term fixed personnel costs. In this respect the funding agencies should abolish the fixed staff appointment scheme (Stellenplan) as soon as possible.”*

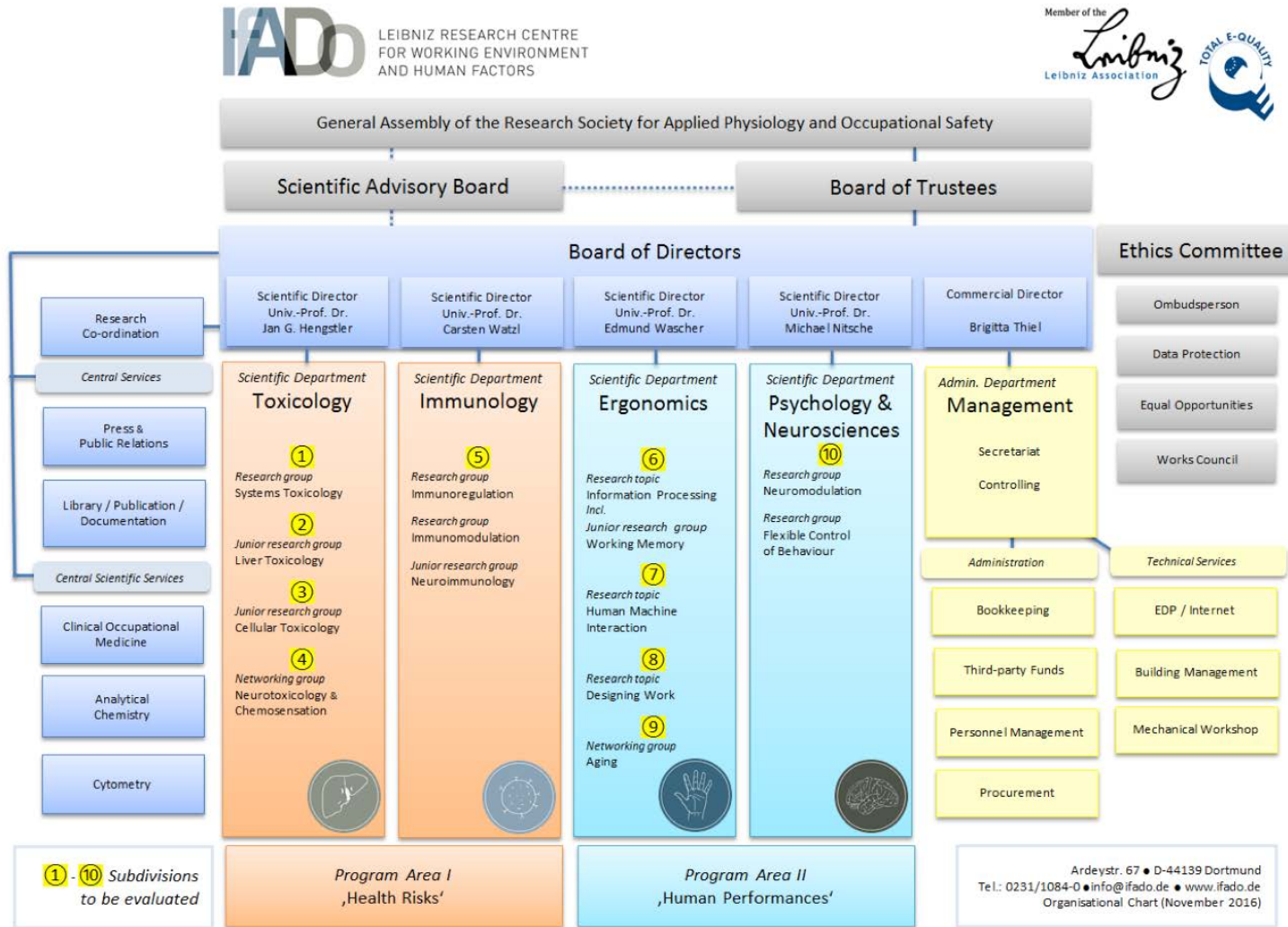
Since the last evaluation, permanent scientific positions are assigned only to highly qualified scientists or when special expertise needs to be secured or gained for the institute. Additionally, IfADo intensified its efforts in training and qualification of young scientists in order to help them to achieve scientific positions outside the institute. This, as IfADo points out, resulted in a steady decline of permanent positions for scientists and to an increase in temporary positions respectively (2010: 116 permanent contracts, 23 fixed-term contracts; 2015: 88 permanent contracts, 63 fixed-term contracts).

As of 2016, IfADo still has a binding staff appointment scheme (Stellenplan). However, according to the institute, the funding bodies introduced flexibility from 2017 onwards.

(12) *“The institute is encouraged to continue to pay special attention to the career-situations of **female scientists** and for the **special needs of parents**. It should not decrease its efforts to promote equal chances for men and women and to promote work-family balance.”*

IfADo states that it has intensified its efforts for equal opportunity employment and for improved work-family balance since the last evaluation (see chapter 5).

# Organisational Chart



## Appendix 2

## Publications and patents

	Period		
	2013	2014	2015
<b>Total number of publications</b>	<b>123</b>	<b>162</b>	<b>150</b>
Monographs	3	–	6
Individual contributions to edited volumes	26	54	39
Articles in peer-reviewed journals <sup>1)</sup>	88	103	97
Articles in other journals	5	2	3
Editorship of edited volumes	1	3	5

<b>Industrial property rights (2013-2015) <sup>2)</sup></b>	Granted	Registered
Patents	1	
Other industrial property rights		
Exploitation rights / licences (number)		

---

<sup>1</sup> Contributions that have been accepted for publication but not yet appeared are added in parenthesis.

<sup>2</sup> Concerning financial expenditures for revenues from patents, other industrial property rights and licences see Appendix 3.

## Appendix 3 Revenue and Expenditure

Revenue		2013			2014			2015 <sup>1)</sup>		
		K€	% <sup>2)</sup>	% <sup>3)</sup>	K€	% <sup>2)</sup>	% <sup>3)</sup>	K€	% <sup>2)</sup>	% <sup>3)</sup>
<b>Total revenue (sum of I, II. and III.; excluding DFG fees)</b>		13,206.9			12,725.3			13,102.2		
<b>I.</b>	<b>Revenue (sum of I.1., I.2. and I.3)</b>	13,111.4	100 %		12,564.0	100 %		12,890.3	100 %	
1.	<u>INSTITUTIONAL FUNDING (EXCLUDING CONSTRUCTION PROJECTS AND ACQUISITION OF PROPERTY)</u>	10,184.2	78 %		9,222.0 <sup>4)</sup>	73 %		10,565.3	82 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and <i>Länder</i> governments according to AV-WGL	10,184.2			9,222.0			10,565.3		
1.2	Institutional funding (excluding construction projects and acquisition of property) not received in accordance with AV-WGL	–			–			–		
2.	<u>REVENUE FROM PROJECT GRANTS</u>	2,927.2	22 %	100 %	3,342.0	27 %	100 %	2,325.0	18 %	100 %
2.1	DFG	568.7		19 %	708.0		21 %	417.5		18 %
2.2	Leibniz Association (competitive procedure)	62.1		2 %	157.3		5 %	229.6		10 %
2.3	Federal, <i>Länder</i> governments	1,299.2		44 %	1,637.8		49 %	1,372.3		59 %
2.4	EU	519.9		18 %	413.5		12 %	42.5		2 %
2.5	Industry	106.6		4 %	100.6		3 %	51.7		2 %
2.6	Foundations	5.7		0 %	4.8		0 %	–		–
2.7	other sponsors	365.0		12 %	320.0		10 %	211.4		9 %
3.	<u>REVENUE FROM SERVICES</u>	–	–		–	–		–	–	
3.1	Revenue from commissioned work	–			–			–		
3.2	Revenue from publications	–			–			–		
3.3	Revenue from exploitation of intellectual property for which the institution holds industrial property rights (patents, utility models etc.)	–			–			–		
3.4	Revenue from exploitation of intellectual property without industrial property rights	–			–			–		
<b>II.</b>	<b>Miscellaneous revenue</b> (e.g. membership fees, donations, rental income, funds drawn from reserves)	95.5			61.3			67.9		
<b>III.</b>	<b>Revenue for construction projects</b> (institutional funding by Federal and <i>Länder</i> governments, EU structural funds, etc.)	–			100.0			144.0		
<b>Expenditures</b>		<b>T€</b>			<b>T€</b>			<b>T€</b>		
<b>Expenditures (excluding DFG fees)</b>		12,925.4			12,576.5			12,362.4		
1.	Personnel	9,286.3			9,179.8			8,927.3		
2.	Material expenses	2,563.3			2,633.2			2,134.1		
2.1	<i>Proportion of these expenditures used for registering industrial property rights (patents, utility models etc.)</i>	–			–			–		
3.	Equipment investments	1,075.8			763.5			1,301.0		
4.	Construction projects, acquisition of property	–			–			–		
5.	Other operating expenses	–			–			–		
DFG fees (if paid for the institution – 2.5% of revenue from institutional funding)		250.5			244.9			252.2		

<sup>1)</sup> Preliminary data: no

<sup>2)</sup> Figures 1.1, 1.2 and 1.3 add up to 100 %. The information requested here is thus the percentage of "Institutional funding (excluding construction projects and acquisition of property)" in relation to "Revenue from project grants" and "Revenue from services".

<sup>3)</sup> Figures 1.2.1 to 1.2.7 add up to 100 %. The information requested here is thus the percentage of the various sources of "Revenue from project grants".

<sup>4)</sup> Due to pending investments and a staffing transition 850.0 k€ of the core budget were moved from 2014 to 2015 using the mechanism of self-management.

## Appendix 4

## Staff

(Basic financing and third-party funding / proportion of women (as of: 31 December 2015))

	Full time equivalents		Employees		Female employees	
	Total	on third-party funding	Total	on temporary contracts	Total	on temporary contracts
	Number	Percent	Number	Percent	Number	Percent
<b>Research and scientific services</b>	<b>59.88</b>	<b>33.9</b>	<b>75</b>	<b>77.3</b>	<b>40</b>	<b>95.0</b>
Professors / Direct. (C4, W3 or equivalent)	4.0	-	4	-	-	-
Academic staff in executive positions (A15, A16, E15 or equivalent)	8.0	-	8	-	-	-
Junior research group leaders (A13, A14, E13, E14 or equivalent)	3.75	-	4	100.0	2	100.0
Junior professors / post-doctoral fellows (C1, W1, A14, E14 or equivalent)	12.65	39.5	14	92.9	8	100.0
Scientists in non-executive positions (A13, A14, E13, E14 or equivalent)	16.23	43.1	20	80.0	11	81.8
Doctoral candidates (A13, E13, E13/2 or equivalent)	15.25	55.4	25	100.0	19	100.0
<b>Service positions</b>	<b>48.53</b>	<b>8.9</b>	<b>60</b>			
Laboratory (E9 to E12, upper-mid-level service)	3.9	-	5			
Laboratory (E5 to E8, mid-level service)	21.97	19.7	29			
Animal care (E5 to E8, mid-level service)	1.0	-	1			
Workshops (E5 to E8, mid-level service)	3.0	-	3			
Library (from E13, senior service)	0.5	-	1			
Library (E9 to E12, upper-mid-level service)	2.0	-	2			
Library (E5 to E8, mid-level service)	0.75	-	1			
Information technology - IT (E9 to E12, upper-mid-level service)	3.5	-	4			
Technical (large equipment, service) (E5 to E8, mid-level service)	11.9	-	14			
<b>Administration</b>	<b>26.09</b>	<b>-</b>	<b>33</b>			
Head of the administration	1.0	-	1			
Staff positions (from E13, senior service)	2.7	-	3			
Staff positions (E9 to E12, upper-mid-level service)	1.0	-	1			
Internal administration (financial administration, personell etc.) (from E13, senior service)	0.5	-	1			
Internal administration (financial administration, personell etc.) (E9 to E12, upper-mid-level service)	6.35	-	7			
Internal administration (financial administration, personell etc.) (E5 to E8, upper-mid-level service)	11.98	-	13			
Building service (E1 to E4)	2.55	-	7			
<b>Student assistants</b>	<b>9.97</b>	<b>22.2</b>	<b>29</b>			
<b>Trainees</b>	<b>9.0</b>	<b>-</b>	<b>9</b>			
<b>Scholarship recipients at the institution</b>	<b>1.0</b>	<b>100.0</b>	<b>1</b>		<b>1</b>	
Doctoral candidates	1.0	100.0	1		1	
Post-doctoral researchers	-	-	-		-	



## Annex B: Evaluation Report

Leibniz Research Centre for Working Environment and Human  
Factors (IfADo), Dortmund

### Contents

1. Summary and main recommendations .....	B-2
2. General concept and profile .....	B-3
3. Subdivisions of IfADo .....	B-6
4. Collaboration and networking.....	B-12
5. Staff development and promotion of junior researchers.....	B-13
6. Quality assurance .....	B-14

#### Appendix:

Members of review board and guests; Representatives of collaborative partners

## 1. Summary and main recommendations

The Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo) investigates potentials and risks of modern work. It focuses on fundamental life functions and processes, assessing health risks as well as designing and optimising working tasks and environments that promote both performance and well-being.

IfADo was last evaluated in 2010. Thanks to a strategy process and the reform of the institute's legal framework recommended at the time, it has continued to develop convincingly. It grasped the opportunity offered by retirement to use two of its four leadership positions to establish departments of immunology and neuroscience. As a result, IfADo is now able to analyse a raft of cognitive, psychological, neurobiological, immunological and toxicological factors in working environments, investigate their interactions and collate knowledge on human beings in their entirety. In recent years, the institute has increasingly used model simulations. The plans to strengthen data collection and systems modelling are welcomed.

Staff at the institute are active in both fundamental research, and consultancy and knowledge transfer. Their publication record is very good. They are involved in producing a large number of regulations and standards, in particular in the context of the MAK Commission. Furthermore, IfADo conducts widely-recognised consultancy for groups outside of science (such as insurances, industrial and trade associations). The institute is thus very visible and receives a great deal of recognition for its work. In this particular constellation, its combination of approaches and methods taken from the work, life and behavioural sciences is unique in Europe.

IfADo has proven very successful at acquiring third-party funding. Cooperation with university and non-university partners has been extended since the last evaluation. The institute has also made great strides in supervising junior researchers and its postdoctoral staff.

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

### General concept and profile (Chapter 2)

1. The institute intends to apply for additional funding from the Federation and the *Länder* ("Sondertatbestand", Category B1) to establish a Central Unit on Systems Modelling and Data Acquisition. The Review Board expressly endorses this proposal. In the context of the new unit, however, questions of sustainable data management and open access/open data must be considered to a greater extent than has been envisaged so far. Moreover, to implement the proposal it is mandatory that the relevant conditions are established in IfADo's IT structure.
2. The course that has been set in the last few years with regard to human resources, contents and organisation has generated potential that IfADo should exploit yet further in future. Above all, it should expand the strategic linkages across all its departments, which should also have implications for future staff recruitment.

3. IfADo should collate its strategic thinking in a mission statement to facilitate communicating its overarching goals.
4. IfADo's research groups produce diverse results that are of great practical relevance. However, this is not yet sufficiently reflected in collaboration with partners in industry, the volume of funding acquired from industry or the number of patents and licensing agreements.

#### Subdivisions of IfADo (Chapter 3)

5. IfADo is recommended to clarify the future strategic status of biomechanical ergonomics within the institute at the earliest opportunity. As part of a detailed analysis, the situation of biomechanical research elsewhere should also be considered (analysis of the scientific environment).

#### Staff development and promotion of junior researchers (Chapter 5)

6. The institute is recommended to align the contracts of positions financed by third-party funding more closely with the relevant project lifetime.
7. The institute should continue to maintain tenured positions for highly specialised technical staff. At the same time, it is recommended to offer additional in-service training opportunities to technicians to improve their professional eligibility for positions outside of IfADo.
8. IfADo must drive its efforts to promote female researchers in order to increase the proportion of women at leadership level. In the first instance, the institute should enhance its mentoring opportunities and take further steps to improve the situation.
9. With reference to supporting individual doctoral candidates' career, the institute should become more proactive in future.

#### Quality assurance (Chapter 6)

10. It is positive that the institute awards part of its financial support on the basis of performance-related funding. The criteria adopted for this purpose are transparent and generally accepted. In relation to the core budget, however, the funding distributed in this way (approx. 1.5 percent of the core budget) is too low and should be increased.

## **2. General concept and profile**

The Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo) investigates potentials and risks of modern work. It focuses on the health of the working population, and the design of working tasks and environments. The institute works on different system levels, from subcellular units and cells via organs to the working individual and her/his working environment, and employs a broad spectrum of methods deriving from both the life and behavioural sciences.

## Development of the institution since the last evaluation

Building on the recommendations made at the 2010 evaluation, IfADo embarked on a comprehensive strategy process which led to convincing structural, organisational and content-related developments. After reforming its legal framework, the responsibilities of the various bodies within the institute are now clearly regulated. In accordance with recommendations and in contrast to the previous situation, IfADo's leadership holds complete and sole responsibility for human resources and finances. It is pleasing that the institute's independent scientific development is now on a secure institutional footing.

The twelve former project groups were also reorganised to create four new departments. In addition, IfADo established its first junior research groups and networking groups, a step which has proven valuable (see Chapters 3 and 5).

Following the retirement of the heads of Occupational Medicine and Psychology, two of the four departments were given a new thematic focus. One of the positions was filled in 2011 (Department of Immunology), the other in 2015 (Department of Psychology and Neurosciences). In cooperation with TU Dortmund University two excellent appointments were made.

Given what is now the institute's broad interdisciplinary spectrum, IfADo is able to analyse the cognitive, psychological, neurobiological, immunological and toxicological factors in working environments, investigate their interactions and collate knowledge on human beings in their entirety. In doing so, it spans an impressive gamut from fundamental research via application-related work to diverse and highly sought-after consultancy services (see below). The institute derives new research questions from a constantly changing working environment and addresses them across research groups.

## Strategic work planning for the next few years

IfADo now has firm foundations for pushing ahead with its work, pursuing topics on a so-called brain-liver-immune axis and employing methods that focus strongly on systems modelling. The plans to establish a Central Unit for Systems Modelling and Data Acquisition with which IfADo wants to continue strengthening its in-house expertise in data collection, data analysis and modelling very appropriately build on substantive research achievements of the past (see Chapter 3).

It is a convincing strategy to supplement the area of data collection and analysis by technologies that allow additional parameters of significant relevance to differing working environments to be measured and assessed. Continuing to drive systems modelling is also convincing. Since the last evaluation, IfADo has already developed fundamental expertise in model simulation. Its intention to extend this field is a necessary prerequisite for enabling it to model and predict the impact of the complex, multivariate influences of various parameters on human beings in their entirety as well as on organs and cell functions. **The institute intends to apply for additional funding from the Federation and the Länder ("Sondertatbestand", Category B1, see Status Report, p. A-6f.) for this purpose. The Review Board expressly endorses this proposal. In the context of the new unit, however, questions of sustainable data management and open access/open data must be considered to a greater extent than has been envisaged so**

**far. Moreover, to implement the proposal it is mandatory that the relevant conditions are established in IfADo's IT structure.**

**The course that has been set in the last few years with regard to human resources, contents and organisation has generated potential that IfADo should exploit yet further in future. Above all, it should expand the strategic linkages across all its departments, which should also have implications for future staff recruitment.** One area in which IfADo might develop in general could involve applying toxicological efforts that currently concentrate on the liver to other organ systems. It may also be worthwhile to make greater use of Ageing as an overarching subject to enhance the institute's profile. Given the increasing age of the working population, there could be considerable potential here for linking up with international research and initiatives such as those of the WHO. **IfADo should collate its strategic thinking in a mission statement to facilitate communicating its overarching goals.**

## Results

Through its research, which targets different scientific as well as non-scientific audiences, IfADo enjoys a high degree of visibility and is seen as one of the key occupational research institutes in Europe.

IfADo's overall publication record is very good. Staff regularly publish in recognised journals representing the various disciplines at the institute. The large number of joint publications across research groups is also positive.

IfADo staff are, moreover, involved in research that generates an impressive number of regulations and standards, thanks both to publications and their activities on the relevant committees. IfADo's contributions to the DFG's Permanent Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK Commission) are especially relevant and visible (see Chapter 3). The institute successfully transfers knowledge derived from fundamental research to applications, e.g., in the context of defining chemical exposure limits in working environments or ergonomic recommendations for designing workplaces and working environments. With these activities, which reach as far as the legislature, IfADo staff conducts important, widely-recognised consultancy, for example for ministries, insurance providers, industrial and trade associations. There is great demand for the in-service training courses offered by the institute in occupational toxicology, toxicokinetics as well as alternative testing methods.

**IfADo's research groups produce diverse results that are of great practical relevance. However, this is not yet sufficiently reflected in collaboration with partners in industry, the volume of funding acquired from industry or the number of patents and licensing agreements.** For instance, IfADo could drive the development and marketing of innovative portable technologies.

As a consequence of organising scientific events and active public outreach, IfADo is now more visible than it was in the past. However, since its scientific topics are also of interest to broad sections of the public, its public outreach activities should be enhanced yet further.

## **Appropriateness of facilities, equipment, and staffing**

The provision of institutional funding is sufficient to enable IfADo to fulfil its current portfolio of tasks. Thanks to the annual growth agreed in the Joint Initiative for Research and Innovation, the core budget has increased since the last evaluation by approx. 38 percent from €7.6 million in 2008 to €10.5 in 2015.

IfADo used part of the additional funding to increase its investment budget, a measure the institute had been reminded to implement at the previous evaluation. It is pleasing that, over and beyond this, the funders have provided additional resources for investing in the building fabric and purchasing technical equipment. This has facilitated a significant improvement in technical facilities and equipment. In its core units IfADo has impressive science-supporting infrastructure.

IfADo has been successful in raising third-party funding. On average, it accounted for 22 percent of the institute's budget. Significant funding was acquired from the Federation (especially the BMBF), the DFG, the EU and in the Leibniz Competition. In addition, certain application-related units were very successful in acquiring funding from associations and other funders. Viewed in connection with the appointment of the two new heads of department, the prospects for increasing the amount of third-party funding yet further in future are very good.

## **3. Subdivisions of IfADo**

### **Department of Toxicology**

The primary objective of IfADo's toxicology research is chemical risk assessment based on elucidating the molecular mechanisms that induce adverse effects in the human body, especially the liver.

#### **3.1 Research Group Systems Toxicology**

[19.1 FTE, thereof 8.54 FTE Research and scientific services, 2.5 FTE Doctoral candidates, and 8.06 FTE Service staff]

The group investigates the effects of toxic substances using systems biology approaches. On the basis of model simulations, hypotheses on the functional mechanisms of chemicals on the molecular, cellular and organ levels are drawn up and tested.

The group's work covers an impressively broad spectrum of fundamental research questions as well as applied research, ranging from self-organisation principles in liver organelles through intercellular communication to toxicity predictions for certain chemicals in humans and OMICS-based tissue profiles. With its work, the group succeeds impressively to address problems at different scales, to combine them and to establish relationships. It thus focuses on highly relevant, topical themes which it tackles with great methodological expertise. Using the liver as the organ of investigation is a very productive way of making the connection between fundamental research and applications. The systems approach which was adopted after the last evaluation has proven its merit. It

has generated outstanding results which have turned the group into one of the leaders in the field it itself has significantly shaped.

The group publishes its results very well and also distinguishes itself by very considerable engagement in consultancy on issues such as risk assessment of chemicals in the working environment and hepatotoxicity. Special mention should be made of the group's high visibility both in applied liver research and fundamental research in toxicology. The head of the group is one of the most highly-cited toxicologists in Europe. The group is also remarkably successful in acquiring third-party funding, particularly from the Federation (BMBF), and the EU.

The group's performance is rated as "excellent".

### **3.2 Junior Research Group Liver Toxicology**

[4.1 FTE, thereof 2 FTE Research and scientific services, 0.5 FTE Doctoral candidates, and 1.6 FTE Service staff]

This junior research group, which was established in 2013, investigates how toxins impact on liver metabolism. It focuses on identifying the signalling pathways and gene network interactions induced by hepatotoxic substances.

Overall, the group has produced very convincing work which has benefitted greatly from the modelling work done in other groups. Its publication record is very good. The junior research group leader is scientifically very autonomous. His methodological expertise and technological know-how in imaging techniques are remarkable. Follow-up studies, including those on stem cell-derived hepatocytes or the role of the immune response to hepatotoxic damage, are innovative and very promising.

The junior research group has appropriate third-party funding income (BMBF) which was boosted by the successful acquisition of DFG funding in 2016. It also has manifold contacts to external partners.

The junior research group's performance is rated as "very good" with great potential for yet further improvement in future.

### **3.3 Junior Research Group Cellular Toxicology**

[4.4 FTE, thereof 1.75 FTE Research and scientific services, 0.65 FTE Doctoral candidates, and 2 FTE Service staff]

This junior research group, which was established in 2013, investigates how cells respond to different stressors, focusing on cellular metabolism with an emphasis on lipid and choline metabolism. Since it was founded, the group has been headed by two researchers who complement each other very well both in terms of methods and topics.

The research themes addressed are interesting. In particular, the group has managed to build important expertise in characterising cellular responses to different stressors. It has also produced revealing work on the connection between metabolism and cancer. Overall, however, the group tackles rather specific research themes within toxicology that are not easily aligned with others in IfADo. The group has good third-party funding income (BMBF) and publishes its work in the pertinent specialist journals.

It is recommended, however, that this work should lead more often to single first and last authorships; so far, it seems that in comparison with other junior research groups, this group operates less independently. While the two group leaders work very well together, IfADo should make efforts to ensure that both researchers achieve the independence they need for their continued professional development.

The junior research group's performance is rated as "good to very good".

### **3.4 Networking group Neurotoxicology & Chemosensation**

[8.71 FTE, thereof 5.5 FTE Research and scientific services, 0.5 FTE Doctoral candidates, and 2.71 FTE Service staff]

This networking group was set up in 2011 and investigates the effects of chemicals in the working environment on the functions and structure of the nervous system.

The establishment of this working group has proven worthwhile. It pools IfADo's neurotoxicological expertise and is particularly successful in the fields of applications and knowledge transfer. It is very adept at transferring the results of its risk assessment of chemicals in the workplace to the relevant occupational toxicology commissions, bodies as well as into rules and standards (e.g. the MAK Commission). As a result, the group enjoys an exceptionally high reputation and visibility.

This status is based on the group's innovative research on risk analysis of irritants and neurotoxins which has generated well-received publications, particularly in the field of (chemo)sensory studies. The group has also been successful in the further development of test systems that underpin these efforts, including cell modelling. It draws on a broad methodological repertoire and benefits from the expertise IfADo has accrued in systems modelling, which would be greatly enhanced by the planned reinforcement of this area. The networking group raised a considerable volume of third-party funding, not only from the Federation and the *Länder* but also from German Social Accident Insurance.

The networking group's performance is rated as "very good".

### **3.5. Department of Immunology**

[14.68 FTE, thereof 6 FTE Research and scientific services, 1.8 FTE Doctoral candidates, and 6.88 FTE Service staff]

This department, which was established in 2011 (see Chapter 2), focuses on fundamental and application-related investigations into molecular control mechanisms in immune cells, in particular innate immune cells.

In the research topic Immunoregulation the department seeks to understand how Natural Killer (NK) Cells function at molecular level. The group has produced excellent results in this area which have appeared in top journals. It relies on impressive technological platforms and uses methodological expertise as well as sophisticated model systems. The group is very visible in both the national and international community.

The research topic Immunomodulation addresses the impact of factors related to occupational physiology (e.g. stress, exposure to chemicals, age) on the immune system. This work, which forms a bridge between fundamental research and applications, is very in-



teresting and important but is still under development; hence, as yet, it falls somewhat short of the strong results achieved in the field of Immunoregulation. It is recommended to provide the group with more advanced equipment and technological platforms.

Since 2016, within the department one junior research group has been tackling neuro-immunological issues which is a very promising addition to the existing portfolio of topics and also links up well with other groups at IfADo. In order to fully exploit the junior research group's potential, however, it would be necessary to strengthen the department by the addition of an established neuroimmunology researcher.

The department has established itself very well since it was set up. The development of its scientific programme was well considered and has been continually augmented by interesting issues, leading to promising results. Also, the department has managed to acquire convincing third-party funding, amongst others from the DFG and in the Leibniz Competition. Research results have been very well published. Overall, the department has great potential which could be exploited to even greater effect in future by intensified collaboration with other groups at IfADo. The data on the immune system that are collected here and that can be applied to other fields, are a promising basis for further collaboration.

Overall, the department's performance is rated as "very good".

### Department of Ergonomics

This department was restructured in 2015 by reorganising the former project groups into three subdivisions. This process has proven its worth and already produced very visible results.

#### **3.6 Subdivision Information Processing**

[8.91 FTE, thereof 2 FTE Research and scientific services, 1.65 FTE Doctoral candidates, and 5.26 FTE Service staff]

This subdivision investigates the principles and limits of conscious information processing in humans. Apart from issues relating to information uptake, it addresses, amongst other things, how humans perceive visual information for action. The subdivision integrates the former research groups Perceptual Cybernetics and, in part, Individual Visual Performance. Since 2015, a junior research group has also been working on the neuronal principles underlying working memory.

The subdivision has conducted a host of very good, focused, fundamental investigations, producing results that are being successfully transferred to application contexts. At the same time, it managed to draw on application aspects derived from different working environments and work on them in sophisticated experimental set-ups. The results generated within this broad spectrum, such as its investigations of internal and external influences on human information processing and studies on cognitive fatigue, are highly visible and very well published both in the relevant specialist journals and in the context of recommendations. In future, the subdivision should, however, exploit its existing publication potential to an even greater extent. It is already recognised for its consultancy

services, for example in workplace design. It successfully acquired funding from the Federation and the *Länder* as well as from the DFG.

The subdivision's applied neurophysiological measurement techniques are highly developed. Also, it can resort to an impressive technical arsenal, particularly of mobile equipment for measuring parameters in the working environment, e. g. a portable electroencephalogram and eye/motion tracking systems.

The subdivision's performance is rated as "very good".

### **3.7 Subdivision Human Machine Interaction**

[8.77 FTE, thereof 2 FTE Research and scientific services, 2.5 FTE Doctoral candidates, and 4.27 FTE Service staff]

This subdivision studies cognitive functions and issues relating to information processing and performance in the context of new technical (working) environments. Amongst others, it focuses on factors which influence human performance in interaction with machines (human factors).

This subdivision is extremely productive and uses a broad spectrum of experimental and physiological approaches. Following on from previous efforts, it has managed to direct IfADo's occupational research towards new developments in the field of information technologies and their relevance for modern working environments, integrating new, dynamic approaches such as systems modelling. The subdivision's income from third-party funding is high, deriving, amongst others, from the Federation and the *Länder*, the DFG and other funders. Its publication record is very good. Furthermore, it is especially successful at transferring its research findings into applied occupational research contexts by helping to draw up regulations and comparable works, such as those on road safety related performance potential.

The subdivision's technical infrastructure is impressive, particularly in the field of portable instruments which allow continuous data acquisitions of various work-related parameters. These instruments, e.g. a mobile EEG (see above), are used in a wide range of contexts. In this way, the subdivision generates an excellent evidence base both for its own work as well as for other groups at IfADo.

The subdivision's performance is rated as "very good to excellent".

### **3.8 Subdivision Designing Work**

[8.4 FTE, thereof 4 FTE Research and scientific services, and 4.4 FTE Service staff]

This subdivision, which was created in 2015 by amalgamating the former project groups Biodynamic Work Design and, in part, Individual Visual Performance, addresses issues relating to visual, biomechanical and, more recently, also cognitive ergonomics.

The subdivision performs outstanding application-related work which has earned it a high reputation. The results of its very practical efforts have been very well translated into regulations and standards and adopted into legislation. The subdivision cooperates very convincingly with external partners, which is reflected in the volume of third-party income acquired from insurances and trade associations. It has also been very successful

in its DFG applications. The studies and concomitant recommendations, for example on good vision at work or back-friendly in-patient care, are extremely relevant to many people's everyday working lives.

The subdivision's performance is rated as "very good to excellent".

Currently, the subdivision is headed by two researchers who will retire in 2017 and 2020 respectively. It is plausible that the resources that will then become available should be used, in particular, to drive recently introduced research on neuroergonomics. That being said, the results of biomechanical research are of exceptional practical relevance, are underpinned by excellent facilities, and are one of IfADo's unique selling points. **IfADo is, therefore, recommended to clarify the future strategic status of biomechanical ergonomics within the institute at the earliest opportunity. As part of a detailed analysis, the situation of biomechanical research elsewhere should also be considered (analysis of the scientific environment).**

### 3.9 Networking Group Ageing

[10.82 FTE, thereof 4.89 FTE Research and scientific services, 1.15 FTE Doctoral candidates, and 4.78 FTE Service staff]

This networking group, which was established in 2013, employs behavioural and neurophysiological methods to investigate changes in the cognitive functions of people in mid-life and old age and their relevance for the work process. The group's work focuses on speech perception, mobility, and learning and training.

The group addresses issues that are of major relevance. It boasts great expertise in its field and can draw on a raft of widely-recognised studies produced by a previous project group. The work generates highly-visible publications and the group has managed to acquire substantial third-party funding income from many different funders, including the DFG and industry.

The networking group very successfully pools IfADo's existing expertise in ageing research. By developing the Dortmund Vital Study, a comprehensive longitudinal study set up in 2015, a seminal activity has been launched. In order to exploit its potential yet further, the institute is recommended to strengthen the networking group's epidemiological expertise.

The networking group's performance is rated as "very good".

### 3.10. Department of Psychology & Neurosciences research

[14.94 FTE, thereof 5 FTE Research and scientific services, 3.45 FTE Doctoral candidates, and 6.49 FTE Service staff]

The department addresses the cognitive challenges of modern working conditions as well as the relevant fundamental physiological and psychological determinants. Following on from this, it aims to identify enabling/disabling working conditions and to modify them so as to enhance performance, motivation and satisfaction.

The department was set up in 2015 when the outstandingly qualified Head of Department was appointed. The department has developed very well in the short time since

then. Moreover, the research questions addressed by the two research groups (determinants and modulators of neuroplasticity; fundamentals and mechanisms of cognitive and motor functions) fit very well with the topics under scrutiny at IfADo; there are many linkages which are already being very well utilised. Planning for future research activities is very convincing.

Partly thanks to the head of department's outstanding previous work, the department is already very visible. Its initial results are impressive and have generated excellent publications. Since it was established, the department has managed to acquire very substantial third-party funding, promising first-rate prospects for the future. The department would benefit greatly from the creation of a Central Unit Systems Modelling and Data Acquisition and especially from the procurement of a magnetic resonance scanner (MRI scanner, see also Chapter 2).

The department's performance is rated as "very good to excellent".

## 4. Collaboration and networking

### **Collaboration with universities**

IfADo cooperates closely and successfully with TU Dortmund University (TUD) as well as with other regional, national and international university partners. The heads of all four departments hold joint professorships with TUD. As recommended at the last evaluation, links with Ruhr-Universität Bochum (RUB) have been intensified, which has already had a very positive impact on training junior researchers. Two of the four professors are co-opted to RUB's Faculty of Psychology. Fruitful contacts exist both in the scientific sector and in the use of central technical infrastructure which have been strengthened since the two heads of department were appointed in 2011 and 2015 respectively. A remarkable number of joint publications has emerged from this closer collaboration.

IfADo staff are highly engaged in academic teaching with a wide range of activities. Together with its university partners, IfADo is involved in various networks, research initiatives and Collaborative Research Centres, in some cases as the lead partner, very effectively and visibly contributing the institute's expertise to these contexts. It is positive that further initiatives are foreseen and that the institute also plays an important role in TU Dortmund University's strategic planning.

### **Collaboration with other domestic and international institutions**

The institute cooperates successfully with a large number of non-university institutions, which has given rise to a remarkable network in the national and international community. This network could still be enhanced even further by hosting more long-term research visits as well as by more IfADo staff visiting other institutions. It is of fundamental importance to IfADo to involve non-academic partners in its work, such as authorities and public administrations, industry and trade associations and other interest groups, and to communicate its results to them. This the institute manages outstandingly. Furthermore, members of staff continually contribute to the MAK Commission and its ongoing work on setting up toxicological threshold values (see chapter 3).

IfADo cooperates with a number of Leibniz institutions and is involved in four Leibniz research alliances including Healthy Ageing and Health Technologies.

After successfully completing various EU joint research projects, which have now come to an end, IfADo should increase its efforts in this sector again.

## 5. Staff development and promotion of junior researchers

### Staff development and personnel structure

IfADo's staffing levels are appropriate. In terms of full-time equivalents, the number of staff has only increased marginally from 141.12 FTE at the last evaluation to 143.5 FTE in 2015. The fact that two of the four heads of department retired brought about significant changes in staffing; the institute managed to recruit two excellent successors. IfADo also established its first junior research groups (see below) and so-called networking groups, coping very efficiently with the respective processes. It is welcomed that the changes in personnel have also been used to increase the number of staff from abroad.

Since the last evaluation, IfADo has significantly increased the percentage of staff on fixed-term contracts. **The institute is recommended to align the contracts of positions financed by third-party funding more closely with the relevant project lifetime.**

In comparison with other international institutes IfADo has a large proportion of technical staff. Here too, an increasing number of fixed-term contracts have been concluded over the last few years, which is beginning to prove disadvantageous. **The institute should continue to maintain tenured positions for highly specialised technical staff. At the same time, it is recommended to offer additional in-service training opportunities to technicians to improve their professional eligibility for positions outside of IfADo.**

It is welcomed that the *Land* which hosts the institute abolished the previous staffing plan at the beginning of 2017, in accordance with recommendations, and introduced a more flexible staffing plan under collective agreements.

### Promotion of gender equality

It is positive that IfADo ascribes an important role to the work-family balance and equal opportunities in its strategic development. It received the Total E-quality Award in 2010 and 2014. In the area of Research and Scientific Services, the proportion of women grew from 39 percent in 2010 to 53 percent in 2015. Amongst doctoral candidates and mid-level scientific staff the percentage of women is high. At the time of the review board visit, two of the six junior research groups were also headed by women (in one case with two leaders, both female researchers). At the highest scientific leadership level (departments), however, there are no women. It is a pity that the institute did not manage, despite its best endeavours, to improve this situation when filling the two vacant scientific leadership positions. **IfADo must drive its efforts to promote female researchers in order to increase the proportion of women at leadership level. In the first**

**instance, the institute should enhance its mentoring opportunities and take further steps to improve the situation.**

### **Promotion of junior researchers**

IfADo now provides convincing opportunities for junior researchers to enhance their qualifications, which are concentrated in a well-structured programme. This improvement had been recommended at the last evaluation. Thanks to the elements that have been introduced since then, such as thesis committees, IfADo provides very good mentoring for doctoral candidates. It is also positive that many of these doctoral candidates now come from other countries. In this context, IfADo should provide more support for staff who wish to improve their German skills.

Very good connections exist to various graduate programmes and schools at the universities in Dortmund and Bochum. Thanks to IfADo staff being involved in academic teaching, the institute also manages to recruit qualified students as doctoral candidates. In comparison with the last evaluation, IfADo has significantly developed its mentoring activities in line with recommendations and nearly twice as many doctorates have been completed successfully. **With reference to supporting individual doctoral candidates' careers, the institute should become more proactive in future.** In toxicology, for example, IfADo should encourage those who do not wish to pursue an academic career to continue their training to become specialist toxicologists.

In promoting postdoctoral researchers, too, IfADo has made remarkable progress following the recommendations made at the last evaluation. Since then, three junior research groups have been established, funded by the institute, as well as a further three funded by the BMBF and the EU. An additional junior research group is due to be launched in 2017. This has proven to be a very effective tool. In a further positive development five members of staff completed their professorial qualifications (Habilitation) between 2013 and 2015.

### **Vocational training for non-academic staff**

IfADo distinguishes itself in its remarkable commitment to training non-scientific staff. It offers a total of ten traineeships both in administration and in the technical and laboratory sectors. Between 2013 and 2015, nine trainees successfully completed their apprenticeships.

## **6. Quality assurance**

### **Internal quality management**

IfADo employs various tools to guarantee the quality of its scientific activities. Apart from events at which its work is presented and discussed, it fosters communication structures which allow it to communicate not only the Directorate's decisions to the institute but also – vice versa – to pick up needs and ideas circulating amongst staff. Issues relating to ensuring good scientific practice are dealt with by a specifically elected ombudsperson.

**It is positive that the institute awards part of its financial support on the basis of performance-related funding. The criteria adopted for this purpose are transparent and generally accepted. In relation to the core budget, however, the funding distributed in this way (approx. 1.5 percent of the core budget) is too low and should be increased.**

### **Quality management by the Scientific Advisory Board**

The Scientific Advisory Board carries out its duties conscientiously and was actively involved in the institute's strategic development as recommended in 2010. Information sharing between the Board members, the Directorate and IfADo staff is good.

### **Implementation of recommendations from the last external evaluation**

IfADo has largely been successful in implementing the recommendations issued by the Senate of the Leibniz Association in 2010. The institute should, however, continue to observe the recommendation to increase the number of extended scientific visits. In order to enhance the percentage of women in leadership positions, IfADo must drive its efforts to promote female researchers. The institute is, moreover, still called upon to continue improving its public outreach.

## Appendix

### 1. Review Board

*Chair (Member of the Leibniz Senate Evaluation Committee)*

**Gisa Tiegs** Institute of Experimental Immunology and Hepatology, University Medical Center Hamburg-Eppendorf, Germany

*Deputy Chair (Member of the Leibniz Senate Evaluation Committee)*

**Hans Spada** Institute of Psychology, University of Freiburg, Germany

*Reviewers*

**Verity Joy Brown** School of Psychology and Neuroscience, University of St Andrews, Fife, Scotland, UK

**Barbara Deml** Institute of Human and Industrial Engineering (ifab), Karlsruhe Institute of Technology, Germany

**Martin Göttlicher** Institute of Molecular Toxicology and Pharmacology, Helmholtz Zentrum Munich, Germany

**Klaus Gramann** Biological Psychology and Neuroergonomics, Technische Universität Berlin, Germany

**Andrea Hartwig** Chair of Food Chemistry and Toxicology, Karlsruhe Institute of Technology, Germany

**Hans-Gustaf Ljunggren** Center for Infectious Medicine, Department of Medicine, Karolinska Institutet, Karolinska University Hospital Huddinge, Stockholm, Sweden

**Mike Martin** Division of Gerontopsychology and Gerontology, University of Zurich, Switzerland

**Michal Schwartz** Maurice and Ilse Katz Professorial Chair in Neuroimmunology, Department of Neurobiology, Weizmann Institute of Science, Rehovot, Israel

**Charlotte Stagg** Nuffield Department of Clinical Neurosciences, University of Oxford, UK

**Martin F. Wilks** Swiss Centre for Applied Human Toxicology, University of Basel, Switzerland

*Representative of the Federal Government*

absent with apologies

*Representative of the Länder Governments*

absent with apologies



## 2. Guests

### *Representative of the relevant Federal government department*

**Bettina Dolle** Federal Ministry of Labour and Social Affairs,  
Berlin

### *Representative of the relevant Land government department*

**Anke Ortmann-Gerhardt** Ministry for Innovation, Science and Research  
of the State of North Rhine-Westphalia, Düsseldorf

### *Representative of the Scientific Advisory Committee*

**Pablo Steinberg** Institute for Food Toxicology and Analytical  
Chemistry, University of Veterinary Medicine,  
Hannover

### *Representative of the Leibniz Association*

**Andreas Radbruch** German Rheumatism Research Centre (DRFZ),  
Berlin

### *Member of the advisory committee "Evaluation of the Leibniz evaluation procedure"*

**Werner Müller-Esterl** (chairman) Former president of Goethe University Frank-  
furt/Main

## 3. Representatives of collaborative partners (one-hour interview)

**Lars Adolph** Federal Institute for Occupational Safety and  
Health, Dortmund

**Nikolai Axmacher** Department of Neuropsychology, Ruhr-  
University Bochum

**Ursula Gather** Rector Technical University Dortmund

**Marcel Leist** Doerenkamp-Zbinden Chair of in-vitro  
Toxicology and Biomedicine/Alternatives to  
Animal Experimentation, University of Kon-  
stanz

**Manfred Schedlowski** Institute of Medical Psychology and Behav-  
ioural Immunobiology, Universitätsklinikum  
Essen

20 September 2017

**Annex C: Rejection of an application by IfADo for the Review Board  
to reappraise the evaluation report**

**Leibniz Research Centre for Working Environment and  
Human Factors, Dortmund (IfADo)**

## I.

Mit Schreiben vom 1. September 2017 macht das IfADo geltend, dass bei der Bewertung des Instituts Sachverhalte nicht berücksichtigt worden seien. Das IfADo verbindet dies mit Kritik an zwei Einschätzungen. Kritisiert wird, dass (a) die Leistungen der Nachwuchsgruppe „Cellular Toxicology“ besser seien als von der Bewertungsgruppe abschließend mit „gut bis sehr gut“ eingestuft und dass (b) eine Empfehlung in Bezug auf die Einwerbung von Fördermitteln der Industrie nicht stichhaltig sei. Das Institut bittet darum, die aus seiner Sicht nicht berücksichtigten Sachverhalte und seine Erläuterungen dazu in die Bewertung einzubeziehen und den Bewertungsbericht zu modifizieren.

## II.

Die „Grundsätze des Evaluierungsverfahrens des Senats der Leibniz-Gemeinschaft“ ermöglichen es den Leibniz-Einrichtungen, bei den Vorsitzenden des SAE eine erneute Befassung der Bewertungsgruppe mit dem Bewertungsbericht zu beantragen, falls sie die Grundsätze des Verfahrens verletzt oder einen erheblichen Mangel bei der Darlegung eines Sachverhalts im Bewertungsbericht sehen.

Die Vorsitzenden des SAE entscheiden gemeinsam mit den Vorsitzenden der Bewertungsgruppe und der bzw. dem Evaluierungsbeauftragten des Präsidiums der Leibniz-Gemeinschaft (im folgenden: „Prüfgruppe“) darüber, ob der Antrag zulässig und ggf. ob er begründet ist. Falls ein Antrag begründet ist, wird der Bewertungsbericht erneut mit der Bewertungsgruppe abgestimmt.

### III.a)

Die Prüfgruppe sieht es als zulässig an, dass das IfADo eine Befassung der Bewertungsgruppe beantragt hat.

Die Prüfgruppe sieht den Antrag jedoch nicht als begründet an. Weder wurden Grundsätze des Verfahrens verletzt noch besteht ein erheblicher Mangel bei der Darlegung von Sachverhalten im Bewertungsbericht.

Das IfADo kommt auf der Grundlage von Sachverhalten zu anderen Einschätzungen als die Bewertungsgruppe. Dies allein führt nicht zu einer erneuten Befassung der Bewertungsgruppe mit dem Bewertungsbericht. Dem IfADo steht es aber offen, seine Einschätzungen in der Institutsstellungnahme zum Bewertungsbericht darzulegen.

### III.b)

Im Folgenden werden die Hinweise des IfADo (kursiv) sowie die jeweiligen Prüfergebnisse im Einzelnen festgehalten:

**Junior group „Cellular Toxicology“****(1)**

*The group published novel cellular mechanisms in high-impact journals, including PNAS (IF:9.7), Cancer Res (IF:9.1), Clin Cancer Res (IF:9.619), Nucleic Acids Research (IF:10.2), and J Hepatol (IF:11.0).*

*The publications of the group have been well cited, also compared to the other evaluated units (Table 1 of the attached letter).*

Die Publikationsleistungen der seit 2013 bestehenden Nachwuchsgruppe waren der Bewertungsgruppe bekannt und wurden bei der Bewertung der Gruppe in gleicher Weise wie bei den übrigen Gruppen des Instituts berücksichtigt.

Dabei wurden auch Arbeiten zu „novel cellular mechanisms“ einbezogen, die die beiden Leiterinnen in den Jahren zuvor erbracht hatten, u. a. die als „revealing“ gewürdigten Arbeiten zur Verbindung von Krebs und Metabolismus, die im Rahmen der Nachwuchsgruppe weiter vertieft wurden.

**(2)**

*The research themes of the group are well aligned with the other groups, as documented by 17 conjoint publications with the heads of other evaluation units (Table 3). The group has approx. 1 Mio third party funding; the DFG project of the junior group has not been considered in the evaluation report.*

a) Angaben zu den gruppenübergreifenden Publikationen der Nachwuchsgruppe waren der Bewertungsgruppe bekannt und wurden bei der Bewertung der Gruppe berücksichtigt.

Diese Arbeiten sind allerdings gemeinsam mit wissenschaftlichen Gruppen des vom Institutsdirektor geleiteten Departments „Toxikologie“ erstellt worden. Der Institutsdirektor war an nahezu allen diesen Publikationen beteiligt.

b) Die Drittmittelinwerbungen der Nachwuchsgruppe waren der Bewertungsgruppe bekannt und wurden bei der Bewertung der Gruppe berücksichtigt.

Dies betrifft auch ein Projekt, das 2016 bei der DFG eingeworben wurde (vgl. Darstellung, S. A-10). Dieses Vorhaben wurde federführend vom Institutsdirektor eingeworben. Eine der beiden Leiterinnen der Nachwuchsgruppe zeichnete als Mitverantwortliche (vgl. DFG-Datenbank „Gepris“).

Die Bewertung der Drittmittel-Einwerbungen der Gruppe im Bewertungsbericht war insgesamt gesehen positiv.

**(3)**

*The group has the lowest institutional funding and 40% of the positions are funded by external grants. This rate is clearly above average (Table 2).*

Die Angaben zur Gruppengröße waren der Bewertungsgruppe bekannt und wurden bei der Bewertung der Gruppe berücksichtigt.

**(4)**

*A publication of one of the group leaders (Cadenas et al., Cell Cycle. 2014; 13(20):3282-91) was awarded by the Society of Toxicology (GT) price 2015.*

Die Information zur Verleihung des GT-Toxicology-Preis im Jahr 2015 war der Bewertungsgruppe bekannt und wurde bei der Bewertung der Gruppe berücksichtigt.

Der Preis wurde aber laut Homepage der Deutschen Gesellschaft für experimentelle und klinische Pharmakologie und Toxikologie e. V. (DGPT) dem Institutsdirektor verliehen, der als Letztautor der ausgezeichneten Publikation fungierte.

**(5)**

*CellTox is the only evaluated group in our institute headed by women. According to the objectifiable parameters summarized in Tables 1 and 2 the groups performs similar to or better than most other groups who obtained better evaluation scores. Because of our obligation to guarantee gender equality, it is our duty to report this case. We are sure that this is the result of a misunderstanding that will be adjusted as soon as the facts are made available to the reviewers responsible for the CellTox group (details and tables: see attached letter of the CellTox group). The directors of IfADo are pleased with the performance of the CellTox group and will guarantee that the work of the two researchers will be continued as independent groups in future.*

Die oben genannten Ausführungen zu den Punkten (1) bis (4) zeigen, dass alle relevanten Sachverhalte einbezogen wurden.

Die Vermutung des IfADo, dass die Nachwuchsgruppe aufgrund der Leitung durch zwei Wissenschaftlerinnen anders bewertet wurde als Gruppen unter der Leitung von Wissenschaftlern weist die Prüfgruppe entschieden zurück. Die Planung des IfADo, die Arbeiten in einer oder in zwei unabhängigen Gruppen unter Leitung der beiden Nachwuchswissenschaftlerinnen weiterzuführen, stehen im Einklang mit der Bewertung.

**Status as independent experts**

*It would be appreciated, if the following recommendation could be modified: "IfADo's research groups produce diverse results that are of great practical relevance. However, this is not yet sufficiently reflected in collaboration with partners in industry, the volume of funding acquired from industry or the number of patents and licensing agreements." (page B-3 and similarly page B-5)*

*Members of our institute participate in several committees that are involved in the decision making and establishment of regulations and standards, for example risk evaluation of chemicals produced by industry. If we then accept funding from industry as recommended by the reviewers, we would lose our status as independent experts and would no longer be allowed to work in regulatory commissions. The sources of our grants are thoroughly monitored, including by journalists, and are debated publicly as illustrated by the links given below. Similarly, acquiring patents and licensing agreements that we subsequently sell to industry would compromise our status as independent ex-*

*perts. In contrast, there are no objections against collaborating with partners in industry, as long as there are no payments, funding, or favors involved.*

Der Sachverhalt, dass Wissenschaftlerinnen und Wissenschaftler des IfADo als Experten in Beratungs- und Regulierungsgremien tätig sind, war der Bewertungsgruppe bekannt und wurde bei der Bewertung berücksichtigt.

Im Bewertungsbericht wird die Tätigkeit in Beratungs- und Regulierungsgremien positiv gewürdigt (S. B-5, S. B-8 und B-12). Im Bewertungsbericht wird davon ausgegangen, dass es möglich ist, solche unabhängigen Tätigkeiten wahrzunehmen und gleichzeitig Förderungen von Unternehmen einzuwerben, ohne dass dies zwangsläufig zu Interessenkonflikten führen muss.

12 October 2017

**Annex D: Statement of the Institution on the Evaluation Report**

**Leibniz Research Centre for Working Environment and  
Human Factors, Dortmund (IfADo)**

Wir danken allen Gutachtern und Mitgliedern der Bewertungsgruppe für die Evaluation unseres Instituts. Wir freuen uns über die positive Einschätzung unserer Arbeit und die sehr gute bis exzellente Bewertung unserer Leistungen, auch wenn wir es als unsere Pflicht ansehen, den Empfehlungen der Bewertungsgruppe in den in unserer Erwiderung aufgeführten Aspekten zu widersprechen. Aufgrund objektivierbarer Kriterien wie Publikation in hochrangigen Journalen und Drittmittelinwerbung sind wir der Meinung, dass die Juniorgruppe Cellular Toxicology eine bessere Bewertung verdient hätte. Die Empfehlung, die Einwerbung von Mitteln aus der Industrie zu steigern, wird das IfADo mit dem wissenschaftlichen Beirat und dem Kuratorium diskutieren. Das IfADo muss in diesen Fragen besonders vorsichtig agieren, um Interessenskonflikte und Schwierigkeiten in Hinblick auf die rechtliche Würdigung des Vereinszwecks, z.B. Besteuerung, EU-Beihilferecht, zu vermeiden. Da wir an der Festsetzung von Grenzwerten für toxische Substanzen und Richtlinien für Arbeitsplätze beteiligt sind, könnte es unserer Glaubwürdigkeit schaden, wenn wir Mittel von Unternehmen annehmen, für welche diese Richtlinien gelten sollen (siehe auch unsere Erwiderung: [www.ifado.de / evaluierung](http://www.ifado.de/evaluierung)).

Besonders wichtig für die weitere positive Entwicklung des Instituts ist die Tatsache, dass der beantragte Sondertatbestand mit Nachdruck zur Förderung empfohlen wurde. Die Hinweise in Bezug auf Datenmanagement und IT-Infrastruktur haben wir bereits in den Antrag für den Sondertatbestand aufgenommen. Wir werden gemeinsam mit dem Wissenschaftlichen Beirat und dem Kuratorium beraten, wie die Empfehlungen umgesetzt werden können, um die positive Entwicklung des Instituts weiter voranzutreiben.