

Minutes of the 5th Annual Community Meeting of



on 2 - 4 July 2014 in Fulda

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Attendees

Nariman Ansari	Sergiy Avilov	Dominik Bisinger
Jasmin Breymayer	Gertrude Bunt	Steffen Dietzel
Hans Fried	Hella Hartmann	Peter Hemmerich
Antje Keppler	Thomas Korte	Christian Kukat
Christian Liebig	Peter March	Elisa May
Roland Nitschke	Ralf Palmisano	Jan Peychl
Nicole Rebscher	Jürgen Reymann	Sandra Ritz
Astrid Schauss	Anje Sporbart	Stefan Terjung
Achim Tieftrunk	Nadine Utz	Stefanie Weidtkamp-Peters
Werner Zuschratter		

1 “Introduction, Status Quo, and Perspective of German BioImaging” by Elisa May,

2 July 2014, 1.00 - 2.15 pm

After a short round of introductions of all participants, Elisa May gave a short overview about the history of German BioImaging (GerBI) and a status report on its activities during the last year.

1.1 Web Page, Number of Participants of the Annual Community Meeting, of Registered Facilities, of Imaging Facility Users represented by GerBI, and of Mailing List Subscribers

Since the first meeting in 2010, the total number of participants at the GerBI Annual Community Meeting has varied between 53 and 25. The number of participants working in an imaging facility remained relatively constant. 112 interested scientists have subscribed to the GerBI-mailing list. Since its launch in 2011, the number of imaging facilities and research groups registered on the German BioImaging web page has increased and is now 55. The facility form was upgraded in summer 2013 and included a distinction made between canonical facilities, microscopy research groups and sites operating as both research group and facility. 25 facilities have updated their facility page since the facility form upgrade and provide information about their number of users per year. In total, the registered GerBI core facilities represent around 2500 users. Facilities are encouraged to register on the GerBI web page and to keep the information updated as this page is frequently visited also by funding agencies.

“News from German BioImaging” were regularly circulated via the *GerBI-mailinglist* to inform about news and activities of interest for German light microscopists. As discussed during the 4th Annual Community Meeting, the *Event Calendar* contains a separate calendar for *Courses* in addition to *Conferences*. All registered users of the web page can add events to both calendars and a tutorial on the GerBI *Help* page explains how to do this. Companies who like to add an imaging or image processing course can contact Nadine Utz. The sidebar menu was extended by the topics *Training*, *Useful Information*, and *Hotline*.

1.2 Educational Programme

GerBI has hired *hfp consulting* to develop and conduct a 3.5 day workshop which focuses on the specific demands of core facility managers. Facility managers do not only need technical and scientific knowledge, but leading and interacting skills as well. As management of the finances of a core facility (CF) is more complex than the management of a single DFG project,

budgeting is also part of the course. The trainers have backgrounds in educational sciences and business administration, but also experience in the life sciences. For preparing the *GerBI Core Facility Management Course for Imaging Specialists*, the trainer team of *hfp consulting* together with GerBI representatives analysed the special career paths and working environments of imaging CF leaders. In addition, cost models of different CFs were discussed with the purpose of including into the course also financial and administrative aspects. A first course took place in October 2013 and received an excellent evaluation result. The second course took place on 23-27 June 2014 and a third course is planned for 2015. The course is highly subsidized by GerBI via its DFG funding. Christian Kukat reported on his experience as a course participant on Friday morning (see section 13).

A *Job Shadowing* and *One Place for GerBI* Programme was launched as decided at last year's meeting. The *Job Shadowing* Initiative fosters the interaction between facilities and promotes visits of CF staff members to other CFs to learn more about the operation procedures of facilities, teaching activities of CFs, or specific imaging or image processing techniques. The *One Place for GerBI* Initiative enables interested scientists to take part in a training course provided by CFs or research groups outside their own institution. German BioImaging serves as a platform to bring together *Job Shadowing* hosts and guests, *One Place for GerBI* course providers and applicants, and offers also travel grants. Gertrude Bunt gave a report on her experience as a *Job Shadowing* guest on Thursday morning (see section 7).

A survey was published by the work group *Staff Training* to find out the needs of the community for courses organized together with microscope manufacturers (*GerBI-Industry Courses*). The issues most widely mentioned were maintenance and troubleshooting, advanced software, and cleaning of microscopes and optical components. A first *Leica-GerBI Course* took place on May 6, 2014, a *Zeiss course* is planned in autumn 2014. Companies have been interested in GerBI from the very beginning. The *GerBI-Industry Courses* and the invitation of representatives of microscope companies to the *Panel Discussion* of this meeting helped to foster contact between the GerBI community and industry.

1.3 GerBI-Hotline

At the last Annual Community Meeting it was decided to offer a *Hotline* for scientists and facility managers where they can report about problems in financing the repair and maintenance of equipment. Facility managers experience sometimes difficulties in gathering funds for repairs and updates or upgrades of their instruments. When applying for a new instrument, the home department or institution typically states that repair costs and main-

tenance are taken care of. But there is a gap between what is experienced in the facilities and what is communicated to the funders. To improve the situation, GerBI wants to collect concrete cases so that there is a fact based evidence for this situation. This topic was elaborated by Roland Nitschke in the article “Großgeräte und das liebe Geld” which appeared in the February issue of the *Laborjournal*. The participants were encouraged to call the GerBI project manager (+49 (0)7531 88-5337) when experiencing such difficulties. The information will be handled confidentially and the cases will be kept anonymous.

1.4 Image Analysis Software Overview

The *Image Analysis* WG revised their web page and included detailed descriptions of image analysis software packages. By introducing basic image analysis tasks (based on the results of last year’s Image Analysis Survey) the fundamental image analysis functionalities of each of the software packages are described step by step (see section 3.6).

1.5 Best Practice Manual

The results of the work of German BioImaging shall be published in an article with the working title *GerBI Best Practice Manual for how to set up and run an imaging facility*. Further details and a discussion took place on Thursday morning (see section 4).

1.6 Conferences and Meetings

At last year’s conferences and meetings, great interest was shown for the GerBI Educational Programme.

- Nadine Utz was invited on behalf of Stefan Terjung to the meeting of the Euro-BioImaging *Workpackage Training* in Prague on 22-23 October 2013 to present the “Training Strategy of German BioImaging”. Amongst other topics, Nadine Utz reported on the experience with the *GerBI Core Facility Management Course for Imaging Specialists*. This is of interest to Euro-BioImaging which plans to include a Facility Managers Course in the Euro-BioImaging training portfolio. The Euro-BioImaging *Workpackage Training* proposed to implement an exchange programme for Euro-BioImaging Node staff on the blueprint of the *GerBI Job Shadowing Programme*.
- The Euro-BioImaging Stakeholder meeting on 26-27 November 2013 in Heidelberg was attended by Elisa May, Roland Nitschke, and Nadine Utz to represent the German bioimaging community. Antje Keppler presented the latest developments of Euro-BioImaging on Friday morning (see section 10).

- Nadine Utz attended the Royal Microscopy Society Facility Managers Meeting on 6-7 January 2014 in Leeds to intensify contact to other imaging communities.
- Nadine Utz was invited to present the German BioImaging training strategy at the Core Facility Session of the *ELMI* meeting which took place from 20 till 23 May 2014 in Oslo.
- The Core Technologies in Life Sciences (CTLS) Congress on 2-5 June 2014 was attended by Nadine Utz (see section 11). She was invited to give a presentation about “National networking within Germany” at the satellite meeting “Working in and networking between microscopy and cytometry bioimaging core facilities”.
- A GerBI Workgroup Speakers and Steering Committee meeting took place on 27-28 November 2014 in Heidelberg. Discussed topics included a status report and the GerBI long term goals, the Status Quo of each workgroup (WG) was presented, and it was discussed how the *GerBI Best Practice Manual* can be realized.
- The GerBI Steering Committee Meeting took place on 28 November 2013 in Heidelberg. Topics included the follow-up proposal to DFG if a *Call for Core Facilities and Networks* will be launched, the planning of the 5th Annual Community Meeting, and the *GerBI Core Facility Management Course*. It was decided to hold a second course, and discussed if the target group of the *GerBI Core Facility Management Course* shall be expanded. The minutes of both the Steering Committee Meeting and the Workgroup Speakers and Steering Committee Meeting are published on the GerBI web page.

1.7 Networking with other Communities

GerBI is in close contact with *ELMI*, also through Stefan Terjung who is member of the Steering Committee of both GerBI and *ELMI*. Nadine Utz attended the meeting of *CTLS*, who is planning to found an association (see section 11). GerBI is also in contact with the *RMS*. Peter March gave a presentation on Friday (see section 12). Members of the *Deutsche Gesellschaft für Elektronenmikroskopie* attended the 3rd GerBI Annual Community Meeting and were involved in GerBI workgroups.

1.8 Perspectives of German BioImaging

The German biological and medical imaging communities submitted a proposal named German Euro-BioImaging (GEBI) for a distributed and coordinated national infrastructure for advanced imaging technologies to the

German Federal Ministry of Research and Education. This application delineated the inclusion of Euro-BioImaging into the German National Roadmap for Research Infrastructures. In the evaluation report of the German Council of Science and Humanities (Wissenschaftsrat) in April 2013, GEBI received an excellent evaluation result. Nonetheless, the BMBF did not include GEBI in the German Roadmap for Research Infrastructures. Presently, the DFG is in contact with the BMBF concerning this issue, and more information was given on Thursday by Achim Tieftrunk (see section 6).

German BioImaging is funded by DFG until June 2015 and a proposal for a second funding period will be filed if a follow-up *Call for Core Facilities and Networks* will be opened by DFG. The main goal of a second funding period shall be to transform German BioImaging into a self-sustaining organization. To this end, legal advice will be sought to identify the best legal form for the network (Fachgesellschaft, Verein e.V., Genossenschaft, ...). At this point, GerBI will need to raise membership fees and support from industry.

1.9 Workgroup Breakout Session

Elisa May gave a short overview of the six GerBI WGs so that those participants who are not part of a workgroup could decide which breakout session they would like to attend. As an example for the enthusiasm and great spirit of the WGs, a picture of the *User Training* WG was shown, on which WG members were discussing teaching modules late at night during the *ELMI* meeting.

2 “Workgroup Breakout Sessions”, 2 July 2014, 2.15 - 3.30 pm and 4.00 - 5.00 pm

Workgroup 1, joint WGs 2 and 3, joint WGs 4 and 5, and WG 6 met in breakout rooms to elaborate on their projects. They reported about their breakout session in the subsequent session.

3 “Report, Recap, and Aims of Workgroups”, 2 July 2014, 5.00 - 6.30 pm and 3 July 2014, 9.00 - 10.30 am

3.1 “WG 1 *How to set up and run a biological imaging facility*” by Roland Nitschke

During the breakout session, which was attended by many newcomers, Roland Nitschke gave first an update about the work undertaken so far. No missing points of the WG 1 agenda were identified by the participants.

Workgroup 1 will contribute to most topics of the planned *GerBI Best Practice Manual*, i.e. *Starting a Facility*, *Facility Design*, *Construction and Operation*, and partially *Keeping a Facility up-to-date*. The WG had collected a list of publications which covers these topics, and identified together with the Workgroup Speakers and the Steering Committee what information is missing, what is outdated, and which are new developments. Superresolution techniques have not yet been covered as well as booking software. A list of the existing literature can be published on the GerBI web page, but most of the journals are not available at most research institutions. Interested participants can contact Roland Nitschke to receive more information about the existing literature. Participants who are in the process of starting or just started a facility were asked to contribute their experiences to the topic *Starting a Facility* and to contact Roland Nitschke.

The question was raised by participants if an “official” number for the instrument/staff ratio and user/staff ratio exists. This is the case for other disciplines like the caretaker/animal ratio for central animal facilities. It might also be important to distinguish between technicians and scientific staff. For light microscopy, it is unlikely that the ratio will be laid down by law as is the case for animal facilities, but recommendations can be given. It was decided to collect this information from the facilities present at this meeting. Participants shall include the instrument/staff and user/staff ratio in the list which distinguishes between “high end”, “normal” and “low end” systems (see appendix B). The German BioImaging community can contribute by making sure that realistic ratios are mentioned in grant proposals. It was stated that a facility should have more than one person as staff. It was also suggested to shut down instruments in case there is not enough personnel for all instruments.

Participants reported that the contribution of the facility to a publication is often not mentioned in the acknowledgement.

3.2 “WG 2 *Financial and legal framework of imaging facilities*” by Jan Peychl

The idea of the WG was to collect the knowledge, especially about user fees, which already exists in the group and to share it. Last year, Ivan Baines (MPI of Molecular Cell Biology and Genetics in Dresden), who is an expert regarding the financial and legal issues of CFs, attended the meeting and shared his knowledge with the audience. Most institutes’ administrations prefer not to disclose information about their legal framework to avoid possible misinterpretations. The legal and financial framework of different institutes can vary slightly. The attendees of the breakout session Ralf Palmisano, Stefanie Weidtkamp-Peters, Hella Hartmann, Anje Sporbert, Sergiy Avilov, Nariman

Ansari, Gertrude Bunt, and Jan Peychl will write a draft about the legal and financial framework of their own facility until the beginning of August. The drafts will be shared within this group and feedback provided. Finally, the working papers shall be discussed with their administrations with the aim of sharing the information with the bioimaging community. Hella Hartmann will watch the deadlines.

During the discussion, it was suggested to draw up a list with typical expenses of a facility so that it is known what kind of expenses one faces when setting up an imaging facility. The list should be approved by the WG members to include realistic numbers from different types of institutions.

The WG defined an “evergreen of questions” regarding DFG which were raised during the presentation of Achim Tieftrunk:

- Can service contracts be financed by DFG grants?
- How can user fees be spent? The interpretation differs from institute to institute.
- Can facility staff be financed by DFG grants or user fees?

The question was raised whether facility staff is responsible for the scientific correctness of the work from scientists in their facility. It was agreed that facilities can instruct and provide advice and information regarding the standard codes of scholarly conduct in scientific research, but cannot be hold responsible for scientific misconduct because experiments in an imaging CF are carried out by the users themselves. This can be set forth in the facility’s usage rules. In some institutes, manuscripts have to be approved by the facilities involved in the experiments before publication.

3.3 “WG 3 *New strategies and funding schemes for imaging facilities*” by Elisa May

GerBI sent a letter to the DFG-“Fachkollegiaten” in the life sciences last year to draw attention to the possibility that user fees for microscopy CF can be applied for in DFG grants since funding for user fees are often cut in DFG proposals. Many participants reported that they were told by principal investigators, who received DFG funding, that user fees had been cut in their proposal. It was mentioned that in most cases budgets are reduced by a lump sum without further specification. Facility managers should ask the scientists to send them the DFG letter of approval in which cuts are listed. In case user fees are cut, please contact the GerBI hotline (see next paragraph). It was also agreed to clarify whether imaging fees can be applied for

in the *Scientific Service Projects* or *Scientific Projects* of SFBs (Collaborative Research Centres).

A *Hotline* has been offered for scientists and facility managers where they can report about problems in financing the repair and maintenance of equipment (see section 1.3). It was mentioned that maintenance cannot be paid for by DFG overhead funds even in the case that the research institution forwards these funds (partially) to the applicant scientist.

German BioImaging drafted a position paper concerning the creation of a new type of professorship for directors of imaging CFs. This paper has been presented to the work group “Career Paths in Science” of the German Council for Science and Humanities (Wissenschaftsrat) whose recommendations will be published on 14 July 2014 (comment by Nadine Utz: [Link to WR Press Release “Career Paths in Science”](#)). In Germany, the position of a facility head varies from institution to institution. The position of a professor would enable facility directors to lead an independent unit and take decisions (e.g. which new instrument to buy) in the interest of all scientists, attend faculty meetings, and negotiate as equals. The position paper has been discussed with DFG representatives, professors, and members of staff of the Ministry for Science and Arts (Ministerium für Wissenschaft und Kunst) of Baden-Württemberg and received positive feedback. Astrid Schauss and Stefanie Weidtkamp-Peters volunteered to work together with WG 3 on how such an infrastructure professorship could be shaped.

Recently, German federal and states governments agreed to abolish the “Kooperationsverbot” for universities. This agreement still has to be implemented in the constitution. This would allow the federal state to invest directly in universities and could be a good opportunity for “Bundesprofessuren”.

German BioImaging followed the course of events concerning the German Euro-BioImaging (GEBI) proposal for inclusion in the German national Roadmap for Research Infrastructures by the BMBF (see section 1.8). The BMBF did not include GEBI in the German Roadmap. The coordinators of German BioImaging sent a letter to Minister Prof. Wanka in June 2013, which had been signed by 40 scientists, to express the concern of the bioimaging community about the negative impact of this decision on German scientists. Since then, two meetings with ministry representatives took place. In October, the BMBF approached the scientific societies in Germany (Max-Planck-Gesellschaft, Helmholtz-Gemeinschaft, Leibniz-Gemeinschaft, and Fraunhofer-Gesellschaft) if they were willing to contribute to the upgrade of imaging facilities to enable them to become Euro-BioImaging nodes.

Currently, DFG has taken the initiative of sending a German representative to the Euro-BioImaging Interim Board (see sections 6 and 10).

To improve contact between imaging researchers and facilities, WG 3 suggested to install GerBI technology advisors. GerBI technology advisors should be experienced imaging facility managers who have a profound knowledge in the application of technologies to biological problems. They shall visit research labs and consult about biological applications and how a new technique could be used in a CF. Consulting should be free of charge for the researcher and travel costs and accommodation would be subsidized by German BioImaging. Some participants were sceptical if researchers would take up the offer and it was suggested to use the word “mediate” instead of “consult”. It was agreed on starting a pilot experiment with three interested facility managers. Elisa May will find interested research groups.

WG 3 encouraged interested facility managers to take part in the WG.

3.4 “WG 5 *Training of facility users*” by Christian Liebig

The main output of WG 5 is published on its web page. The WG’s work plan includes the definition of teaching modules, recommendations for hands-on user training, coordination with Euro-BioImaging, and a list with current microscopy training activities around Germany, which is covered by the *Event Calendar* for Courses (see section 1.1).

Recommendations for user training include “before going to the microscope”, “first training session“, ”after the first training session“, and ”to get full user status“. The latter has been finalized and the WG encourages facility staff to provide feedback.

A variety of teaching modules has been elaborated. For each module, prerequisite knowledge, theoretical and practical curricula, and a material section were defined. Ideal and maximum student/teacher and student/instrument ratios are stated for the theoretical and practical sessions. Material sections provide a link to a page with images and protocols which were developed by the WG members. Not yet finalized modules can be found on the ”work in progress page“. As no comparable collection exists, the WG focuses currently on producing images and protocols for the material sections and asks the bioimaging community to review the page and to report mistakes or if something is missing. Contributions to the material sections are welcome and can either be uploaded by the scientist directly or sent to a member of WG 5. Representatives of microscope companies were asked during the Panel Discussion session whether teaching material from their companies can be uploaded to the material collection (see section 9).

WG 5 had a long discussion on copyright issues. Material created by WG members shall be published under the most simple creative commons license. The help of an attorney is needed for the following topics:

- Which license model is the one best fitting and easiest to use for material produced by WG 5 members and the bioimaging community?
- Are scientists allowed to create material for German BioImaging? Is the copyright hold by the scientist or by his/her research institution?

Nadine Utz will contact the legal advisor of the University of Konstanz and then get back to WG 5.

3.5 "WG 4 *Training of facility staff*" by Stefan Terjung

Topics defined so far for WG 4 are:

- Define specific training needs of biomaging CF staff.
- Collect and list available courses for bioimaging CF staff (calendar).
- Team up with other bioimaging communities dealing with this topic, e.g. Euro-BioImaging WP13 (Training).
- Organize additional training activities for bioimaging CF staff: courses, job shadowing.

Additional ideas are welcome.

Most of last year's activities of WG 4 were reported during the *Introduction* (see section 1.2). Specific microscopy training should be developed in collaboration between WGs 4 and 5 as such training would be of interest for both imaging facility users and staff. Links to existing material such as provided by *iBiology* or *Optical Microscopy Primer* should be provided on the GerBI web page. The topic *Training* on the main menu of the website links directly to the activities of the WG.

In May 2014, a first *GerBI-Industry Course* was organized together with Leica. Participants provided very positive feedback. An enquiry regarding the length of such a course demonstrated that a course duration of 2 days was preferred (5 votes) as compared to a 1 day course (2 votes). Stefan Terjung suggested to start on midday and end on the following day at around 4 pm so that most participants are able to travel back and forth in two days. A survey had shown that many participants would have liked the topic "Maintenance", which was not included in this course. A Zeiss course is planned

for autumn and the bioimaging community is welcome to send suggestions for topics to Stefan Terjung.

A GerBI course from facility managers for facility managers was suggested to teach each other. The *Royal Microscopy Society* developed a similar course with the title "Establishing and Providing Light Microscopy Core Facility Services" which took place in October 2013 for the first time.

Further steps would be defining a curriculum for imaging CF managers. So far, facility managers have acquired their skills through "learning by doing" and no career path has been defined. GerBI could award a certificate for facility managers who have accomplished such a curriculum.

In addition, defining guidelines for continuing education of facility managers was suggested. A list of recommended training, conferences, and courses would be useful. These guidelines would also be helpful for CF staff to convince their institute to attend conferences and training activities.

Sandra Ritz joined WG 4.

3.6 "WG 6 Image analysis" by Jürgen Reymann

The aims of WG 6 are:

- Identify image analysis needs of users.
- Strengthen the development of user friendly image analysis software.

To find out the needs of the bioimaging community, WG 6 had launched a survey in summer 2013. The web page of WG 6 was restructured based on the evaluation of the questionnaire. A new page with information about image analysis software has been created on which an overview, a link to the software, a link to tutorials, and a WG 6 contact person are provided for each of the most widely used software packages. WG 6 encouraged facility managers to provide feedback and to distribute the page to their users to receive feedback about the content and the look and feel of the image analysis software page from both facility staff and users.

WG 6 is planning to organize an image analysis course for facility managers who could distribute the knowledge to their users. For such a course the input of the bioimaging community is needed. Fiji as the most widely used software for image analysis could be the topic of a first course.

Questions were raised concerning standards of file formats and funding opportunities for software developers. In most cases, software developing sub-projects are cut in scientific proposals although image analysis software is

crucial to carry out microscopy research projects. Achim Tieftrunk pointed out that an essential requirement for DFG proposals is that a long-term perspective of the project after the end of a three year DFG funding has to be provided.

In the last year, Karol Kozak and Chong Zhang joined the WG.

4 "GerBI Best Practice Manual and Discussion" by Elisa May, 3 July 2014, 11.00 - 11.30 am

The work of the first funding period of German BioImaging shall be put in writing under the working title *GerBI Best Practise Manual for how to set up and run an imaging facility*. An outline of the content includes recommendations for setting up, running, and maintaining an imaging facility, and issues relevant to employment, education, and career of CF personnel. The manual shall be based on the results of the German BioImaging WGs, discussed with the community, be specific for German facilities, and be published in a peer reviewed journal in both German and English.

The writing team is comprised of the WG speakers and the steering committee. Until now, existing literature was reviewed (see section 3.1), a video conference was hold to brainstorm on the topics of the paper, and authors were assigned to sub-topics during the *ELMI* meeting. Criteria for the journal selection were: a peer reviewed, microscopy, and open-access journal, and a good contact to the editor. The journal *Microscopy, Research, and Technique (MRT)* was selected by a poll among the writing team. The editor in chief Alberto Diaspro was contacted who expressed his interest in such an article.

Some of the meeting's participants volunteered to join the writing team, i.e. Nariman Ansari, Hans Fried, Hella Hartmann, Christian Kukat, Ralf Palmisano, Astrid Schauss, Stefanie Weidtkamp-Peters, and Werner Zuschratter. It was suggested to be concise in the article and refer to more detailed content on the GerBI web page, if permitted by the journal's guidelines.

It was decided on the following deadlines: the office will assign more precisely writing tasks and will circulate the outline among authors, contributions to each sub-topic sent to the office until mid October, authors receive amendments until 10 November, first draft until the end of November, feedback by community (crowd writing) until February 2015. For each topic, a person responsible to meet the deadlines was assigned: I: Elisa May, II: Stefanie Weidtkamp-Peters, III: Roland Nitschke, IV: Jürgen Reymann, V: Werner Zuschratter.

5 "Report on Visit of DFG representatives at BioDIP" by Hella Hartmann, 3 July 2014, 11.30 - 11.45 am

In 2011 and 2012 the *Call for Core Facilities and Networks* was initiated by the DFG Committee on Scientific Instrumentation (Apparateausschuss). Two applications from Dresden were granted funding. The Committee on Scientific Instrumentation hold their regular meeting on 19 May in Dresden to receive feedback about the call. It was particularly interested in the suitability of the funding line overall, suggestions for future calls, and discussed also general issues such as the contribution of universities and hosting institutions to CFs.

Beside its meeting, committee members were introduced into the two funded projects GMP and BioDIP. The light microscopy project BioDIP focuses on the development of the local network between imaging and related facilities at different faculties and research institutions. The committee members visited several CFs of the Technical University of Dresden and the Max Planck Institute for Cell Biology and Genetics within a "meet the facilities" session.

The Committee on Scientific Instrumentation will suggest to the DFG Joint Committee (Hauptausschuss) to continue the programme and to launch a *Call for Core Facilities and Networks*.

6 "DFG and Core Facilities" by Achim Tieftrunk, 3 July 2014, 11.45 - 12.15 am

In 2011, DFG received 57 applications within the "Call for Core Facilities and Networks" of which 12 projects were funded (including German BioImaging). In 2012, 42 applications were filed and 10 proposals received funding. At its meeting in October, the DFG Joint Committee (Hauptausschuss) will decide whether it will provide funding for a future *Call for Core Facilities and Networks*. The Committee on Scientific Instrumentation (Apparateausschuss) is very pleased with all funded projects, in particular with German BioImaging and its innovative programmes such as Job Shadowing and the Core Facility Management Course. The committee considers the DFG Core Facility programme as an efficient funding instrument, plans to launch two new calls in 2015 and 2016 with a similar budget as in the previous calls, and suggests the consolidation of the programme. Application for extension shall be made possible for projects funded in 2011/2012 for another funding period of two years. Newly funded and follow-up projects are supposed to include new aspects and serve as examples for other facilities. Questions were raised by the audience regarding the time line of the new calls. At earliest, a first call could be launched in the beginning of 2015 and funds could be granted by

April 2015. Projects, whose funding might end before a follow-up proposal will be granted funding, could consider a cost-neutral extension of their current project. Furthermore, a question was raised if personnel hired by a grant in 2011 can be funded via a potential follow-up proposal. This will be possible, but particular attention will be paid to universities' commitments regarding the long-term funding of the applied project.

In recent years, DFG invested 25 million € per year in advanced light microscopes with an average instrument price of 600 000 €. There is a trend to big instruments which are placed more and more often in CFs. DFG will continue to fund as well instruments applied for by research groups in justified cases.

In the opinion of DFG (and the BMBF), a lot of money is already invested in microscopy in Germany. This questions the necessity of additional investments as proposed by Euro-BioImaging. Still, the participation of Germany in Euro-BioImaging is important and Achim Tieftrunk represents DFG in the Euro-BioImaging Interim Board with observer status. DFG plans to send a joint German delegate authorized by the Alliance of Science Organisations in Germany and the Federal Ministry of Education and Research (BMBF).

Further funding opportunities within DFG include:

- Scientific networks (might be used for software projects).
- Workshops for Early Career investigators.
- Conferences such as Trends in Microscopy or meetings of scientific societies.

There are special funds for new funding lines and scientists are welcome to propose innovative concepts to the committee of experts (Fachausschüsse).

Questions posed the day before by WG 2 were raised. There is no overhead included in Large Instrument Grants for microscopes, because the funds are from the Federal State and are only administered by DFG. Universities agree in these cases to carry running costs of the instruments. In case the instrument was financed via DFG, e.g. via Collaborative Research Centres (Sonderforschungsbereiche) it is possible that maintenance is paid for by the overhead, but the overhead must not be spent for hardware costs. User fees paid from DFG grants cannot be used for covering depreciation costs. A detailed specification of expenditures covered from user fees is not requested so far.

Cases were reported where the institute's administration would be very strict in interpreting guidelines for the use of DFG funds not allowing necessary

items to be purchased. Facility managers can ask their administration to contact DFG. There is a DFG division which advises university administrations on how grant money can be spent and can give written confirmations.

7 "Report on *Job Shadowing*" by Gertrude Bunt, 3 July 2014, 12.15 - 12.45 am

Gertrude Bunt visited the Biopolis Dresden Imaging Platform (BioDIP) within the GerBI *Job Shadowing* Initiative together with a second participant for three days. The underlying motivation of her participation in the programme was to learn more about financial aspects of a facility and also about new microscopy techniques. The reason why the BioDIP was chosen as the hosting facility was because of similarities between the campuses in Göttingen and Dresden with its collaborative and distributed characters. The schedule included visits to the different imaging facilities of BioDIP, meetings with the administration of each institute to discuss the facility's financial framework, and hands-on sessions to learn how new techniques and instruments work in "real life". In Gertrude Bunt's point of view, social aspects of the visit were also important and she left Dresden fully enthusiastic.

Questions were raised concerning the duration of the stay. To experience the day to day life in a facility, the length of the stay should be longer than a week. This might be of interest for new facility managers whereas a stay of a few days is sufficient to gain a general impression of a new technique or discussing technical issues. For *Job Shadowing* hosts, it is important to prepare the schedule of the visit. One has to get used to a "shadow" who is following you. In addition, microscopes have to be booked in case the guest is introduced into a new technique. It was agreed on keeping the programme flexible so that participants can choose the duration of their stay.

8 "Recap, Discussion, and Future Plans for German BioImaging", 3 July 2014, 2.30 - 3.30 pm

To recapitulate, future tasks of the WGs were repeated. All WGs should keep their web page up to date. WG 1 shall merge input of other WGs on both the web page and the upcoming article. For WG 2 the minimum requirement is to elaborate a list which specifies the costs one faces when starting a facility. It would be nice to have two to three examples from different institutions about how to manage the budget of a facility. Results should be published e.g. as a table on the web page and the planned article. WG 3 will follow developments concerning Euro-BioImaging and the German Roadmap, will bring forward the infrastructure professorship, and

organize the GerBI Technology Advisors. If DFG decides upon launching a new *Call for Core Facilities and Networks*, the Steering Committee will meet to discuss details of the proposal and WG 3 will prepare a draft. The basic idea for the proposal is to change GerBI into a sustainable organization such as a scientific society. By the time the proposal is submitted in the beginning of 2015, our web page should be in the best possible shape as reviewers will consult it (WG pages and pages of facilities including provided links). WG 4 will define modules for CF staff similar to WG 5 modules and will in parallel develop a curriculum for CF managers. WG 5 is already far advanced. The GerBI office will provide help for the legal issues. Modules shall be finalized and material be uploaded. The idea came up that WG 5 could as well start to outreach to schools or museums. This could be a topic for the new proposal. WG 6 has already performed very well with its software analysis web page. The web page shall be kept updated, and an image analysis course is envisaged.

It was suggested to change the text on the GerBI main page about how to participate in GerBI into a more welcoming phrase.

An innovative idea for a new grant could be also to promote image analysis. This may include the development of new software as well as image analysis support to facilities. Only large facilities have specific trained personnel hired to provide help for image analysis, but there is a lack for most other facilities. This could as well be an idea for a future GerBI organization if a person is hired to provide image analysis support to which all members have access.

GerBI was approached by international scientists if they could subscribe to the GerBI mailing list. The discussion revealed that there should not be a problem and scientists from abroad should be allowed to subscribe to the mailing list. On top, GerBI members were approached by Austrian facility managers if they could join GerBI. They lack critical mass to have their own network. According to Achim Tieftrunk, scientists from abroad can take part in DFG financed programmes. It was agreed on allowing DACH scientists to take part in GerBI programmes but that priority will be given to scientists working in Germany. For the moment, only German facilities can be listed and receive an account for the GerBI web page. At a later date, facilities from abroad could be listed as e.g. associated facilities.

9 "Panel Discussion with Representatives of Microscopy Companies" moderated by Roland Nitschke, 3 July 2014, 4.00 - 6.00 pm

Representatives of the four big microscopy companies kindly joined the German BioImaging Annual Community Meeting and were available to engage in discussion with the meeting participants:

Dr. Benedikt Geldmacher-Voß, Leica Mikrosysteme Vertrieb GmbH

Dr. Richard Ankerhold, Carl Zeiss Microscopy GmbH

Dr. Hauke Kahl, Olympus Corporation

Dr. Martin Peschel, Nikon Corporation

Beforehand, both participants and company representatives were asked which topics they were interested in:

- Making performance and technical specifications available for high-end microscopy systems.
- Hints of protocols for doing calibration and quality checks.
- How do companies think about offering special courses for facility staff to perform simple repairs of microscopes?
- Service contracts: how useful are they?
- Relationship between GerBI and EUBI.
- Discounts for individual facilities and local networks of facilities.
- Alternative funding for GerBI: would companies become a member?
- Teaching material from companies on our web page?
- Web-based problem tracker for hard and software.

Elisa May gave a short overview of German BioImaging to inform the company representatives about the network, its relation to Euro-BioImaging, and its future plans.

Participants stated that facility managers need to know if a microscope is performing well or not. They often have to discuss with users if results are not as expected because the microscope is not working properly or because of the user's sample. Facility managers were also interested in how companies test their systems, how the wearing of a system can be monitored, and whether a testing sample can be included when a new microscope is bought.

Companies can provide some specifications but suggested that GerBI defines what exactly is needed so that companies can react to this. The wish was expressed that companies develop a standardized tool box for testing instruments. According to competition law, companies are not allowed to develop such a tool together. Instead, GerBI could define such standards. It was decided to form a new WG *Microscope Specifications and Standardized Measurements*. WG members are: Roland Nitschke (speaker), Steffen Dietzel, Anje Sporbert, Werner Zuschmitter, Jan Peychl, Stefanie Weidtkamp-Peters, Hans Fried, and Sandra Ritz.

Would companies be willing to offer a course for facility managers to teach how an instrument should be maintained and how to perform simple repairs? Companies replied that this is in principle possible but cannot be decided only by the representatives present at the meeting. Repairs can be included in the course but are restricted by insurance issues, e.g. the microscope should not be opened because of the risk of eye damage.

From the point of view of facility managers, service contracts are very expensive and it is difficult to raise money to pay for them. Companies stated that it is difficult to sell service contracts in Germany and that the content of such a contract can be adjusted to the specific wishes of a customer so that it fits the needs of the facilities. Facility Managers should think about what they would like to have included and negotiate with their funding agencies. The question was raised, if there could be discounts for German BioImaging members. Companies are by competition law not allowed to discuss this openly, but GerBI could negotiate with each company separately.

Companies would like to be in contact with both Euro-BioImaging and the national networks. A financial contribution to German BioImaging is in principle possible, but it has to be taken into account that there are more and more organisations and societies who ask for financial contribution. Benedikt Geldmacher-Vogt stated that a direct contact with many facility managers and a joint feedback is very valuable. Richard Ankerhold suggested that GerBI should think about what it would like to receive from companies. The Euro-BioImaging industry board could be a good model for a possible interaction of GerBI with industry. Companies should have a benefit from the collaboration as well. As an example, the Zeiss Lecture of the *Deutsche Gesellschaft für Zell Biologie* was mentioned.

Members of the WG 5 *Training of users* would like to use teaching material developed by the companies for their material sections of the teaching modules (see section 3.4) on the GerBI web page. The company representatives replied that in principle this should be possible and WG members shall contact the marketing divisions.

A web-based problem tracker and known bugs cannot be published by the companies. Typically, companies read the *confocal mailinglist* to be informed about problems scientists experience with their instruments. GerBI could collect a list with technical problems facilities face. This could be either done via a list server or preferably a structured forum. Its content could be made visible only to registered users. All companies would be interested in this valuable information.

10 "Update on Euro-BioImaging (EUBI)" by Antje Keppler, 4 July 2014, 9 - 9.45 am

Antje Keppler gave an introduction into Euro-BioImaging and recapitulated developments since last year.

Euro-BioImaging has been prioritised on the Roadmap of nine countries and in six countries the evaluation process is ongoing. The *Workpackage Training* developed a training programme for node users and staff including a course for facility managers which was partly inspired by the German BioImaging training programme. In June 2014, Euro-BioImaging passed from the Preparatory Phase to the Interim Phase which is supposed to lead to the Construction Phase in 2015. The Interim Board governs the implementation of the Interim Phase and consists of representatives of countries who signed the Memorandum of Understanding (MoU). Twelve countries and EMBL signed the MoU and five more countries received observer status (including DFG for Germany). Current tasks of the Interim Board include the selection of the legal framework, identify a hub hosting country through a call launched in autumn, continue with the selection and construction of nodes, and develop a governance model. Elaboration of the latter is almost finished and ERIC was chosen as a model by the board.

Many participants expressed their disappointment with the BMBF decision not to include German Euro-BioImaging into the German Roadmap for Research Infrastructures as well as with the reply to the letter sent by the German BioImaging community last year (see section 3.3). It was discussed how the German contribution to Euro-BioImaging can be pushed forward. It was decided that German BioImaging provides a very short position paper and a bullet list with the most important topics for discussions about Euro-BioImaging to be used by facility managers when they are in contact with other scientists, their institute's administration, or with representatives of the government. The report published by the German Council of Science and Humanities (Wissenschaftsrat) gives a very sound evaluation of

GEBI. Furthermore, it was suggested to get in contact with local and regional politicians. Recent experiences show that politicians are very interested in visiting a CF and in Euro-BioImaging. As only the federal government can decide whether Germany will take part in Euro-BioImaging, GerBI members should update each other about contacts with politicians. The concern was expressed that the BMBF decision will result in disadvantages for both German microscopy companies and scientists and a brain drain. For Elisa May, it is important to hear the opinion of the meeting's participants and of the German BioImaging community to know that she is talking on behalf of German microscopists when taking further actions.

A PDF version of this talk is published on the GerBI web page.

11 "Imaging and Core Facility Networking Abroad" by Roland Nitschke and Nadine Utz, 4 July 2014, 9.45 - 10.00 am

The *Association of Biomolecular Resource Facilities (ABRF)* is an international society dedicated to advancing core and research biotechnology laboratories through research, communication, and education. The association, founded in 1986, has more than 700 members worldwide, most of them in the United States and few in Europe. The agenda of its yearly meetings include scientific, training, and core administrative sessions, and also exhibitions and demos of companies. A unique feature are the ABRF Research Groups which are organized by ABRF members which develop research studies whereby participating laboratories can gauge their ability to perform a given analytical technique and to gauge the effectiveness of that technique or methodology in real laboratory situations. The *ABRF Light Microscopy Research Group* elaborates and publishes protocols and studies about e.g. how to calibrate a microscope at which 30 to 40 CFs investigate the reproducibility of instruments and techniques. This could particularly be interesting for the newly founded GerBI WG 8.

In June 2014, the *Core Technologies for Life Sciences (CTLS) Congress 2014* took place in Paris as a basis for a new European society to promote science and teaching within Core Facilities. Companies were involved via exhibition booths and three parallel sessions were organized: "Research and Development with and within Core Technology Facilities", "Core Technology Facility management for long-term sustainability", and "National and Trans-national Core Facility Networking". Around 350 participants from 26 countries took part in the congress. Workshops and satellite meetings took place such as the "OMERO Annual Users Meeting" and the "Administrative support & management skills: should we improve the existing administration or RI managers' skills?" satellite meeting which was organized among others by

Johannes Janssen (DFG). Nadine Utz gave a talk about “National networking within Germany” at the satellite meeting “Working in and networking between microscopy and cytometry bioimaging core facilities”, which was organized by Peter O’Toole and Joshua Rappoport. In the final open discussion, participants voted in favour of the formation of a *CTLS* society. The question was raised whether national chapters will be needed acting as lobbies on a national level. The organizing committee is going to elaborate a business model until September in preparation of the foundation of the association. During the following discussion of GerBI participants, it was pointed out that *ELMI* is not a legal entity and focuses on science and technology in imaging CFs whereas *CTLS* is going to focus on networking between, administration of, and lobbying for life science CFs. It was decided to monitor and to be in contact with *CTLS*. Once GerBI will be transformed into a legal entity, it could become a member of other associations such as the *Society for Cell Biology* or *CTLS*.

12 “Facility Managers Meeting and Networking in UK” by Peter March, 4 July 2014, 10.30 - 11.30 am

Peter March gave a very lively presentation about the *RMS Facilities Managers Meeting*, imaging organizations and funding opportunities in UK, and gave an insight in the structure of his own facility.

The *RMS Facilities Managers Meeting* was initiated seven years ago by Peter O’Toole amongst others. The underlying idea was to give facility managers the opportunity to meet people who are in a similar position to discuss career perspectives, the job description, learn about best practices, or how work in facilities can be acknowledged. The meeting is organized every year by a different facility manager in a different city and includes a visit to the host’s CF. The meeting’s character has changed over time. The first meeting was attended by ten facility managers and two companies while the last meeting had to take place in an auditorium and was attended by 100 facility managers and 27 companies. Many topics were discussed at most of the meetings such as facility management, training, system calibration, and service contracts. Companies give five minutes presentations and sponsor the costs of the meeting, participants cover costs of travelling and accommodation, and the *Royal Microscopy Society* has taken over the administration of the meeting. Facility managers who met at the meeting often communicate during the year and help each other out. A Wiki based web page was built on which UK biological imaging facilities can be listed.

BioImagingUK is an organization of UK scientists that develop, use, or administer imaging solutions for life science research. Its formation was pre-

pared during the breakout sessions of *RMS Facilities Managers Meetings*. The organization seeks to represent the views of UK scientists to *Euro-BioImaging* and was granted funding of 100 000 £. Spurred by *BioImagingUK*, funding agencies and representatives of imaging facilities came together in 2012 for the first time to discuss about the needs of facilities on an (inter)national and departmental level, training programmes, and career structures for facility staff. Since then, funding of CFs has been pushed and many training activities such as the *Establishing and Providing Light Microscopy Core Facility Services* course were organized by the *RMS*. Some funding agencies support only superresolution microscopes whereas some others fund as well “work horse” machines which are partly financed by the faculties and are therefore typically placed in the faculty’s CF.

Peter March gave an insight in the structure of the facility that he heads as an example for imaging facilities in UK. He pointed out, how the training of users is organized, how costs can be reduced by constructing small equipment parts by facility staff itself, and that facilities should be seen as well as a business. For sake of the latter, the facility’s logo is present everywhere and in case visitors are guided through the facility, the opportunity is used also to promote the facility.

Participants raised questions concerning the training concept and user fees. According to Peter, in most UK imaging facilities user fees cover only a fraction of full costs and receive extra funding.

A PDF version of this talk is published on the GerBI web page.

**13 “Report on *GerBI Core Facility Management Course for Imaging Specialists*”
by Christian Kukat,
4 July 2014, 11.30 - 12.00 am**

Christian Kukat attended the first *GerBI Core Facility Management Course for Imaging Specialists* which took place from 8 to 11 October 2013 in Ludwigshafen at Lake Constance. Course participants were of different levels of experience, some had been heads of CFs for many years, others worked as facility staff, and some were postdocs, like Christian, who were planning to work in an imaging facility. GerBI hired *hfp consulting* to develop and conduct the course. The trainers had different backgrounds covering natural sciences, business administration, and educational sciences. The schedule of the course was flexible and adjusted to the needs of the participants. The soft skills course covered topics such as role awareness, communication skills, team development, business models, conflict management, budgeting, coaching, and recruiting the right people. The business part was difficult

and interesting at the same time. Participants had to understand business jargon and were able to envision the facility as a business. The course was very interactive and included many role plays, e.g. participants were divided into two groups and each elaborated together with one trainer a negotiation strategy. One group overtook the role of the CF head who wanted to hire and additional person, the other group prepared the strategy of the institute's administration, and representatives of each group were finally conducting negotiations. A few months after Christian had attended the course, he was appointed the head of an imaging core facility. His first task was to elaborate a business plan, and the course helped him a lot to comply. He reported that he has used his gained knowledge in his all-day work in many ways: "setting the frame" when somebody wanted to talk to him when he had little time by specifying how much time he had, he ran into conflicts and went back to the user manual to read how the conversation should be done, and he is in the process of hiring personell for the facility. Very important was as well the exchange with the other participants. Christian would clearly recommend to take part in such a course. Other course participants suggested to organize a follow up meeting a few month after the *GerBI Core Facility Management Course* took place to discuss how course participants applied the gained knowledge in real life and to share their experiences.

A second course took place from 23 to 27 June 2014, and the next will take place from 8 to 12 June 2015 on Reichenau Island located on Lake Constance.

14 "Wrap up and Closure", 4 July 2014, 12.00 am - 12.30 am

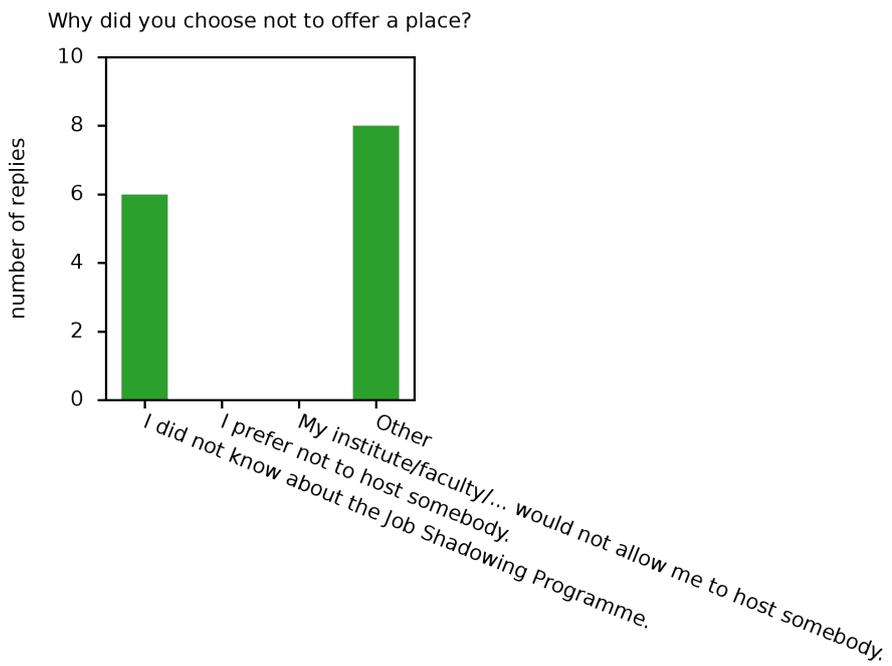
The GerBI WGs were productive and produced very interesting results. WGs may stop when they have achieved their goals and will be substituted by new ones. Probably in the beginning of next year, a follow-up proposal has to be written and its structure will be discussed during the upcoming Steering Committee Meeting in autumn. The underlying idea is to transform GerBI into a legal entity which is financially self-sustaining. Once DFG funding will have ended, there will be the need of institutional contributions to GerBI to not to be completely dependend on funding from companies. Facilities should already explore whether and how this could be possible, and to promote German BioImaging within their own institution, e.g. by putting the GerBI logo on their facility web page, flyers, etc. To convince institutes that their imaging facilities should follow GerBI Best Practice guidelines, on one hand support by DFG would be helpful (e.g. a plus when applying for large instruments), and on the other hand facility managers could suggest to include an external facility manager in the facility's steering committee.

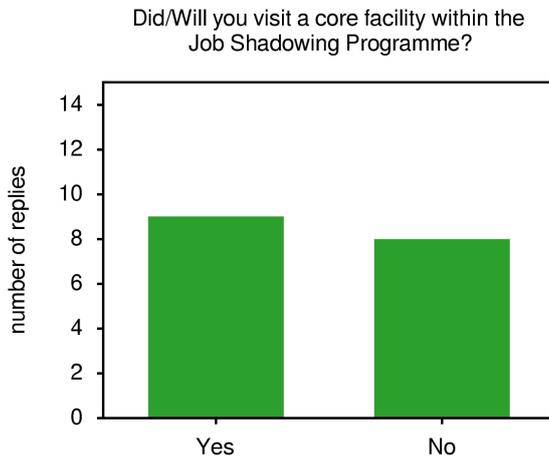
Participants remarked that their administrations will ask for a benefit if facilities will financially contribute to GerBI. Ideas included a facility evaluation board, which could evaluate member facilities and award a GerBI quality label if GerBI best practices are fulfilled. Some facilities were already evaluated and it was suggested to include this topic in the next Annual Community Meeting.

Respectfully submitted, Dr. Nadine Utz
(Project Manager of German BioImaging)

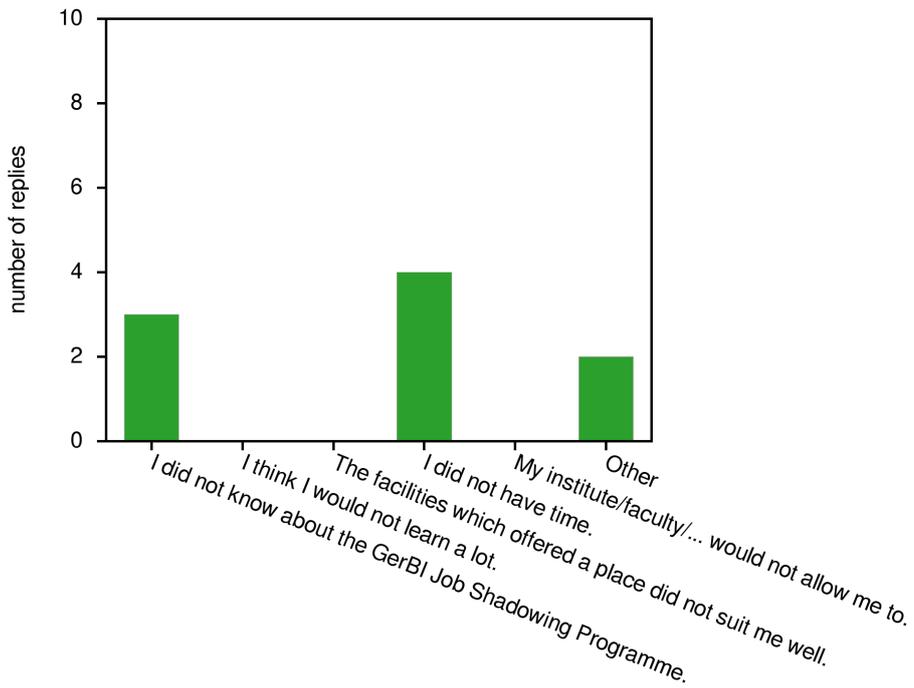
A Feedback of the Questionnaire

A.1 Part I: Educational Programme

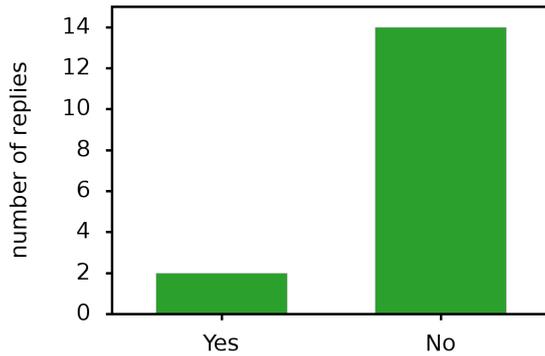




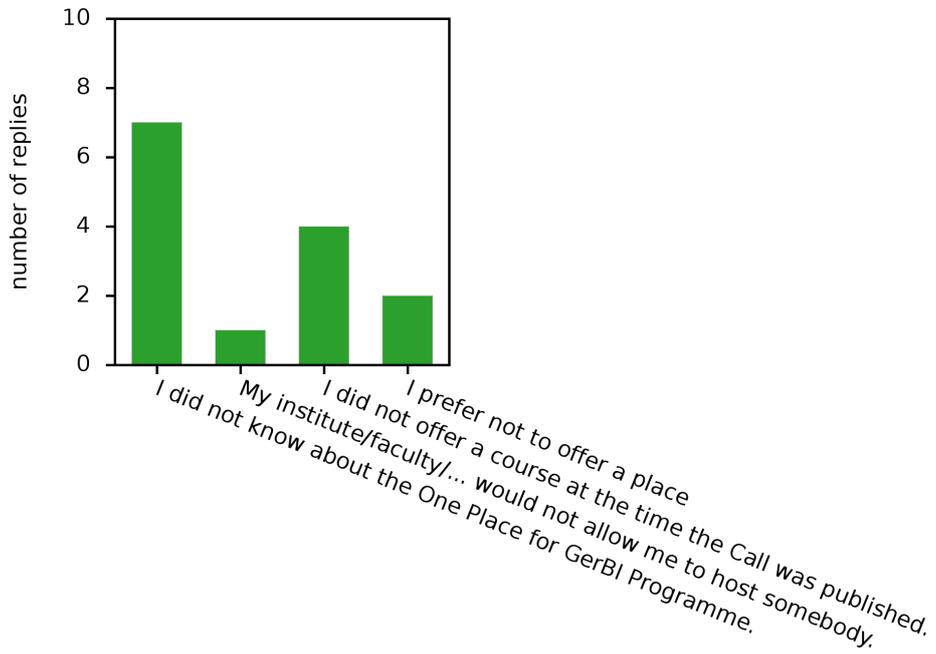
Why did you not apply for the Job Shadowing Programme for guests?

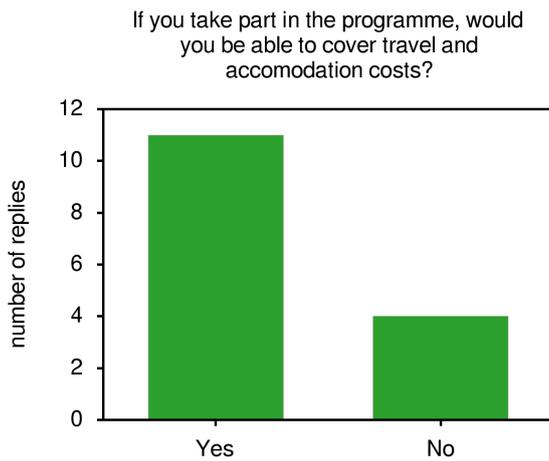
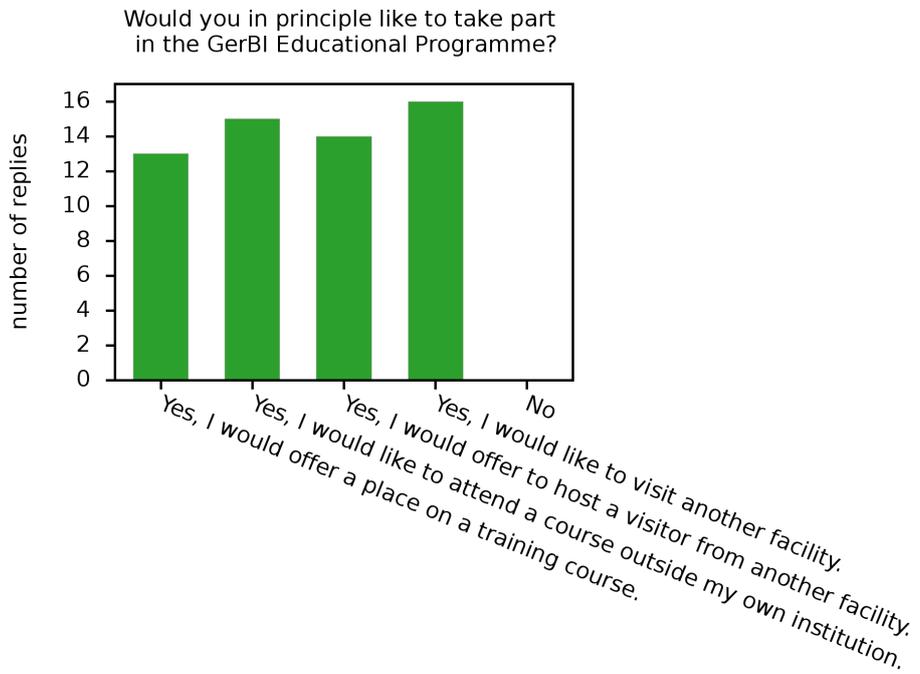


Did you offer a place for an external participant on a bioimaging or image processing training course within the One Place for GerBI Programme?



Why did you choose not to offer a place for an external participant?

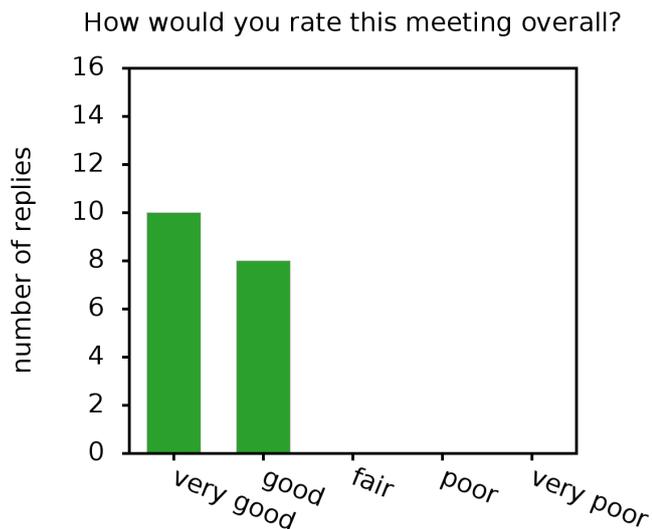




Comments regarding the Educational Programme?

- I am very thankful that this is taking place. We should continue doing this.
- Excellent! Especially Facility Managers Course. Many aspects covered in short time -> would be possible to also have courses more specialized on specific aspects in addition, go deeper into these issues?
- Great idea, I really want to take part in the future.
- Great stuff.

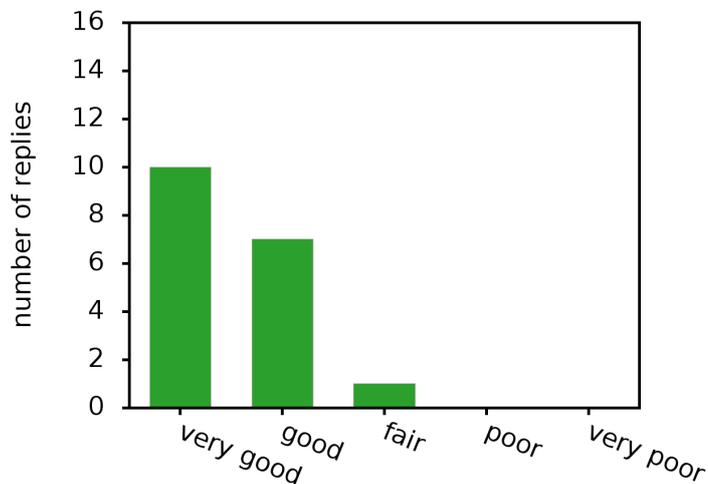
A.2 Part II: 5th GerBI Annual Community Meeting (2-4 July 2014)



Which topic(s) did you miss?

- Missed some topics on company session.
- Concise outcome of workgroups and timelines.
- IT-issues and data management and large size data formats.

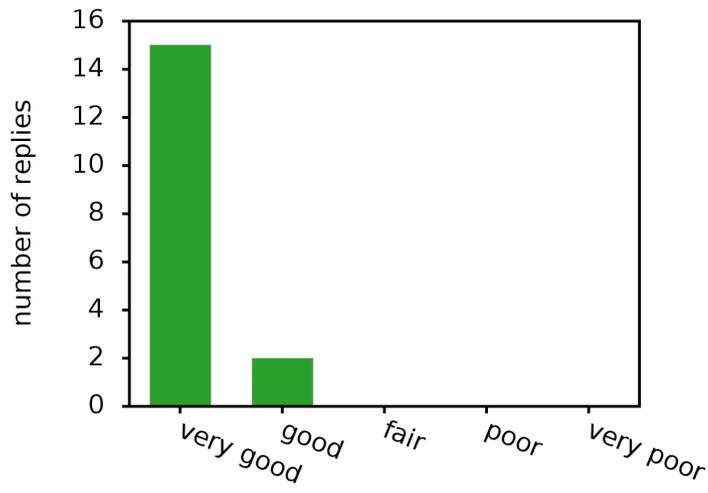
How would you rate the programme of the meeting?



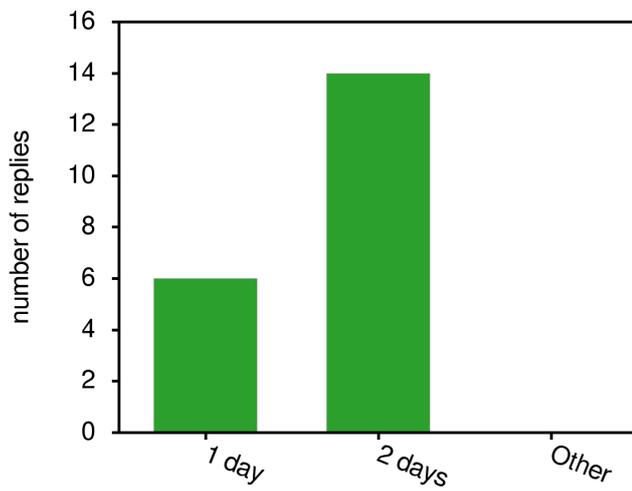
Which topic(s) were you most interested in?

- Breakout sessions + transfer of the outcome into the community + the “manual”.
- Setup of a facility, staff + user training.
- Discussion about future perspective.
- DFG. (6x)
- Panel discussion with representatives of companies. (4x)
- Funding of facilities.
- Euro-BioImaging. (2x)
- Workgroup sessions/reports, reports on GerBI activities.
- Insight from UK.
- Discussions, How to set up and sustain a microscopy facility, grant possibility.
- German BioImaging.

How would you rate the organization of the meeting?



Which duration of the meeting do you prefer?



How could the meeting be improved?

- Some sessions' content was redundant, some talks could have been shorter, freed up time could be used for WG work.
- Boule instead of Bowling.
- Find a nicer location.
- Restrict discussions that take circles.
- Longer coffee break because we have never been in time -> Time for discussion and exchange.
- I had the feeling that there was some redundancy.
- Maybe visiting an actual facility?
- Not all the time the same Euro-BioImaging talk.
- Invite hfp-coaches of the management course (2x).
- WG: some too general, to improve packages for the futures -> be more specific/detailed/precise: e.g. WG 2: numbers!
- More discussion rounds to specific topics facing microscopy facility issues.
- Open panel discussion, feedback, more international experience.

A.3 Part III: Anything else?

Do you have any other comment regarding German BioImaging?

- I am impressed about the enthusiasm and the work done since 2012.
- Proud to be part and contribute.
- Keep going, find a legal form and motivate participants to actively work on politicians regarding Euro-BioImaging.
- Map for visits among facilities (not just job shadowing but also informal meetings/visists) to show that GerBI fosters interaction on webpage.
- I would not ask the companies to attend on every year, but surely not all the time (this was well done here, but not efficient enough from company side) -> but very good was part about performing test standards -> hope that this is put forward.
- Keep going. Thank you!

B Results of the on-site survey of instrument/staff and user/staff ratios

The meeting's participants were asked to report the instrument/staff and user/staff ratio for their facilities.

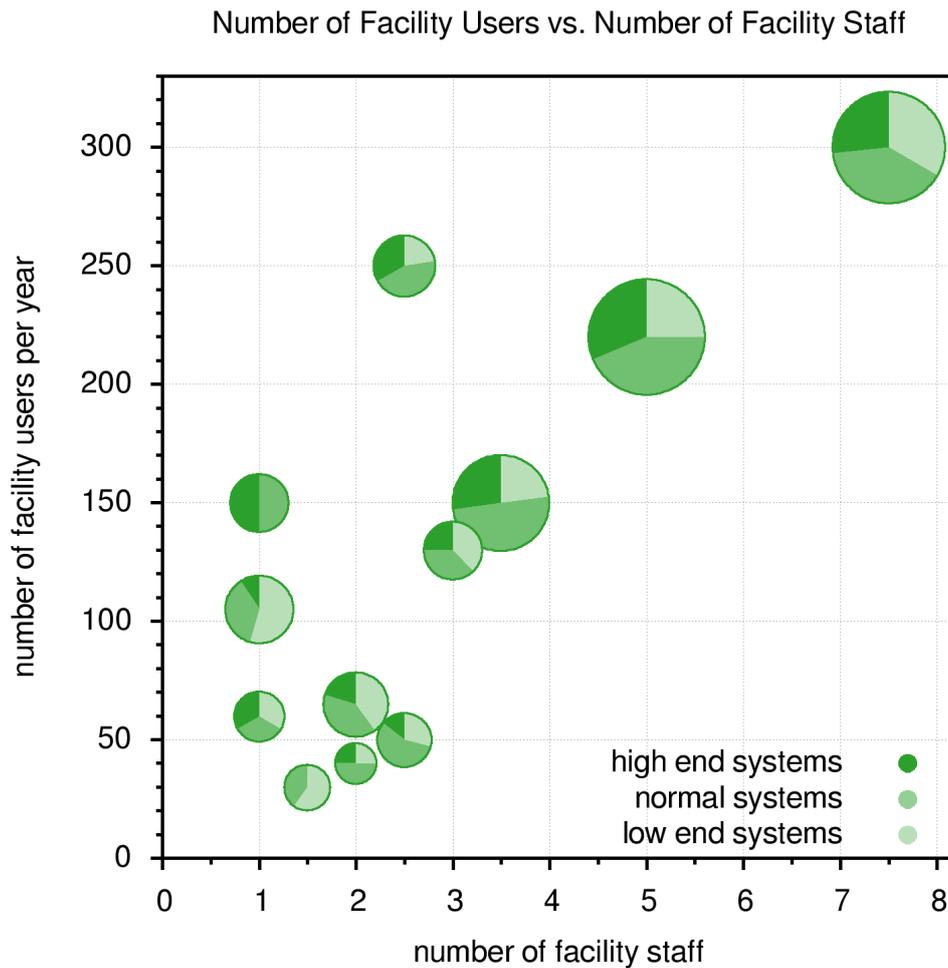


Figure 1: The graph displays the number of facility users/year (ordinate) vs. the number of supporting staff (abscissa). Each circle represents one CF. The number of instruments is enclosed by the circle area and ranges between 4 and 32. The proportion of high/normal/low end systems is given by the circle sectors. Personell from Facility (2,40) takes also care of cytometers.

A distinction was made between high end systems, normal systems, and low end systems:

High end systems: STED, OMX, Palm etc., FLIM, FCS, 2-Photon with SHG or other specials, Light Sheet, Laser Capture Microdissection

Normal end systems: Confocal, TIRF, SD, Ratio-imaging, Wide-Field with deconvolution, wide-pv convolution

Low end systems: Wide-Field, Stereo Microscopes, Biostation, Lupe