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Faculty of Medicine
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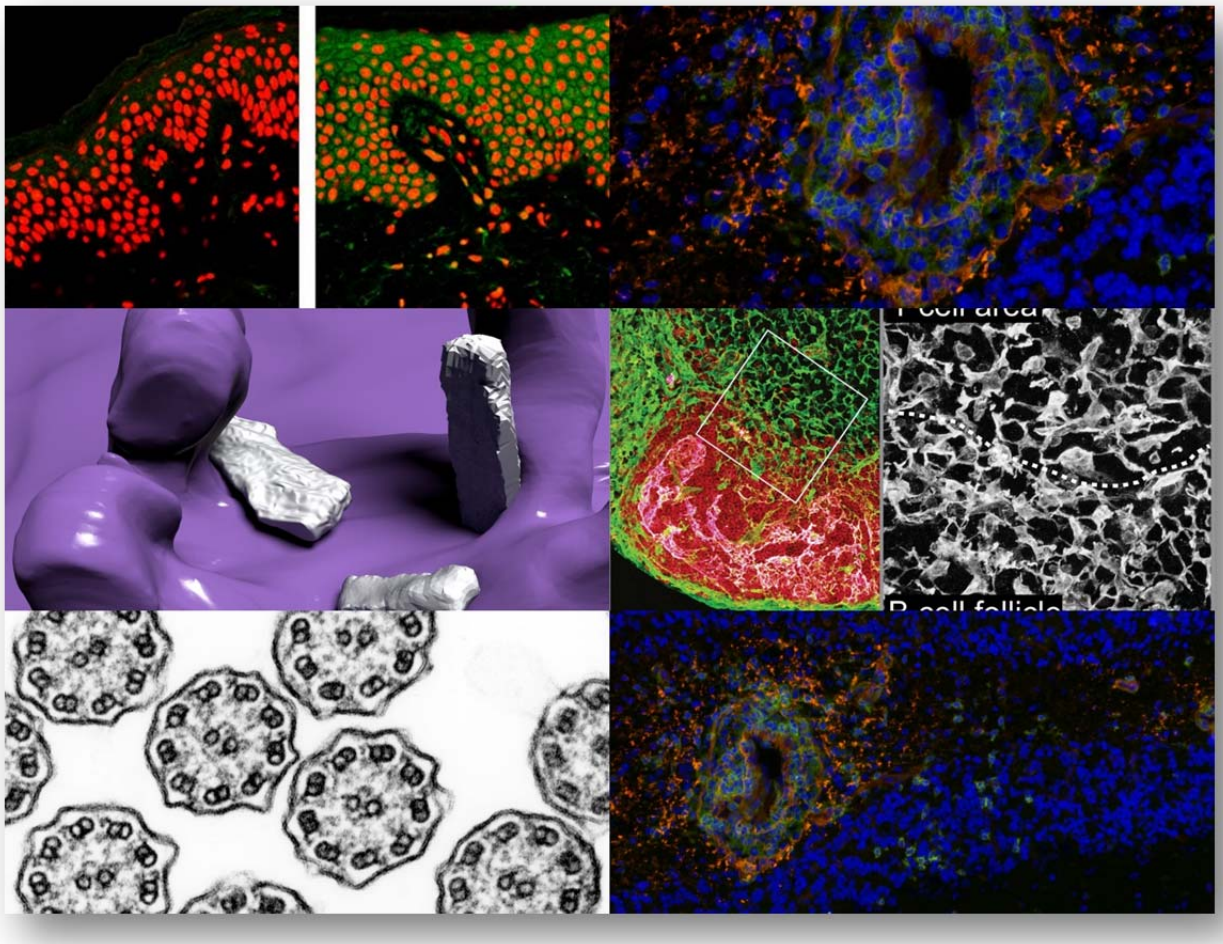
Microscopy Imaging Center

Annual Report 2012

Microscopy Imaging Center (MIC)
University of Bern



May 2013

The MIC at a glance

The **M**icroscopy **I**maging **C**enter of the University of Bern (MIC) is an association of scientists and institutions interested in high-end microscopy techniques.

It represents the center of competence for microscopy in life science and beyond.

Founded in 2005, it has continuously increased its activities and is well recognized for its coordinative function in microscopy and imaging. Since 2012, the MIC has an official performance mandate from the University Leadership associated with financial support.

MIC Activities

- Access to high-end microscopy
- Services linked to microscopy: sample preparation, data handling, stereology
- Platform for knowledge transfer in microscopy
- Coordination of shared usage of equipment
- Performance and utilization reporting of equipment
- Coordination of microscopy investment and related application support
- Teaching in cutting-edge microscopy (lectures, practical modules)
- Quality management in microscopy
- Publicity for microscopy of the University of Bern (e.g. yearly MIC symposium

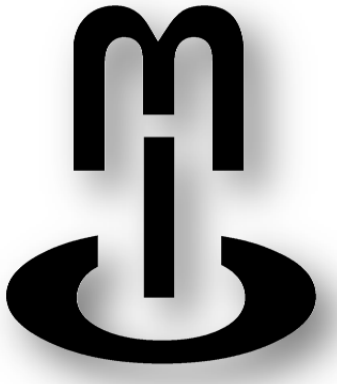
MIC Organization

The steering committee of the MIC is its **Commission**, where decisions are taken. Involvement of the **MIC-Commission members** is voluntary. The **MIC Coordinator** (Dr. Stefan Tschanz) is primary contact person and executive of the MIC. The **MIC Board** (chair: Prof. Britta Engelhard, Medical Faculty, Prof. Volker Heussler, Faculty of Science, Prof. Michael Stoffel, VetSuisse Faculty) represent the MIC towards the Faculties and University leaderships.

Participating Faculties:	3
Participating institutions:	12
MIC-Commission members:	25

MIC Equipment

Shared microscopes	**38**
Light Microscopes (different techniques)	28
Electron Microscopes (different techniques)	8
Other imaging instruments (Atomic Force / Micros-CT)	2



Contact

Stefan Tschanz, MD / Software Engineer

MIC Coordinator

Institute of Anatomy

University of Bern

Baltzerstrasse 2

3012 Bern

Phone: +41 31 631 84 78

Fax: +41 31 631 38 07

Email: stefan.tschanz@ana.unibe.ch

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Introduction

Microscopy is one of the key techniques in modern life science.

The Microscopy Imaging Center of the University of Bern (MIC) is the center of competence in high-end microscopy and provides a central access to state-of-the-art imaging techniques. It acts as contact podium, platform for knowledge exchange and teaching resource for microscopy.

The spectrum of high-end microscopic techniques grows in a fascinating way while complexity and costs increase even more. Shared use of expensive systems presents a practicable solution in this situation. Users of high-end microscopy must therefore get into closer association and overlapping coordination of microscope usage is necessary. Initiated by a particular effort of the former Dean of the Medical Faculty and current Rector of the University of Bern, Prof. Martin Täuber, the Microscopy Imaging Center of our University was founded in 2005.

The MIC aims to maintain and increase expertise in advanced microscopic techniques and to provide these technologies to interested users in Bern and beyond. The equipment listed on the MIC website can be used irrespective of being an institutional or personal member of the MIC. Utilization charges are applied and help to share maintenance costs for expensive instruments.

Regular meetings of the MIC members allow for a continuous exchange of know-how and expertise between the different institutes providing high end microscopy.

The MIC is outlined as an umbrella organization for microscopy users and functions according to the principle of **decentralized equipment location** and **central coordination**. Thus, it is not a physical core facility; it rather acts as center of competence and contact platform for microscopy of the University as a whole. From its beginning, the MIC was intended to act as an inter-faculty center. Soon after its foundation, institutes of the Medical Faculty, the VetSuisse Faculty and the Faculty of Science joined forces. To date, the focus of MIC services is still live sciences.

Well aware of the necessity of coordinative work, the University Leadership supported the MIC in 2012 with CHF 120'000.-. This financial support was associated with an official performance mandate that defines in detail the responsibilities of the MIC (see "Performance mandate"). The money was used for basic operation of the MIC including salaries, smaller investments in infrastructure and repairs.

During the past year, several new administrative tools and process definitions were created in order to facilitate access to microscopes, but also to allow a coherent and overlapping management of expensive equipment, its degree of utilization and its costs.

One of the tasks of the MIC is the coordination and evaluation of funding requests for microscopy equipment. The comprehensive view over existing microscopy systems and the recognition of research focuses allow prioritizing and supporting applications towards the funding organizations. In 2012, three large high-end microscopy systems (a Confocal System, a High-Content Analysis System and a Spinning Disk System) were acquired with the assistance of the MIC.

The MIC is well recognized within the community of microscopy scientists of Switzerland and internationally. This was substantially the result of the yearly MIC symposium where more than 100 scientists met in the frame of the annual microscopy meeting of the Swiss Society for Optics and Microscopy (SSOM).

Another success story has been established with the microscopy lecture series of the MIC during which over 60 master and graduate students were trained in cutting-edge microscopy techniques this year.

Organization of the MIC

The Microscopy Imaging Center unites scientists and institutions interested in high-end microscopy. The MIC is founded on collaborative work of the participating institutions. Contributions are effected by voluntary efforts of the MIC members.

Every institution using and providing high-end microscopy may join the MIC commission, preferably by defining a delegate experienced in microscopy.

Currently, institutions from three Faculties of the University of Bern and the Adolphe Merckle Institute of the University of Fribourg are member of the MIC.

Decisions are made in the MIC-Commission which consists of delegates (MIC-members) from all participating institutions. The MIC-Board consists of the chair person (Prof. Britta Engelhardt, also representative of the Medical Faculty), the MIC coordinator (Dr. Stefan Tschanz) and one representative of each participating faculty (Prof. Volker Heussler - Faculty of Science, Prof. Michael Stoffel, VetSuisse Faculty). The Board prepares the topics for the MIC-Commission and represents the MIC towards the Faculties and the University Leaderships.

The MIC-Commission meets four times per year.

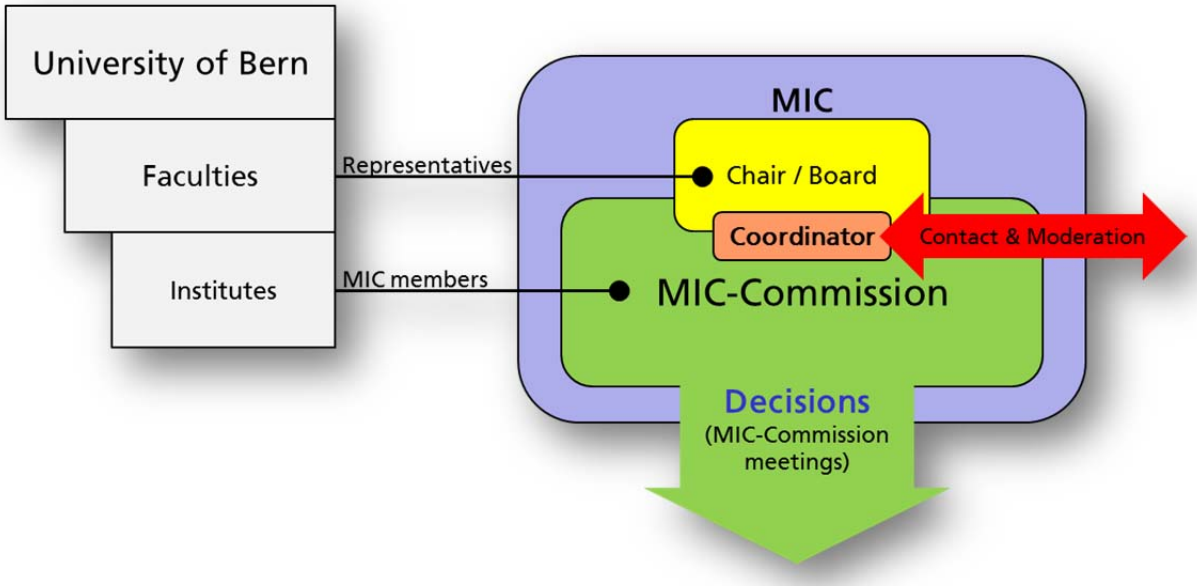

Fig. 1: Structure of the MIC

Table 1: Participating Institutions and Members of the MIC

Faculty	Institute	Delegates (MIC-members) (state Dec. 2012)
Medicine	Anatomy	PD Dr. Edik Babiychuk Beat Haenni (**core technician**) Dr. Daniel Studer Dr. Stefan Tschanz (**coordinator**) Prof. Dr. Benoît Zuber (**contact electron microscopy**)
	Biochemistry and Molecular Medicine	Prof. Dr. Dimitrios Fotiadis Prof. Dr. Matthias Hediger
	DKF / ArtOrg	Prof. Dr. Olivier Guenat
	DKF / Pneumology	Dr. Fabian Blank (**contact light microscopy**)
	DKF / Tiefenau	Prof. Dr. Anne-Catherine Andres
	Pathology	Prof. Dr. Verena Niggli
	Pharmacology	Prof. Dr. Shida Yousefi
	Physiology	Prof. Dr. Thomas Nevian Prof. Dr. Ernst Niggli
	Theodor-Kocher Institute	Prof. Dr. Britta Engelhardt (**chair**, board) Dr. Ruth Lyck Prof. Dr. Jens Stein
Science	Applied Physics	Prof. Dr. Martin Frenz Prof. Dr. Jaroslav Ricka
	Cell Biology	Prof. Dr. Volker Heussler (**board**) Prof. Dr. Peter Meister
	Plant Science	Dr. Daniel Kierzkowski
VetSuisse	Dept. of Veterinary Anatomy	Prof. Dr. Michael Stoffel (**board**)
University of Fribourg	Adolphe Merckle Institute	Prof. Dr. Barbara Rothen-Rutishauser Dr. Dimitri Vanhecke

MIC Coordinator

The MIC coordinator, Stefan Tschanz (part time position dedicated to the MIC), is the key contact person and moderator for all MIC belongings. He accepts support requests regarding technical, administrative, teaching, funding and other issues. If support cannot be provided directly, he mediates the appropriate contacts. The contact person for **light** microscopy is Dr. Fabian Blank (DKF) and for electron microscopy Prof. Benoît Zuber, Institute of Anatomy (see MIC web site).

The coordinator organizes the MIC-Commission meetings four times a year, manages all teaching administration and organizes the international MIC meeting once a year. His administrative tasks comprise all forms of reporting including equipment usage and financial statistics . He is responsible for the internet presence of the MIC (web site and equipment manager) and is also the main contact person for data and image handling issues. He helps scientists in accomplishing successful grant applications for microscopy investments.

Stefan Tschanz is the MIC coordinator since July 2011. He succeeded to Prof. Dr. Barbara Rothen-Rutishauser who was coordinator from 2010 to 2011.

Leading house: Institute of Anatomy

Due to its large experience in microscopy techniques and a large portfolio of equipment, the Institute of Anatomy was defined as the leading house of the MIC in 2010. Most of the MIC staff (coordinator, web master, core lab technician, core microscopy technician) are members of the Institute of Anatomy.

Performance Mandate ("Leistungsauftrag")

Since 2012, the MIC has an official mandate from the University Leadership which defines its responsibilities as a center of competence for microscopy. The mandate is associated with an annual financial support of CHF 120'000.- for basic operation of the MIC, i.e. administrative costs (labor and consumables), development of specific IT tools (website, reservation system) and some smaller maintenance work.

Until 2011, the finances of the MIC were not clearly regulated. Under the new coordinator, a detailed financial analysis of the MIC was performed in 2011 and a report was generated emphasizing the large benefit of the MIC for the University of Bern. With support from the deans of the participating faculties, the University Leadership established the official performance mandate towards the MIC. Besides the urgently needed financial support, the clear commitment of the University Leadership underlined the significant role of the MIC.

In summary, the University Leadership represented by the Rector, Prof. Martin Täuber defined the following objective target:

The MIC shall be the central access point for high-end microscopy in life sciences for the entire University of Bern. It provides the coordination of users. In addition, the MIC evaluates and coordinates investments in life science high end microscopy of the participating faculties.

The MIC provides the following services:

- *Qualified setup of high-end microscopy*
- *High quality image analysis*
- *Optimal use of existing resources (coordination)*
- *Teaching programs in the field of microscopy*
- *Quality management by standardizing processes*
- *Increasing the success of funding applications*
- *Standardizing microscopy fees*
- *Public relations for distinct placing of the MIC as a center of excellence in microscopy*
- *Promotion of knowledge transfer within the University of Bern and to the outside*

(Translated from the original "Leistungsauftrag", 24.01.2012)

Financial support of the University Leadership

The performance mandate the University Leadership was associated with an annual financial assistance of CHF 120'000 in order to support the basic work of the MIC.

The MIC-Board and Commission decided to use a substantial part of this money for compensating salary costs of persons located at the Institute of Anatomy, as the leading house. A part was used for small investments and maintenance costs relevant for the entire MIC.

Table 2: Assignment Financial support

Financial Support University Leadership	**CHF 120'000.00**
Salary costs	CHF *-104'270.40*
MIC Cash Reserve	**CHF 15'729.60**
Salary for MICBOOK programming (N. Fankhauser)	*CHF -3'889.95*
Filter set Zeiss LSM 5 Live DUO (Ana)	
MIC Symposium	*CHF -2'000.00*
Filter Set for 2 Photon LaVision BioTec (J. Stein, TKI)	*CHF -2'170.95*
Mot. reflector revolver for LSM 510 meta (E. Babiychuk, Anatomy)	*CHF -3'130.80*
Balance	***CHF -373.95***

Table 3: Salary policy MIC

Name	Function	Part	Costs / Year
Tschanz Stefan	Coordinator	30%	
Haenni Beat	Core Lab Technician	15%	
Frank Sandra	IT / Web master	10%	
Kämpfer Lilo	Administration	10%	
Schaffer Herbert	EM Technician	10%	
Total salary cost per year		75%	**104'270.40 CHF**
MIC cash reserve, guaranteed by the Anatomy			**15'729.60 CHF**

Visibility of the MIC

Information on the MIC is available under www.mic.unibe.ch. Complete insight is given on the structure of the MIC, its activities, its teaching program, contacts and available equipment.

In 2012, our web master, Sandra Frank, created an automated web content system that allows immediate updating of the pages. Currently, Google displays the URL of the MIC in the first position when "microscopy bern" is entered.

In 2012, the board presented the MIC in official meetings of each of the participating faculties. It was a good opportunity to introduce the activities of the MIC in connection with its performance mandate.

MIC Symposium

The annual MIC symposia have become a well-recognized event in Switzerland and adjacent countries. In December 2012, the symposium was dedicated to "Microscopy in 3 Dimensions". Three international and one local speaker attracted about a hundred experts in high-end microscopy. The Swiss Society of Optics and Microscopy (SSOM) annual microscopy meeting was organized jointly with the MIC meeting. This was an ideal way of promoting the MIC as the center of excellence in microscopy at the University of Bern.

Fig. 2: Impressions from the MIC Symposium 2012

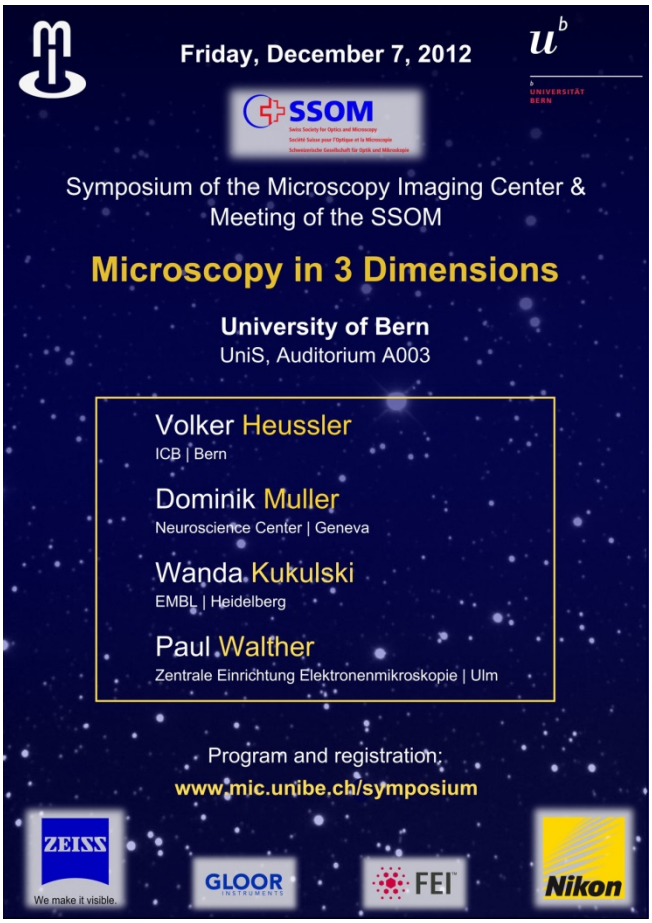

Fig. 3: Flyer of the MIC Symposium 2012

Further promotion of the MIC was achieved by several contacts to the growing expert networks like Swiss Bio Imaging, Swiss-Euro Bio Imaging, and the positioning of our website at Swiss Bio Imaging (http://www.swissbioimaging.org/).

Microscopy Equipment and Services

Through the MIC, a variety of microscopic techniques is made available to University members and others. Additionally, many services around microscopy are available. The instruments may be used by members of the MIC as well as by non-members. The equipment is located at different institutes of the University and administration and maintenance is performed locally. Nevertheless, access is easy and booking is managed centrally. Experts for a particular instrument are available locally. They manage admission and introduction for novices on their instruments. The concept of decentralization, local expertise and central coordination makes the MIC an exceptional institution.

It is the dedicated goal of the MIC and its members to offer a modern and constantly updated range of high-end imaging techniques matching the needs of our research community. This includes a continuous promotion of investments in microscopic equipment.

MIC equipment portfolio

MIC equipment allows imaging of structures from the centimeter to the nanometer range, including three-dimensional reconstruction and various live-imaging techniques.

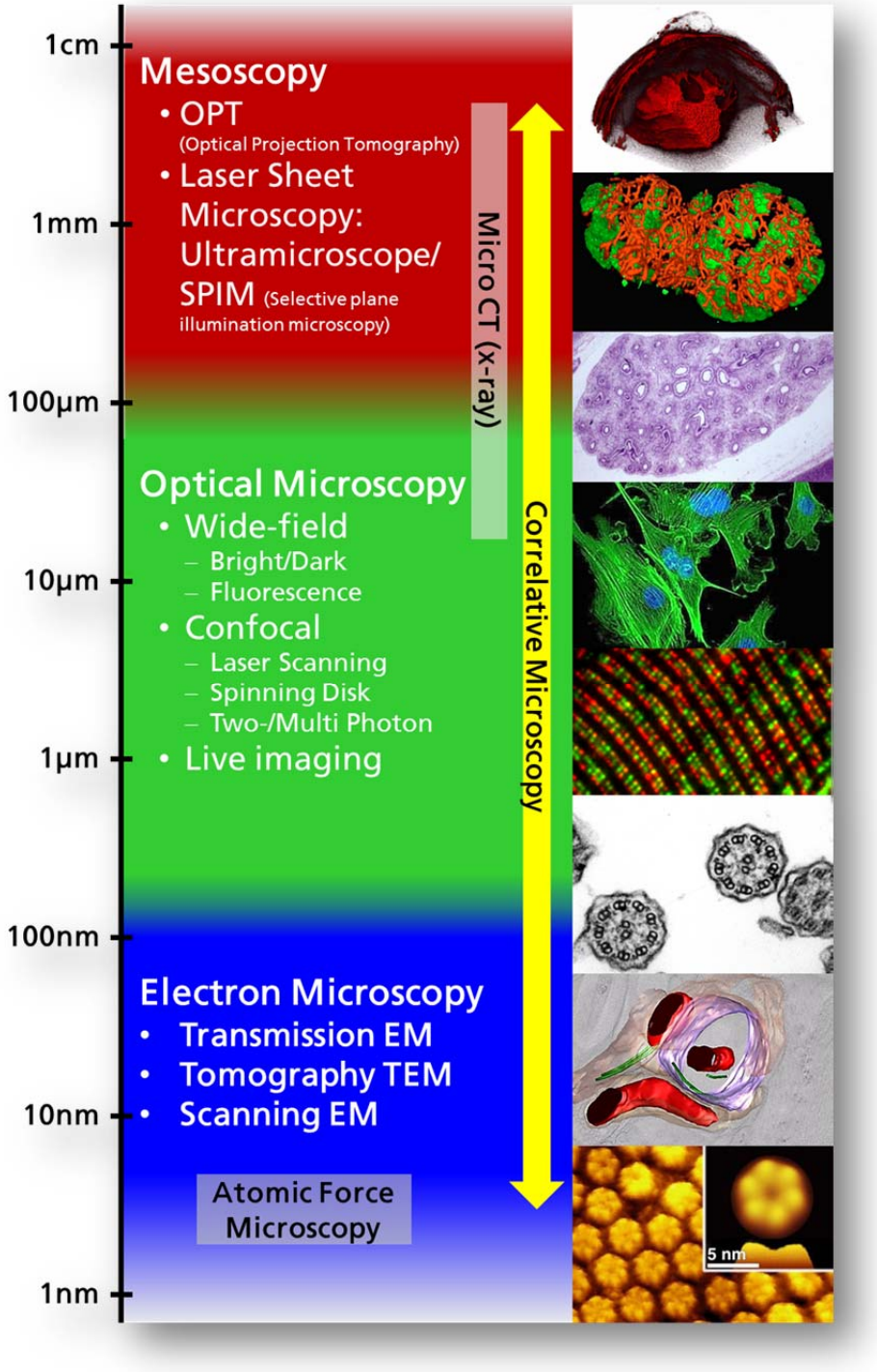

Fig. 4: Magnification range of MIC equipment

Instruments include conventional light and fluorescence microscopes, various laser scanning microscopes including multi-photon extensions, a spinning disk system, microscopes for live cell imaging, laser sheet systems, transmission (with tomography) and scanning electron microscopes, an atomic force system, a high content analysis system as well as the recently installed micro CT. Every instrument is listed on the MIC website with a technical description and the contact to the device expert who is responsible for maintenance and introduction for new users.

Table 4: Available MIC equipment

Microscopic Technique		Number	
LM	Fluorescence	6	
	Live Fluorescence	5	
	Confocal Laser Scanning Microscopy	9	
	Live LSM	2	
	other Confocal Systems (Spinning Disk)	1	
	other LM (High Content Analysis, Reflected Light)	2	
	Mesoscopy (Laser sheet, Optical projection)	3	**28**
EM	TEM (incl. 2 Tomography TEM)	6	
	SEM	2	**8**
Other techniques (µCT, AFM)		2	**2**
		Sum	**38**

Usage modes of MIC equipment

Most of the high-end systems available at the MIC are subject to usage fees.

The MIC-Commission has defined compulsory rates for each category of devices. The rates are published on the MIC website (http://www.mic.unibe.ch/files/Rates_MIC_2012.pdf). Hourly rates and 200 hour packages for heavy usage are offered. The package fee is calculated on the basis of about 15% of a one-hour fee. Packages are effective within one calendar year. Several instruments can be booked with an operator, charged at a higher rate.

Usage of some instruments as part of a scientific collaboration with a major contribution of the local experts may be free of charge.

For usage of MIC equipment by non-university clients, especially from the industry higher rates are applied.

Some institutions offer microscopy as full service from sample preparation to microscopic image acquisition. The individual rates including work costs of the lab technician and operator are taken together.

Table 5: Detailed list of MIC equipment

Main application	Device	Extension	
Mesoscopy	Bioptonics OPT Scanner	Optical Projection	TKI
	Selective Plane Illumination Microsc.	Laser Sheet	TKI
	LaVision Ultramicroscope	Laser Sheet	TKI
Digital Reflected Light	Keyence VHX-600		Vet. Anatomy
Fluorescence	Nikon OptiPhot 2		Anatomy
	Leica DMI4000B		DKF
	Zeiss AxioVert 35		Pharmacology
	Leica MZ16		TKI
	Nikon Eclipse E600		TKI
	Zeiss AxioImager Z1		Vet. Anatomy
Live Fluorescence	Nikon Eclipse Ti-E		Pathology
	Custom made Microscope	2-Photon	Physiology
	IVM-500		TKI
	LaVision TrimScope	2-Photon	TKI
	Zeiss AxioObserver		TKI
Confocal LSM	Zeiss LSM 510 Meta		Anatomy
	Nikon Eclipse Ti-E		Applied Physics
	Nikon TE2000e		Biochemistry & Mol. Med.
	Leica SP2		Cell Biology
	Zeiss LSM 510		Pharmacology
	BioRad MicroRadiance		Physiology
	Olympus FluoView 1000	2-Photon	Physiology
	VisiTech VtEye		Physiology
	Leica TCS SP5		Plant Science
Live Confocal LSM	Zeiss LSM 5 Duo Live		Anatomy
	Zeiss LSM 5 Exciter		DKF
Spinning Disk Microscopy	Till Photonics iMIC		Cell Biology
High Content Analysis System	GE InCell Analyzer		Vet. Anatomy
Transmission EM	FEI CM12		Anatomy
	FEI Morgagni		Anatomy
	FEI Tecnai F20	tomography	Anatomy
	Philips TEM400		Anatomy
	Zeiss LEO 912	tomography	Anatomy
	Philips CM12		Vet. Anatomy
Scanning EM	Philips XL-30	EDX	Anatomy
	Zeiss DSM 982	STEM	Vet. Anatomy
Atomic Force Microscopy	Nanoscope 2		Biochemistry & Mol. Med.
Micro CT	SkyScan µCT		Anatomy

MIC Microscopy Services

Several preparation methods for light and electron microscopy are available as charged service in some MIC institutions. This comprises:

- Chemical fixation
- Embedding
- Contrasting
- High-pressure freezing
- Cryo-substitution
- Ultramicrotomy
- Cryo-ultramicrotomy
- Critical point drying
- Sputtering

Rates of these services are determined individually according to operating expenses.

Other consulting services offered by the MIC are:

- Quantification in microscopy: Stereology, including sampling and data assessment
- Image processing: 3D data visualization, image restoration
- IT issues: data handling and storage

Utilization statistics of MIC equipment

The degree of utilization of microscopes is a benchmark for the appropriate operation of the MIC and its equipment. It allows to assess the efficiency of microscopy systems and to analyze further requirements. By means of the new booking system MICBOOK that centrally manages all the equipment's bookings (see below), the MIC staff has easy access to detailed reports.

A statistical analysis of utilization of some instruments is presented here as "Relative Usage" (see Table 6): The use during 8 weeks in February / March 2013 was analyzed exemplarily. The duration of utilization was tested versus an 8 week 5 days 10 h (400h) period being 100%. Some MIC instruments can be booked over 24h and also at weekend what results in relative values higher than 100%.
In this period 103 users from 12 institutions were using MIC devices.

Table 6: Utilization statistics of MIC devices

Device	Technique	Institute	Usage [h]	Relative. Usage	
TILL Photonics iMIC	Spinning Disk	IZB	615	154%	
Leica TCS SP2	CLSM	IZB	484	121%	
LaVision TrimScope	Multi-Photon	TKI	424	106%	
Zeiss AxioObserver	Fluorescence Live	TKI	336	84%	
FEI Tecnai F20	TEM tomography	ANA	295	74%	
Philips CM 12 (ana)	TEM	ANA	145	36%	
Zeiss LSM 5 Duo Live	CLSM Live	ANA	139	35%	
Nikon Eclipse E600	Fluorescence	TKI	113.5	28%	
Philips CM 12	TEM	VET	103	26%	
Zeiss LSM 510 Meta	CLSM	ANA	97	24%	
FEI Morgagni	TEM	ANA	95	24%	
Philips EM 400	TEM	ANA	78	20%	
Leica DMRB	LM	ANA	60	15%	
Zeiss AxioImager	Fluorescence Live	VET	51	13%	
LaVision Ultramicroscope	Laser Sheet	PHYSIO	26	7%	New on MICBOOK
Nikon Ti-E A1R MP	CLSM	IAP	19	5%	Log not complete
InCell Analyzer 2000	HCA	VET	18	5%	New on MICBOOK
Philips XL 30 FEG	SEM	ANA	10	3%	Reparation
Imaris Computer	Imaging workstation	ANA	8	2%	Reparation
SkyScan µCT	X-Ray Micro CT	ANA	6	2%	Log not complete
Zeiss DSM 982	SEM	VET	2	1%	Log not complete
Keyence VHX-600	Reflected Light	VET	2	1%	Log not complete

This table shows the MIC instruments managed by MICBOOK equipment manager from Feb. 4th to March 31st 2013.

The MICBOOK Equipment Manager is still in the introductory phase. It went online on November 1st 2012 only and some instruments were added just recently. The present utilization is therefore a first appreciation.

Teaching

The teaching activity of the MIC encompasses a lecture series on high end microscopy and several practical modules focusing on particular imaging techniques.

Teaching is performed by the experts in the field coming from all participating institutions.

Cutting Edge Lectures Series

This lecture comprises a series of two hour lessons during the entire fall semester covering all relevant high-end microscopic topics (see Table 7).

Table 7: Cutting Edge Program 2012

Lecture series „Cutting Edge Microscopy“ HS2012

Every Friday, 8:15-10:00, Locations:

- Institute for Anatomy, Bühlstrasse 26, Room A224
- Main building University, Hochschulstrasse 4, Room 106
- EXAM: 11.01.2013: Chemie, Freiestrasse 3, Room UG113

Date	Subject		Lecturer
21.9.2012	2h Introduction to Cutting Edge Microscopy (including practical part in the Histology room of the Institute of Anatomy)		S. Tschanz (Anatomy)
28.9.2012	Group A: 1h Physical basics of LM imaging, part 1 1h Microscopy Demos	Group B: 2h Microscopy Demos	 M. Frenz / J. Ricka (IAP) Various teachers
5.10.2012	Group A: 2h Microscopy Demos	Group B: 1h Physical basics of LM imaging, part 1 1h Microscopy Demos	 M. Frenz / J. Ricka (IAP) Various teachers
12.10.2012	1h Physical basics of light optical imaging, part 2 1h Fluorescence Microscopy		M. Frenz / J. Ricka (IAP) F. Blank (DKF)
19.10.2012	*Specific applications of fluorescence microscopy:* 1h Laser scanning microscopy 1h Laser scanning microscopy and specific applications (FRET, FRAP, Spectral unmixing) and digital image restoration (Huygens and Imaris software)		 B. Rothen (DKF) S. Yousefi (Pharmacology)
26.10.2012	1h Calcium-imaging with confocal microscopy 1h Super resolution imaging		E. Niggli (Physiology) T. Nevian (Physiology)
2.11.2012	1h LED illumination and Grid projection 1h Time Lapse Microscopy		R. Lyck (TKI) V. Niggli (Pathology)
9.11.2012	1h Intravital microscopy 1h Multiphoton-intravital microscopy		G. Enzmann / B. Engelhardt (TKI) J. Stein (TKI)
16.11.2012	1h Optical projection tomography 1 h Atomic Force Microscopy		J. Stein (TKI) D. Fotiadis (IBMM)
23.11.2012	2h Transmission Electron Microscopy		D. Vanhecke (A. Merkle Institute)
30.11.2012	2h Cryo-electron Microscopy		B. Zuber (Anatomy)
7.12.2012	2h Scanning Electron Microscopy		M. Stoffel (Vet. Anatomy)
14.12.2012	2h Stereology		S. Tschanz (Anatomy)
11.01.2013	2h Written exam, **Location: Chemie, UG113**		S. Tschanz (Anatomy)

The lectures on 17 topics are given by 15 experts in the respective field. The topics of the lectures are coordinated and discussed between all contributing lecturers. The unique microscopy "demo parcours" shall be mentioned here in particular. All the students get a hands-on demonstration of six high end microscopes (see Fig. 5) located at the Bühlplatz area.

A written exam evaluating the learning success has to be accomplished at the end of the course. The students get 3 ECTS points and are admitted to the advanced practical MIC modules.

Since the start of the Cutting Edge lecture series in 2010 (40 students) its reputation has steadily increased. In 2012, 64 students from several Master and PhD programs were enrolled in the series. The exam was attended by 57 students 44 of which passed.

The formal evaluation of the lecture series by the students, done in collaboration with the evaluation office of the University of Bern, indicated a very good perception and highest ranking with respect to quality, scope and relevance.

Fig. 5: Students at the Cutting Edge Demo Parcours

MIC modules

Eleven different practical microscopy modules were offered by the MIC (see Table 8). Many of them were almost fully booked. All modules dealing with microscopes were realized on state of the art devices provided by the MIC.

Table 8: MIC Modules 2012

Microscopy Imaging Center (MIC)

Practical modules 2012

Name of the module	Type of module	Semester/Duration	Lecturer	ECTS	Attendance (max)
Basic module: Histologic/microscopic methods *Institute for Cell Biology*	Lecture & Practical	HS – 1h lecture + 3 half-day practicals	Ch. Rhiner	3	12 (12)
Microscopy Applications For Immunological Research *IRB, Bellinzona*	Lecture & Practical	HS - 3 days	M. Thelen,	1.5	10 (10)
Conventional fluorescence microcopy, Laser scanning microscopy (LSM), and digital image processing *DKF*	Practical	FS- 2 days	F. Blank	1	2
Fluorescence microscopy and LSM *DKF*	Practical	HS – 2 days FS – 2 days	S. Yousefi Z. He	1	14 (HS) 16 (FS)
Fluorescence microscope and grid projection/structured illumination (ApoTome) *TKI*	Practical	FS- 1 day	R. Lyck	0.5	
Time lapse Videomicroscopy *TKI, Pathology*	Practical	FS- 1 day	R. Lyck V. Niggli	0.5	
Transmission electron microscopy *Institute for Anatomy*	Practical	FS- 5 days	D. Studer D. Vanhecke	2.5	4 (4)
Stereology *Institute for Anatomy*	Practical	FS- 5 days	S.Tschanz M.Ochs	2.5	19 (25)
Scanning electron microscopy *Vetsuisse*	Practical	FS- 2 days	M. Stoffel	1	2
Multiphoton Intravital Microscopy *TKI*	Practical	FS- 2 days	J. Stein	1	
Intravital Microscopy *TKI*	Practical	FS- 2 days	S. Coisne G. Enzmann	1	1
Imaging and Analysis of Cardiac Calcium Signals with Confocal Microscopy *Institute for Physiology*	Practical	FS- 3 days	E. Niggli	1.5	
Optical Projection Tomography (OPT) *TKI*	Practical	FS- 1 days	J. Stein	0.5	2

HS: Fall semester
FS: Spring semester

Administrative Activities

In the past year, many new procedures and administrative tools were defined. They were designed and established by the coordinator in order to reduce administrative workload for MIC members, instrument users and also administration of institutes.

MICBOOK Equipment Manager

https://micbook.unibe.ch

The MICBOOK Equipment Manager is the web-based tool for managing utilization of MIC equipment. It was set online in November 2012. The system is based on the *Reservation System* of the DKF originally programmed by Niklaus Fankhauser, a bio-computer scientist. He was employed to completely redesign the system and adapt it to the needs of the MIC. The complete redesign of the software was focused to a straightforward booking and administration workflow mapping the multi-level and multi-institutional structure of the MIC.

In summary, every instrument is administered by the respective local instrument administrator. He defines instrument properties (e.g. booking period, maximal booking duration, instrument description) and particularly the admittance to the instruments.

Users and instruments can be assigned to institutes and further to research groups, allowing management per institute and/or per research group.

A user can request admittance to a new instrument by means of an automated email messaging system. After having successfully trained the applicant on the microscope, the administrator grants access to the instrument. Thereafter, the user may book and use the instrument without direct contact with the instrument's administrator.

Many new functions like a simplified login by means of the common CAMPUS login, a locking procedure or an automated email messaging system were implemented.

Particular focus was kept on the new *Usage Report* functionality allowing many kinds of assembled utilization statistics of MIC instruments. This report function includes a module for billing purposes that can be managed by administrative staff on a per institute basis.

The system works on a virtual server provided by the central IT department. Nicklaus Fankhauser has a contract for continuing maintenance and further development.

The MICBOOK Equipment Manager is available for the management of non-MIC objects too. Currently, it houses 66 objects and is operated by more than 185 users. Since its start in November 2013, more than 1600 equipment bookings have been performed (state: April 2013).

MIC Finance Reporting

The high costs of new microscopes but also their maintenance require a central financial assessment. In collaboration with the central Finance Department of the University, a straightforward and comprehensive workflow was established in order to supervise all financial transactions associated with microscopy in MIC institutions.

By simply adding a number tag to the accounting slip ("Kontierungszettel"), financial expenses and incomes are linked to the MIC finance reporting. This tagging is a so-called "Projekt Abrechnungs Objekt" (= PAO). Upon request, the coordinator receives a complete list of all labeled transactions.

Most MIC-associated institutes are currently contributing to this attempt to make financial flows transparent. Reporting was started in October 2012. The first 3 month resulted in the following balance

Revenues (all institutions pooled):	CHF 11'227.50	(Usage fees)
Expenses: **(all institutions pooled)**:	CHF 534'185.57	(e.g. new equipment, maintenance, service contracts)

Grant application support

The MIC has the key task to coordinate and support funding requests in the field of microscopy. The extraordinary costs of high-end microscopes and imaging systems require a coordinated investment strategy that avoids redundancies and lowers the costs. It is essential to focus on those technologies which match the needs of the research community best and which allows for highest scientific level AND optimal degree of utilization.

The MIC with all its members and member institutes has a privileged position to survey the current situation and helps to improve the chances of grant applications.

Together with the Resource Committee of the Medical faculty, a concise workflow of interaction between this committee, the applicants and the MIC has been established (see Fig. 6). As of 2013, this process will streamline the communication between all the actors.

Based on this model, the other participating Faculties (Science and VetSuisse) will adopt similar guidelines.

Successful application support

In 2012, the MIC successfully supported three larger microscopy investments at the University of Bern:

- VetSuisse Faculty, Dept. of Veterinary Anatomy, Prof. Michael Stoffel:
  GE InCell High-Content-Analysis System (HCA) CHF 425'220.-
- Medical Faculty, DCR, Prof. H. Abriel, Prof. B. Rothen-Rutishauser:
  ZEISS LSM710 Confocal system CHF 550'000.-
- Faculty of Science, Institute of Cell Biology, Prof. V. Heussler, Prof. P. Meister
  Till Photonics iMIC Spinning disk system CHF 420'000.-

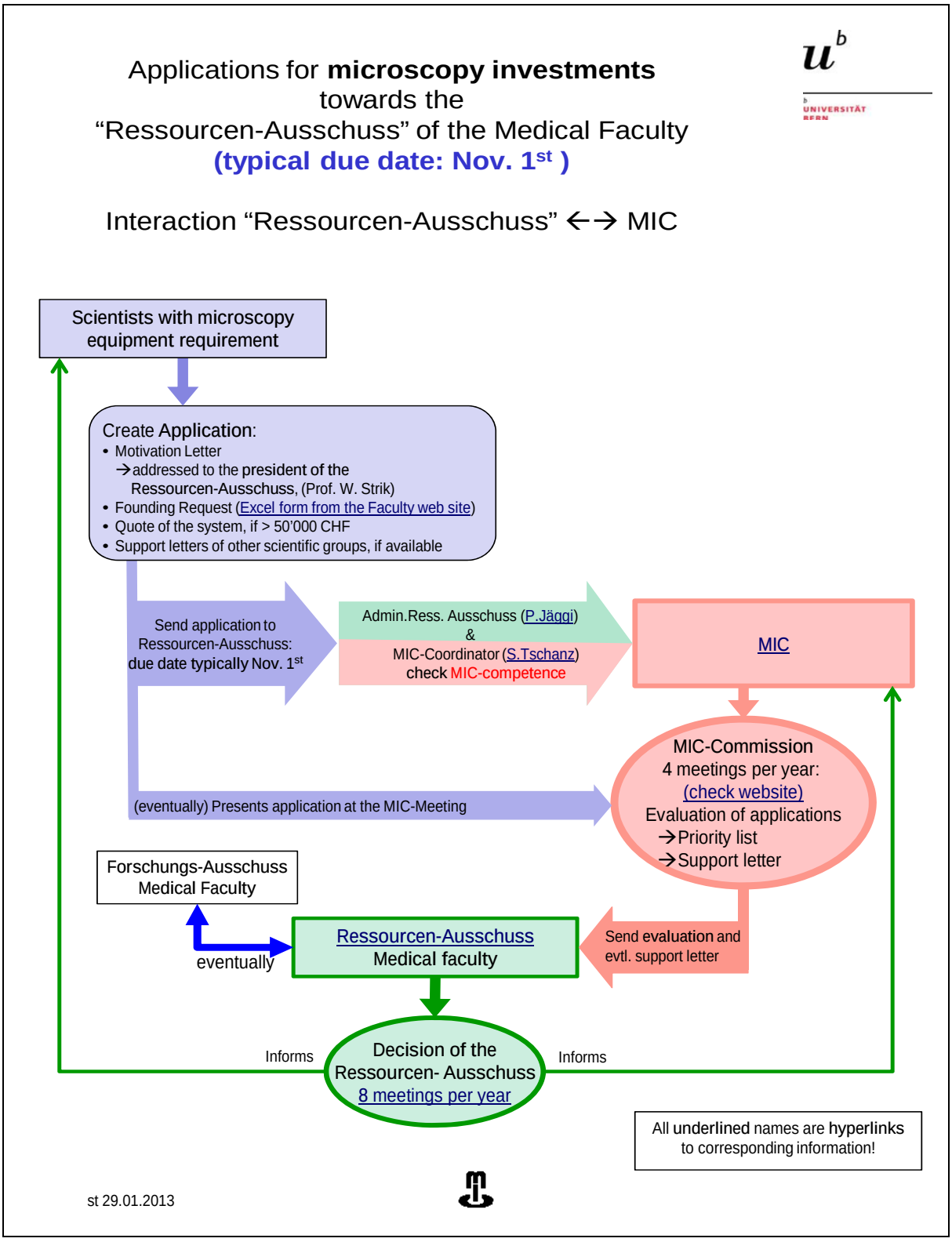

Fig. 6: Funding support workflow

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