



German Research School
for Simulation Sciences

Master's Program Simulation Sciences



Joint Workshop on Large-Scale Computer Simulation
JICS, Oak Ridge National Lab, April 25–27, 2012



Overview



German Research School
for Simulation Sciences (GRS)

Master's Program

Curriculum

Students

Faculty

Characteristic Elements

Potential Collaborations





GRS

- Joint graduate school of RWTH Aachen University and Forschungszentrum Jülich
- Devoted to advanced research and training in applications and methods of computer simulation in science and engineering
- Combines the specific strengths of its founders in the fields of natural sciences, engineering, and high-performance computing

RWTHAACHEN
UNIVERSITY

JÜLICH
FORSCHUNGSZENTRUM





GRS: Partners

Forschungszentrum Jülich

- Research center
(90% Federal Republic, 10% Federal State of NRW)
- 4,700 staff, 1,600 scientific staff, 460M € budget
- Excellent reputation in natural sciences
- Unmatched infrastructure: supercomputing, imaging



RWTH Aachen University

- 480 professors, 2,000 scientific staff, 750M € budget
- 36,000 students (5,500 students from 120 countries)
- 126 study programs
- Consistently ranked #1 in engineering in Germany
- Successful in all funding lines of Excellence Initiative





GRS: Budget and Staff

Budget – 6M € annually, provided by

- Federal Republic of Germany
- State of North Rhine-Westphalia
- Helmholtz Association
- Forschungszentrum Jülich*
- RWTH Aachen University*

*: in kind contributions

Staff – ca. 60 in total, including

- 4 professors
- 10 post-docs
- 36 doctoral candidates





GRS: Laboratories



Prof. Sabine Roller

Applied Supercomputing in
Engineering



Prof. Paolo Carloni

Computational
Biophysics



Prof. Felix Wolf

Parallel
Programming



Prof. Erik Koch

Computational Materials
Science



GRS: Own Infrastructure

- New dedicated buildings
 - in Aachen (August / November 2009)
 - and Jülich (January / April 2010)
- providing office space
and lecture rooms
- Videoconferencing
- Teleteaching
- JARA shuttle (Aachen – Jülich)





GRS: Offerings

- Master's and Doctorate in Simulation Sciences
- Tight integration into research activities in Jülich and Aachen
- Access to extraordinary high-performance computing and visualization resources
- Incentive to broaden and shift individual focus from natural sciences to engineering, or vice versa
- Contacts to industry and partner programs





GRS: Doctoral Offerings

Doctorate (Dr.rer.nat. and Dr.-Ing., equivalent to PhD)

- Duration: 3 years
- Admission: application and interview
- Start: any time
- Funding: position as scientific staff member
- Supervisors: GRS professors or associated professors
- Degrees are formally awarded by RWTH Aachen University, with a reference to the German Research School for Simulation Sciences



Master's Program

Master of Science (M.Sc.) in Simulation Sciences

- Duration: 2 years (4 semesters)
- Non-consecutive, interdisciplinary, international
- Start in winter semester 2008/09
Regular start in winter semester 2009/10
- Students are admitted by GRS and enrolled as RWTH students
- Degrees are formally awarded by RWTH Aachen University, with a reference to the German Research School for Simulation Sciences



Master's Program: Profile

Master of Science (M.Sc.) in Simulation Sciences

- Basic requirements: Bachelor's degree in engineering, natural sciences, mathematics or computer science with excellent grades and programming knowledge
- Basic training in methodological principles of computer simulation
- All mandatory and most of the elective courses held in English
- Specialization in one field or broadening of qualification
- Access to resources of RWTH Aachen University and Forschungszentrum Jülich

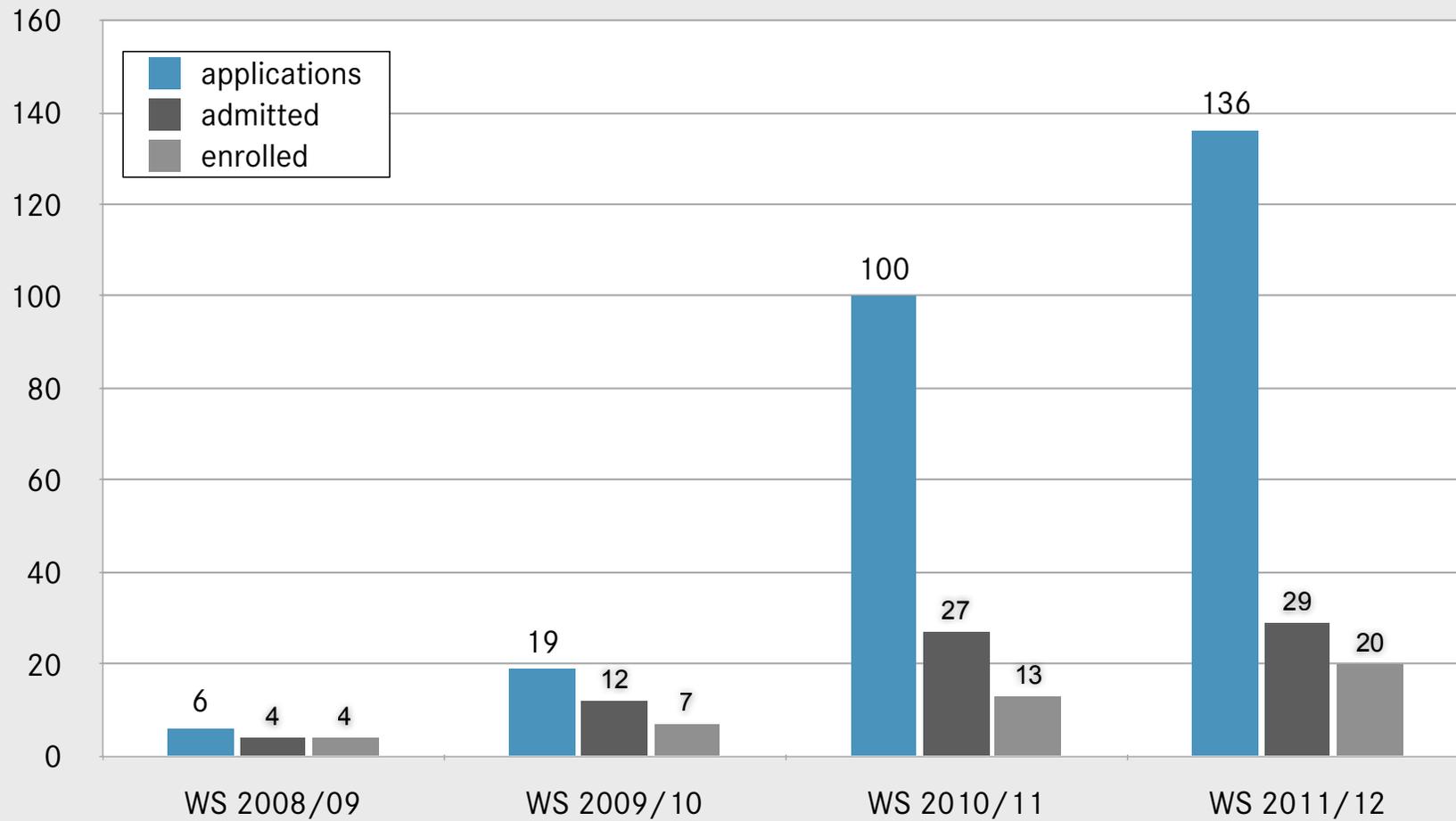


Curriculum

1st Semester (Winter) 30 CP	2nd Semester (Summer) 30 CP	3rd Semester (Winter) 30 CP	4th Semester (Summer) 30 CP
Numerical Methods for PDEs 4+2, 8 CP	Fast Iterative Solvers 2+1, 4CP	SiSc Laboratory 0+3, 6 CP	Master's Thesis 27 CP
	Model Based Estimation Methods 2+2, 5 CP	Elective Courses 24 CP	
From Molecular to Continuum Physics I 3+2, 6 CP	From Molecular to Continuum Physics II 3+2, 5 CP		
Applied Quantum Mechanics 3+3, 6 CP	Parallel Computing in Simulation Sciences 3+2, 6 CP		
Parallel Programming I 3+2, 6 CP	Elective Courses 10 CP		
Data Analysis and Visualization 2+1, 4 CP			Master's Colloquium 3 CP

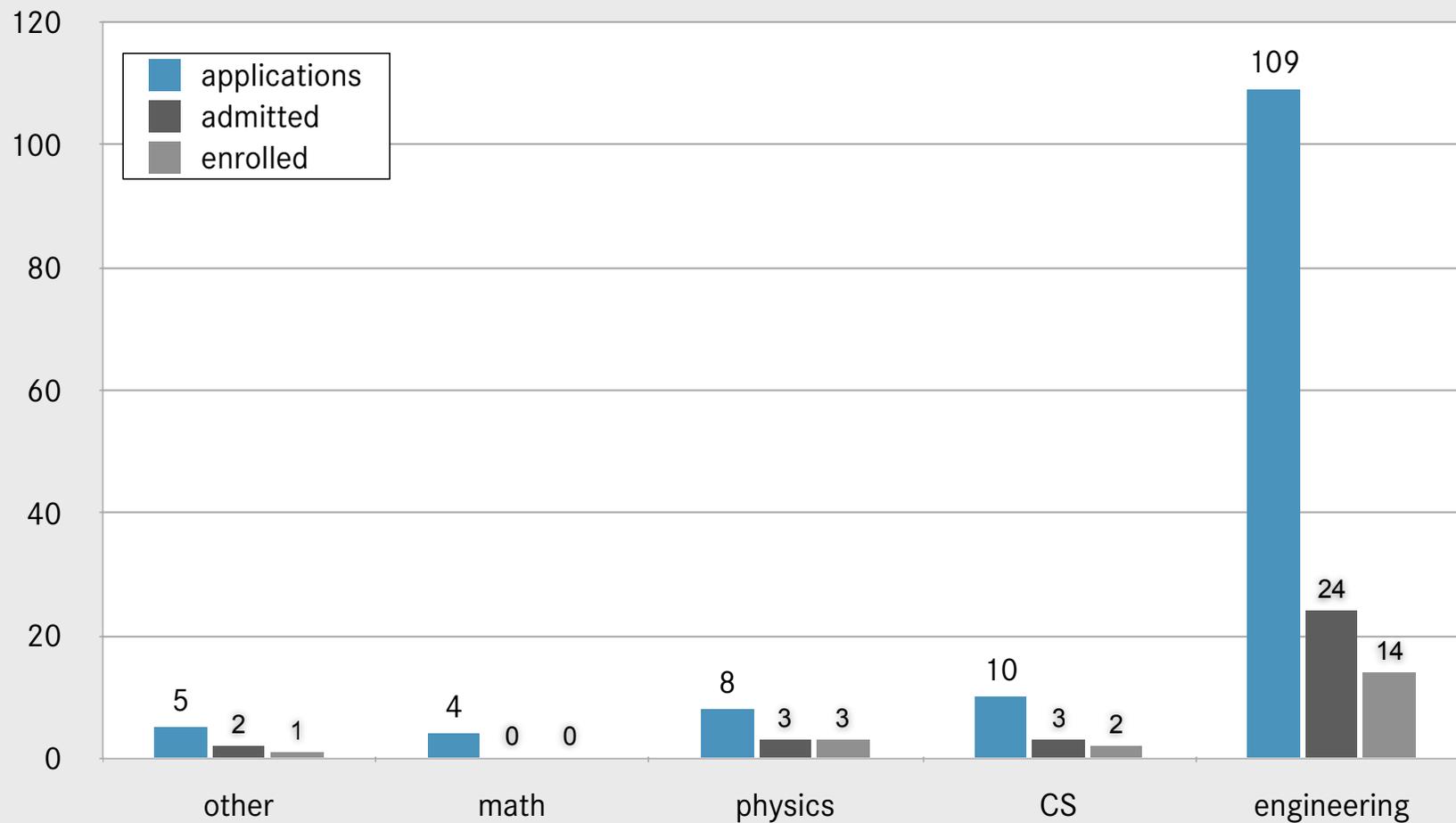


Students



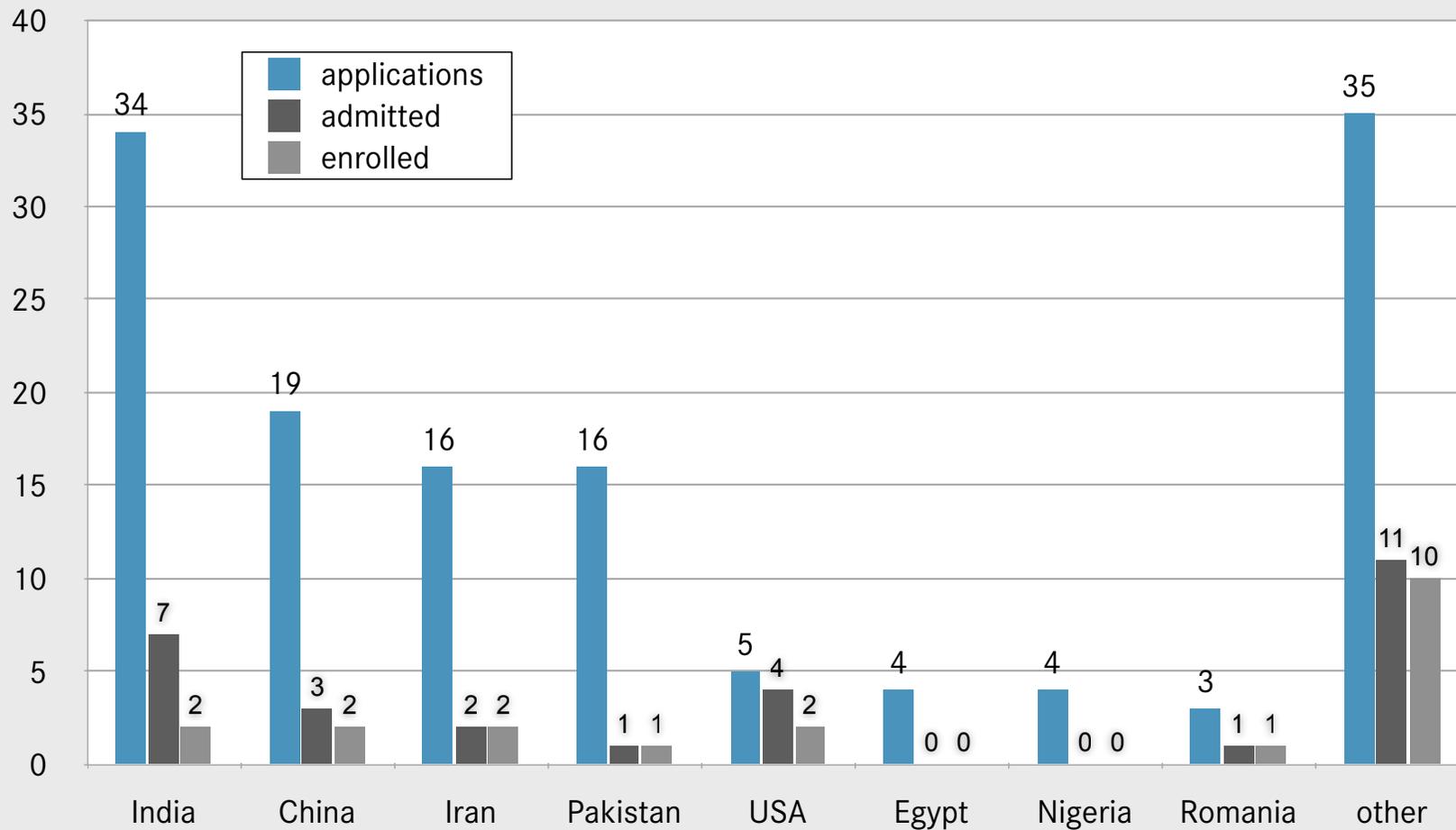


Students: Academic Background





Students: Degree Obtained in ...





Faculty



Prof. Roller

- Numerical Methods for PDEs
- From Molecular to Continuum Physics II
- SiSc Lab



Prof. Carloni

- From Molecular to Continuum Physics I
- SiSc Lab



Prof. Wolf

- Parallel Programming I
- SiSc Lab



Prof. Koch

- Applied Quantum Mechanics
- SiSc Lab



Faculty (RWTH)



Prof. Kobbelt
Prof. Kuhlen

- Data Analysis and Visualization



Prof. Behr

- Parallel Computing in Simulation Sciences



Prof. Marquardt

- Model Based Estimation Methods



Prof. May

- Fast Iterative Solvers



Characteristic Elements: Mentoring

Student Advisor

- gives advice and helps with bureaucratic issues (visa, housing, enrollment,...)

Large number of elective courses, from different scientific fields

→ students need advice to set up study plan

Scientific Advisor

- gives advice on study plan
- needs to agree with study plan
- may allow courses outside of the SiSc curriculum to be taken

Academic Advisor

- gives advice on study plan and formal issues

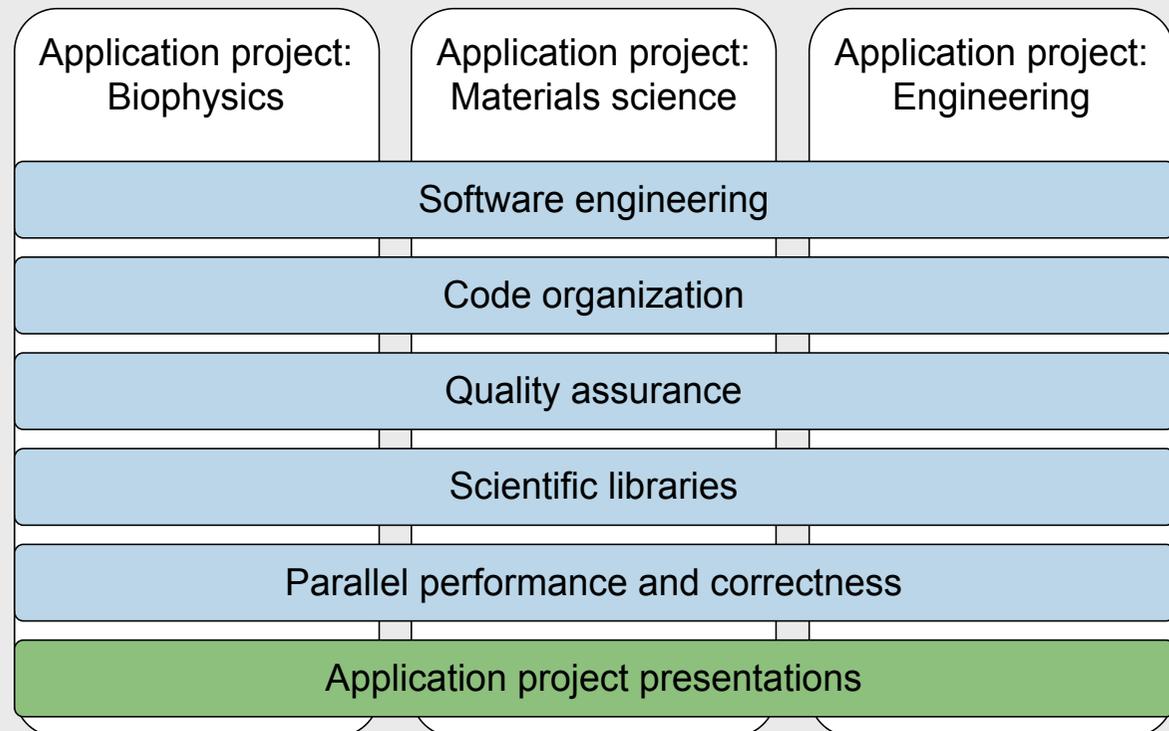


Characteristic Elements: Interdisciplinarity

Interdisciplinary courses

Example: Simulation Science Laboratory
(3rd semester)

- application projects in small groups
- computer science tutorials
- project presentations





Characteristic Elements: Link to Jülich

Additional courses by experts from Jülich

- example: Computational Molecular Biology

Lectures in Jülich

- example in winter semester:
Thursday in Jülich
(Applied Quantum Mechanics,
From Molecular to Continuum Physics I)

Students have access to non-university events:

- example: JSC training courses

Early contact with supercomputers





Potential Collaborations

Semester abroad

- 3rd semester (October–March)
- course selection needs to be checked in advance

Master's thesis abroad

- 4th semester (April–August)
- local supervisor needs to be involved

Stay abroad for doctoral candidates

- common projects
- summer internships

