European Centre for Theoretical Studies in Nuclear Physics and Related Areas

ECT* Wolfram Weise and Technische Universität München

- New Board member
- Scientific events 2014
- Research @ ECT*
- Budget status
- EU Projects (Horizon 2020)
- Perspectives 2015
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Edited by
Susan Driessen and Gian Maria Ziglio

Annual Report
2013

European Centre for Theoretical Studies in Nuclear Physics and Related Areas
Trento
ECT* Scientific Board

- **Board members** (status June 2014)

  Baha *Balantekin* (Chair)  Univ. of Wisconsin  
  Angela *Bracco* (NuPECC)  Univ. of Milano  
  Francois *Gélis*  CEA Saclay  
  Paul-Henri *Heenen*  Univ. Libre de Bruxelles  
  Maria Paola *Lombardo*  INFN Frascati  
  Judith *McGovern*  Univ. of Manchester  
  Piet *Mulders*  Free Univ. of Amsterdam  
  Arturo *Polls* (term ends June 2014)  Univ. de Barcelona  
  Johanna *Stachel*  Univ. Heidelberg  

- Last Board meeting: 6 June 2014, next meeting: 5 September 2014  
  Call for **Workshop Proposals 2015**

- **New Board member**
  following suggestions from the community / ECT* Associates nomination at the ECT* Scientific Board Meeting, 6 June 2014:
  Ubirajara *Van Kolck*  IPN Orsay  
  → proposed to NuPECC for approval

- **Search for next ECT* Director**
  (term of present Director ends 30 Oct 2015)  
  Search committee decided by ECT* Board at June 6 meeting
22 events: **Workshops, Collaboration Meetings** and **Training Programs**
(expected no. of participants / visitors to ECT*: ca. **800**)

**ECT* Scientific Events 2014**

- Nuclear Structure and Reactions
- Nuclear Astrophysics
- QCD and Hadron Physics
- Hot and Dense QCD Matter Relativistic Heavy Ions LHC Physics
- Related Areas: Astrophysics, High-Energy Particle Physics, Condensed Matter Physics, Quantum Many-Body Systems...

**Workshop of special interest** from **NuPECC** point of view:

**Future Directions in the Physics of Nuclei at Low Energies**

(May 21 - 23) Organizers: U.Van Kolck, F.Asaiiez, K.Blaum, A.Schwenk
In this chapter, we present the European landscape of current Nuclear Physics facilities, plans for building new large-scale research infrastructures (RIs) or performing major upgrades of existing ones, and the collaboration in the field at European and global level.

### 3.1 Existing Research Infrastructures and Upgrades

Europe may be grouped into theoretical and computing, lepton and hadron beam facilities. They form a network of closely collaborating laboratories that enjoy the strong support of the European Union via their Framework Programme (FP) 7. Access to these research infrastructures is generally open to researchers whose proposals have passed the scrutiny of programme advisory committees. We follow a north to south principle of arrangement.

#### 3.1.1 Theory and Computing

- **ECT* in Trento, Italy**
  - Website: [www.ectstar.eu](http://www.ectstar.eu)
  - 35 Students from 15 countries (selected from twice as many applicants)

ECT* is the only centre of its kind in Europe and faces new opportunities and challenges in the gradual more international coordination.

- **Jülich Supercomputer Centre, Germany**
  - Jülich Supercomputing Centre (JSC)
  - JSC's strategy is a dual architecture to have always a competitive leadership-class, highly scalable machine, and a general-purpose system with a balance of approximately 80% (in terms of capability).

Meetings per year on the topical problems listed and strengthening thereby the interchange between theoretical and experimental physicists, an absolute prerequisite for the advancement in the various areas of research.

Furthermore, presently and in the years ahead, ECT* administers scientifically the AuroraScience project which consists of interdisciplinary proposals that explore the architectural opportunities for high performance computing applications in Physics, Biology, Bioinformatics and Medical Physics.

National institutions and is embedded into the European Physics and is highly appreciated by the large and HSPXJOHDPNNVOJUZPGJUTVTFST*UTTDJFOUJàDQSPKFDUT are overseen by an internationally composed Scientific Board. ECT* is the only centre of its kind in Europe and faces new opportunities and challenges in the gradual more international coordination.

Programme Coordinators
François Gelis (Saclay) and Jean-Yves Ollitrault (Saclay)

Student Coordinator and Advisor
Georges Ripka (Saclay and ECT*)

Lecturers and topics

**Derek Teaney** *(Stony Brook, USA)*  
Relativistic hydrodynamics

**Guilherme Milhano** *(CENTRA, Lisbon & CERN, Switzerland)*  
Jets in heavy ion collisions

**Gregory Soyez** *(Saclay, France)*  
Jets in heavy ion collisions

**Marco van Leeuwen** *(Universiteit Utrecht, Netherlands)*  
Experimental techniques

**Mikko Laine** *(Universität Bern, Switzerland)*  
QCD at finite temperature

**Dionysis Triantafyllopoulos** *(ECT* Trento, Italy)*  
Color Glass Condensate

**François Gelis** *(Saclay, France)*  
Color Glass Condensate

**Peter Arnold** *(University of Virginia, USA)*  
Strong coupling techniques
In this chapter, we present the European landscape of current Nuclear Physics facilities, plans for building new large-scale research infrastructures (RIs) or performing major upgrades of existing ones, and the collaboration in the field at European and global level.

3.1 Existing Research Infrastructures and Upgrades

Europe may be grouped into theoretical and computing, lepton and hadron beam facilities. They form a network of closely collaborating laboratories that enjoy the strong support of the European Union via their Framework Programme (FP) 7. Access to these research infrastructures is generally open to researchers whose proposals have passed the scrutiny of programme advisory committees.

3.1.1 Theory and Computing

ECT* in Trento and the Jülich Supercomputer Centre (JSC) are two of the most prominent centers in this field.

ECT*, Trento, Italy

ECT* has a unique role in the international research landscape. It is a hub for collaboration between theoretical physicists and experimentalists, and it fosters a culture of openness and sharing.

With an annual turnover of around 10 million euros, ECT* employs about 400 researchers and provides a research environment with up to 700 visitors from about 40 countries spending from one week up to several months at the Centre.

ECT* has achieved high visibility and fulfills an important coordinating function in the European and international scientific community by:

1. Providing a platform for meetings per year on topical problems listed in the programme, which strengthens the interchange between theoretical and experimental physicists, an absolute prerequisite for the advancement in the various areas of research.
2. Offering Doctoral Training Programmes and arranging for them to participate in ECT* research projects.
3. Overseeing the AuroraScience project, which consists of interdisciplinary proposals that explore the architectural opportunities for high performance computing applications in Physics, Biology, Bioinformatics and Medical Physics.

ECT* is the only centre of its kind in Europe and faces new opportunities and challenges in the gradual more international coordination.

Jülich Supercomputer Centre, Germany

The Jülich Supercomputing Centre (JSC) is a European centre for high-performance computing. JSC's strategy is a dual architecture to have always a competitive leadership-class, highly scalable machine, and a general-purpose system with a balance of approximately three in terms of capability.

Today, the JSC's X100 system is one of the fastest supercomputers in the world, with a peak performance of 140,000 teraflops.

ECT* Nuclear TALENT School 2014

July 14 – August 01

Density functional theory and self-consistent methods

Organizers

Morten Hjorth-Jensen (Michigan State University and University of Oslo)
Giuseppina Orlandini (University of Trento)

Student Coordinator and Advisor

Morten Hjorth-Jensen (Michigan State University and University of Oslo)

Local Coordinator

Serena degli Avancini (ECT*)

Topics

Basic techniques of quantum many-body physics
Density functional theory for atoms and nuclei
Applications of nuclear DFT

Lecturers

Scott Bogner (Michigan State University)
Peter Ring (Technical University Munich)
Nicolas Schunck (Lawrence Livermore National Laboratory)
Dario Vretenar (University of Zagreb)

26 Students (selected from 34 applicants)
Research @ ECT* and Perspectives

- **Senior Research Associates (SRA), Postdocs, PhD Students**

  - **Daniele Binosi** (SRA - Italy)
  - **Maddalena Boselli** (PhD - FBK/ECT* - UniTN - Italy)
  - **Marco Cristoforetti** (until Nov. 2014) (Postdoc - Italy)
  - **Alexis Diaz-Torres** (SRA - Cuba / Germany)
  - **Daniel Gazda** (Postdoc - Czech Rep.)
  - **Philipp Gubler** (from Nov. 2014) (Postdoc - Switzerland / Japan)
  - **David Ibanez** (Postdoc - Spain)
  - **Abhishek Mukherjee** (Postdoc - India)
  - **Dionysis Triantafyllopoulos** (SRA - Greece)
  - **Matthias Drews** (visiting PhD - TUM/ECT* - Germany)
  - **Robert Lang** (visiting PhD - TUM/ECT* - Germany)

  (Status: June 2014)

  - **Gauge Field Theories; QCD**
  - **Theory of Low Energy Nuclear Reactions**
  - **Phases of QCD; Lattice Field Theory**
  - **Nuclear Structure & Reactions; Nuclear Astrophysics**
  - **Nuclear Systems with Strangeness; Hypernuclei**
  - **QCD Sum Rules; Quarkonia; Lattice QCD**
  - **QCD; Soft Collinear Effective Theories**
  - **Nuclear EFT & Renormalization Group**
  - **Dense & Hot Hadronic Matter: Transport Properties**

- **Next opening at postdoc level: Sept. / Oct. 2015**

- **ECT*‘s research output 2013:**
  - **32 publications** in high-rank international journals

- **Research output 2014 (by 31 May):**
  - **14 publications** in high-rank international journals + **19 preprints**

- **Future perspectives (from 2015):**
  - **5 additional researchers (through LISC @ ECT*) + one additional postdoc (INFN - TIFPA)**
**BUDGET and STATUS of FUNDING**

**Contributions to ECT* Annual Running Budget 2014**

Total: 1.07 M€

- **France**: 0.48 M€
- **Germany**: 0.13 M€
- **Italy**: 0.11 M€
- **Others**: 0.16 M€
- **Eu Projects**: 0.09 M€
- **Others**: 0.10 M€

**Sponsors**:
- CNRS IN2P3
- CEA
- Bundesministerium für Bildung und Forschung
- HIC for FAIR
- INFN
- EMMI
- GOETHE UNIVERSITÄT FRANKFURT AM MAIN

**Contributing Countries**:
- Belgium, Czech Republic, Finland, Netherlands, Poland, Romania, UK

**Projects**:
- HadronPhysics
- QUTE-Europe
- ENSAR
- Study of Strongly Interacting Matter

**Other**:
- Study of Strongly Interacting Matter
- HadronPhysics
- QUTE-Europe
- ENSAR

**Image**

[Image of a pie chart showing contributions to ECT* Annual Running Budget 2014]
Memorandum of Understanding (MoU)

Signed Sept. 2013 by representatives of national funding agencies and institutions to coordinate financial contributions to ECT* from 2014 onward.

plus

Protocols of Agreement

3 October 2014 next meeting of EJFRC (ECT* Joint Finance Review Committee)

ECT* Budget 2014

<table>
<thead>
<tr>
<th>Country</th>
<th>MoU</th>
<th>Euro</th>
<th>Remarks</th>
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</tr>
<tr>
<td>Belgium FWO</td>
<td>y</td>
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<td></td>
</tr>
<tr>
<td>Belgium FNRS</td>
<td>y</td>
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<td></td>
</tr>
<tr>
<td>Czech Republic</td>
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<td>10.000</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>?</td>
<td>------</td>
<td>no contribution</td>
</tr>
<tr>
<td>Finland</td>
<td>y</td>
<td>8.000</td>
<td></td>
</tr>
<tr>
<td>France CNRS</td>
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<td></td>
</tr>
<tr>
<td>France CEA</td>
<td>y</td>
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<td></td>
</tr>
<tr>
<td>Germany</td>
<td>y</td>
<td>100.000</td>
<td>+ 26.000</td>
</tr>
<tr>
<td>Greece</td>
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<td>(Uni Fra + EMMI + HIC for FAIR)</td>
</tr>
<tr>
<td>Hungary</td>
<td>y</td>
<td>?</td>
<td>no contribution so far</td>
</tr>
<tr>
<td>Italy</td>
<td>y</td>
<td>100.000</td>
<td>+ 10.000 (INFN)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>ų</td>
<td>8.000</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td></td>
<td>------</td>
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</tr>
<tr>
<td>Poland</td>
<td>y</td>
<td>10.000</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>y</td>
<td>6.000</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
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<td>(20.000 for 2012)</td>
</tr>
<tr>
<td>Sweden</td>
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<td>------</td>
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</tr>
<tr>
<td>United Kingdom</td>
<td>y</td>
<td>26.000</td>
<td></td>
</tr>
</tbody>
</table>
New 5-years plan of FBK in preparation

**Interdisciplinary Laboratory for Computational Science (LISC)**
- so far: joint venture of FBK and UniTN integrated into CMM (Centre for Advanced Materials and Microsystems of FBK)
- Research in *many-body theory, computational physics, condensed matter physics*, complex bio-systems etc.
- ECT*-LISC seminars and joint publications

**LISC** basic research group will become part of **ECT**

- 5 **LISC researchers** will join **ECT**
- strengthen **ECT**’s research in “**Related Areas**”
- enhance *cross-disciplinary* profile
- institutional access of **ECT** to **High Performance Computing** facilities
- official start of **LISC**@**ECT** foreseen in **January 2015**
- maintain **ECT**‘s **European character** and **autonomy**
Plan:
establish one **postdoc position** at ECT* within the TIFPA framework

**Status** (as of June 2014):
- postdoctoral position at ECT*, supported by TIFPA, is confirmed
- aimed at reinforcing cooperations of INFN groups with ECT*
- letter of intent in preparation, to be signed by TIFPA and ECT*
ECT* is a Trans National Access center within HadronPhysics3 (2012-2014) Application for TNA within HadronPhysicsHorizon (from 2015) submitted

Horizon 2020 Framework Programme

HadronPhysicsHorizon (HPH)

TNA @ ECT*
540 kEuro / 3 years

Application of ECT* for TNA within ENSAR2 (from 2015) submitted

Horizon 2020 Framework Programme

ENSAR2

TNA @ ECT*
229 kEuro / 4 years
Cooperation Agreements

- Nuclear & Hypernuclear Theory
  - Phases of QCD
  - Nuclear Astrophysics
  - Lattice Field Theories

Cooperation Agreements (signed in 2013) with

**RIKEN Nishina Center** and

**National Astronomical Observatory of Japan**

are active and productive
(exchange of researchers, workshops, etc.)

In preparation (to be signed 31 July 2014):
Cooperation Agreement with

**Institute of Theoretical Physics**
**Chinese Academy of Sciences**, Beijing

Korea:
contacts in preparation for cooperation agreement with **APCTP**
Number of ECT* Visitors per Country 2013

Total: 850

- Germany: 171
- Italy: 132
- USA: 140
- France: 71
- Canada: 21
- Finland: 19
- Belgium: 12
- Poland: 18
- Russia: 36
- Spain: 27
- Switzerland: 29

Visitors