



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093

ECT\*



ECT\*  
EUROPEAN CENTRE  
FOR THEORETICAL STUDIES  
IN NUCLEAR PHYSICS AND RELATED AREAS

---

Gert Aarts (former ECT\* Director)

# Incoming Director: Bira van Kolck



- PhD: University of Texas, 1993 (with Weinberg)
- University of Arizona, from 2000
- Directeur de recherche CNRS, from 2012
- Mise à disposition: ECT\*, from March 1 2024
- expected formal start: July 1 2024, FBK and CNRS still in negotiation

main research  
interests

effective field theories in nuclear, atomic and particle physics  
emergence of nuclear structure and reaction properties from EFT of QCD  
nuclear tests of fundamental symmetries

# Outline: community input

- scientific board
- selected scientific activities in 2023/2024
  - workshops
  - doctoral training programme (DTP)
  - strong-2020
- funding
- 2025 call
- visitor programme (NEW)

all participants at ECT\* activities are invited to join as ECT\* associate



# Early-career researchers

task: think how ECRs can engage with ECT\*

- DTP aimed at PhD students
- participate with ECT\* workshops in informal environment
- co-organise a workshop, leadership skills
- lecture at or co-organise a DTP
- ...



ML and RG May 2024



# ECT\* mission



- ✓ to be a Centre at the frontline of research in theoretical nuclear physics
- ✓ to promote active contacts between theory and experiments, and to related areas of research
- ✓ to further the training of young researchers
- established in 1993
- Institutional member of ESF-Expert Committee NuPECC (Nuclear Physics European Collaboration Committee)
- community-driven, bottom-up approach

# ECT\* Scientific Board



[Almudena Arcones](#) | TU Darmstadt (D)

[David Kaplan](#) | University of Washington (USA)

[Denis Lacroix](#) | CNRS/IN2P3 (F)

[Marek Lewitowicz](#) | NuPECC/GANIL (F)

[Alexandre Obertelli](#) | TU Darmstadt (D)

[Assumpta Parreño Garcia](#) | University of Barcelona (E)

[Barbara Pasquini](#) | University of Pavia (I)

[Vittorio Somà](#) | CEA Saclay (F)

[Urs Wiedemann](#), Board Chair | CERN-TH (CH)

Ex officio: [Albino Perego](#) | University of Trento (I)

selected based on  
recommendations  
by the community:  
ECT\* associates

term is three years

new chair:

**Barbara Pasquini**

new member:  
Gilberto Colangelo

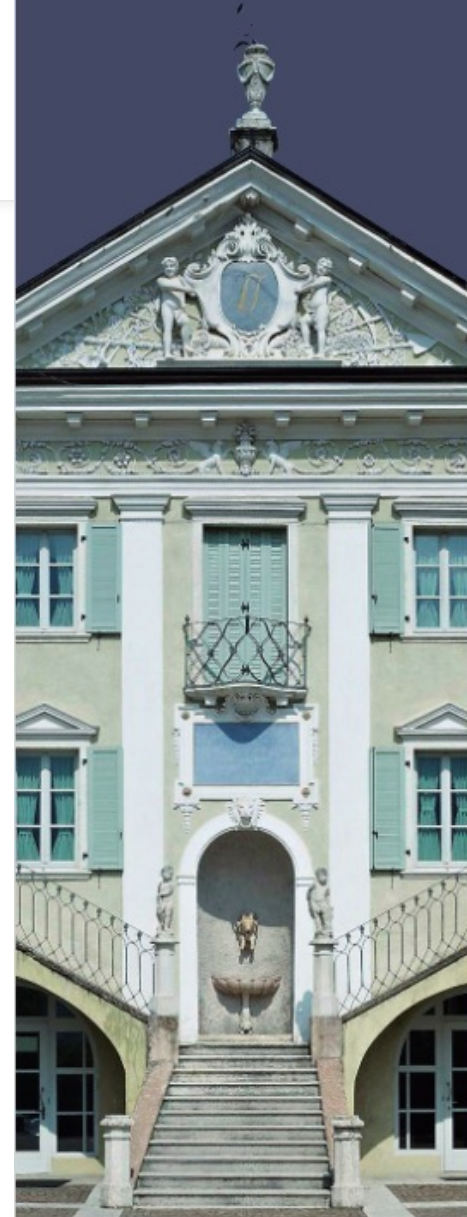
current call for two  
new members

# 2023 Annual Report

<https://www.ectstar.eu/about-us/annual-report/>

overview of all scientific and research activities,  
including list of ECT\* publications

 ECT\*  
EUROPEAN CENTRE  
FOR THEORETICAL STUDIES  
IN NUCLEAR PHYSICS AND RELATED AREAS  
FONDAZIONE  
BRUNO KESSLER



## ANNUAL REPORT 2023

European Centre for Theoretical Studies  
in Nuclear Physics and Related Areas  
Trento | Italy

Institutional Member of the European Science  
Foundation Expert Committee NuPECC

ECT\* | Strada delle Tabarelle 286 | Villazzano (Trento)  
Info: [staff@ectstar.eu](mailto:staff@ectstar.eu)



# SYMPOSIUM IN OCCASION OF THE 30TH ANNIVERSARY OF ECT\*

OCTOBER 4TH, 2023

ECT\* | Aula Leonardi

ECT\* | Villazzano, Trento,  
Strada delle Tabarelle 286

Info: [staff@ectstar.eu](mailto:staff@ectstar.eu)

## PROGRAMME



- 9.00 – 10.00 **Welcome and introduction by invited guests**
- 10.00 – 10.45 **Computing the Heart of Matter**  
Sonia Bacca (University of Mainz)
- 10:45 – 11:15 Coffee break
- 11:15 – 12:00 **Ab-initio Nuclear Physics in Trento**  
Francesco Pederiva (University of Trento)
- 12:00 – 14:00 Lunch at Villa Tambosi
- 14:00 – 14:45 **Color Glass Condensate in Collider Physics**  
Dionysios Triantafyllopoulos (ECT\*)
- 14:45 – 15:30 **Cosmic Laboratories for Nuclear Physics**  
Almudena Arcones (TU Darmstadt)
- 15:30–16:00 Coffee break
- 16:00 – 16:45 **Cosmic Thirty Years of Education and Research on Nuclear Many-Body Physics at the ECT\*; from traditional methods to quantum computing and machine learning**  
Morten Hjorth-Jensen (Michigan State University, USA and University of Oslo, Norway)
- 16:45 – 17:30 **Quantum Fractals**  
Ubirajara Van Kolck (JCLab Orsay & University of Arizona)
- 18:00 Dinner at Villa Tambosi

The ECT\* is part of the Fondazione Bruno Kessler. The Centre is funded by the Autonomous Province of Trento, funding agencies of EU Member and Associated states, and by INFN-TIFPA and has the support of the Department of Physics of the University of Trento.



7 OTTOBRE 2023

ORE 17.00

Aula Grande – Fondazione Bruno Kessler  
Via Santa Croce 77 – Trento

## LAURA FABBETTI IL LUNGO VIAGGIO DEGLI ANTINUCLEI

Gli antinuclei sono immagini speculari dei normali nuclei atomici, con la stessa massa ma carica opposta. Non esistono fonti naturali di antinuclei sulla Terra, ma possono essere prodotti in laboratorio presso grandi acceleratori di particelle. Gli antinuclei vengono cercati anche nello spazio, perché potrebbero essere la chiave di uno dei più grandi misteri della fisica: la materia oscura. La materia oscura è onnipresente e rappresenta cinque volte la massa di tutta la materia che possiamo osservare sotto forma di stelle nel cielo, pianeti e tutto il gas intermedio nelle galassie. Non è però possibile vedere o toccare la materia oscura perché non interagisce con la luce o con le forze elettriche. Gli antinuclei offrono un nuovo modo di guardare nello spazio per cercare la materia oscura in quanto essa può interagire per creare antinuclei altrimenti quasi assenti. Come possiamo trovare queste particelle nello spazio? Quali proprietà dobbiamo conoscere? E da dove possono provenire gli antinuclei nello spazio? Durante l'evento approfondiremo queste domande e seguiremo il lungo viaggio degli antinuclei dal centro della nostra galassia alla Stazione Spaziale Internazionale nello spazio.

EVENTO PUBBLICO IN OCCASIONE DEL TRENTESIMO ANNIVERSARIO DI ECT\*

INFORMAZIONI  
[staff@ectstar.eu](mailto:staff@ectstar.eu)

ECT\* fa parte della Fondazione Bruno Kessler. Il Centro è finanziato dalla Provincia Autonoma di Trento, dalle agenzie di finanziamento degli Stati membri e associati dell'UE, dall'INFN-TIFPA e gode del supporto del Dipartimento di Fisica dell'Università di Trento.

La Prof.ssa LAURA FABBETTI si è laureata in fisica all'università Statale di Milano ed è docente di fisica nucleare presso l'Università Tecnica di Monaco (TUM). Nel 2007 ha diretto un gruppo di ricerca Helmholtz junior alla TUM in stretta collaborazione con la Gesellschaft für Schwerionenforschung (GSI) e, dal 2008, un gruppo di ricerca junior dell'Universe Cluster of Excellence. Nel 2011 ha vinto la cattedra presso la TUM, dove dirige la divisione di Density and Strange Hadronic Matter. Oggi è uno degli scienziati di punta del Cluster of Excellence ORIGINS e dell'Area Speciale di Ricerca 1258. La Prof.ssa Fabbetti conduce i suoi esperimenti all'LHC del CERN nell'ambito della collaborazione ALICE.





# 30-year anniversary

<https://www.youtube.com/watch?v=out6yNhc8F8>

<https://www.youtube.com/watch?v=GEVv1T2Xku0>



which is an ideal size to have  
and of critical mass to have discussions

30 anni di ECT\* - INTERVISTA al Direttore Gert AARTS

FBK - Fondazione Bruno Kessler 2.9K subscribers [Subscribe](#) [Like](#) 0 [Share](#) [Clip](#) [Save](#) [More](#)



30 anni di ECT\* - INTERVISTA a Laura FABBIIETTI

FBK - Fondazione Bruno Kessler 2.9K subscribers [Subscribe](#) [Like](#) 5 [Share](#) [Clip](#) [Save](#) [More](#)

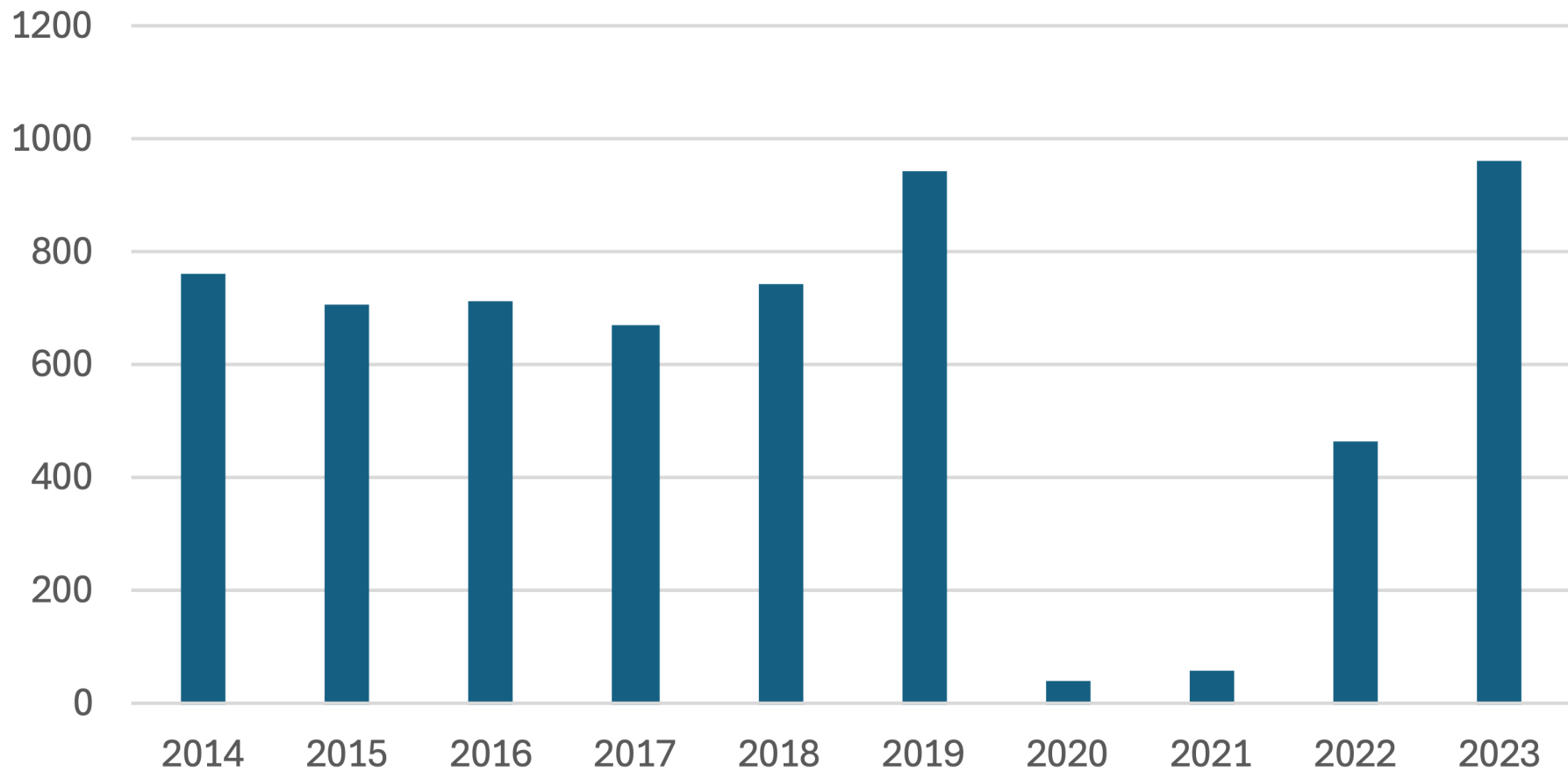






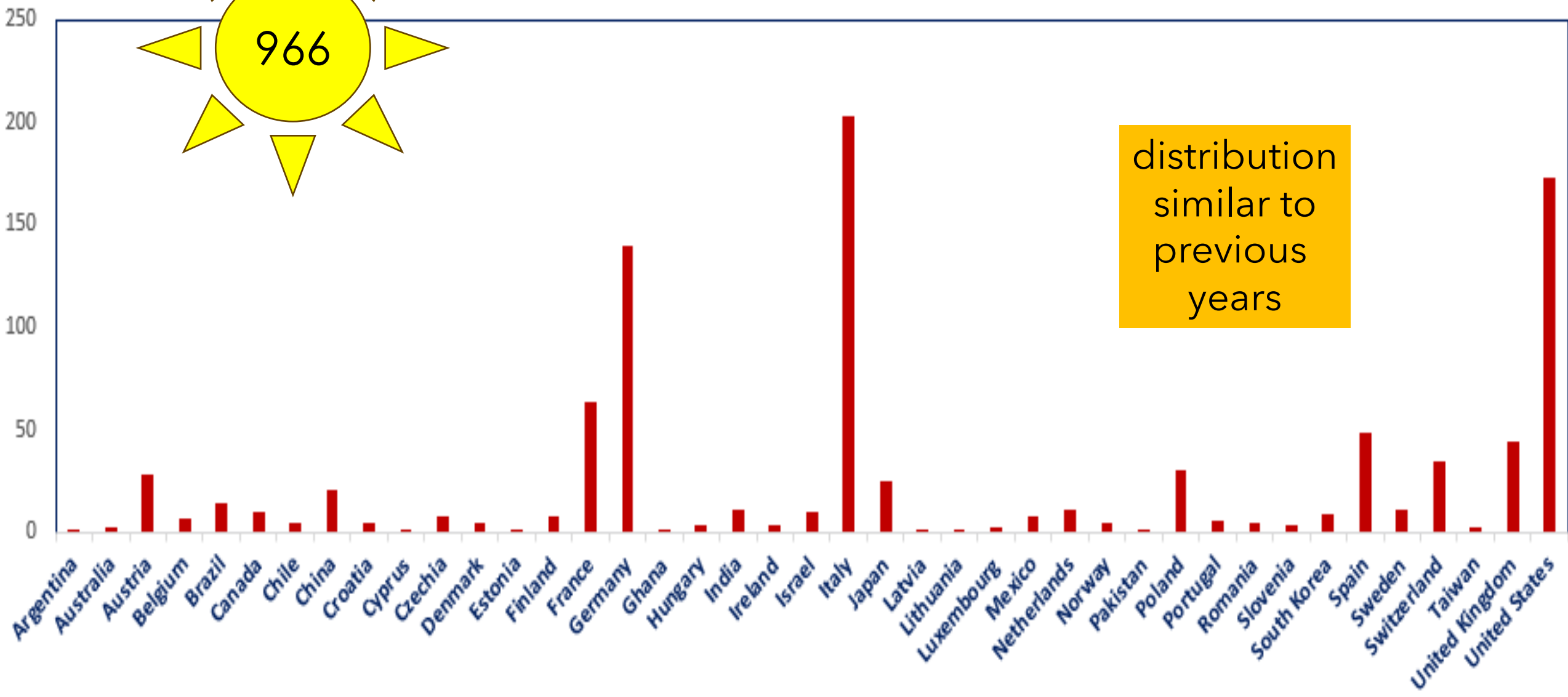
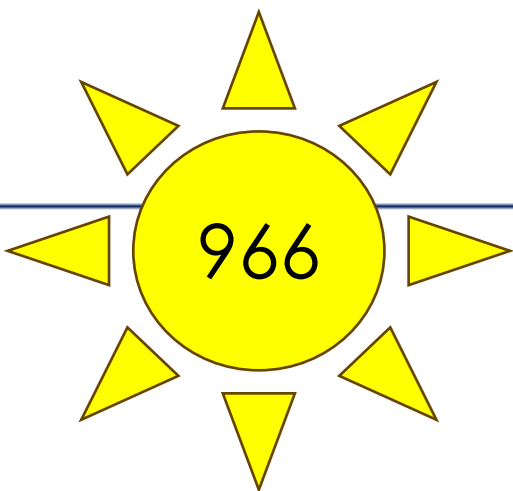
# Annual participation

## ECT\* IN-PERSON PARTICIPANTS



SPICE May 2024

# Participants workshops and DTP 2023



distribution similar to previous years



# 5-year Review

## Report of the ECT\* Review Committee 2023

Sonia Bacca (Johannes Gutenberg University Mainz),  
Barbara Erazmus (SUBATECH),  
Richard Hall-Wilton (FBK),  
Maria Paola Lombardo (INFN) (*chair*),  
Piotr Magierski (Warsaw University of Technology),  
Ulf-G. Meißner (University of Bonn & Forschungszentrum Jülich),  
Sanjay Reddy (University of Washington)

Many thanks to the Review Committee!





## 2024 PROGRAMME OF ACTIVITIES

<b>FEBRUARY</b> 5-9.2	alpha_S(2024): Workshop on Precision Measurements of the Strong Coupling Constant D. D'ENTERRIA (CERN), S. KLUTH (MPP), G. ZANDERIGHI (MPP)	17-21.6	Towards a Consistent Approach for Nuclear Structure and Reaction: Microscopic Optical Potentials C. BARBIERI (University of Milan), C. ELSTER (Ohio University), C. HEBBORN (FRIB), A. OBERTELLI (TU Darmstadt)
12-16.2	New Jet Quenching Tools to Explore Equilibrium and Non-Equilibrium Dynamics in Heavy-Ion Collisions A. SADOBYEV (IGFAE), C. ANDRES (CPHT), J. BARATA (BNL), C. SALGADO (IGFAE)	<b>JULY</b> 1-5.7	New Opportunities and Challenges in Nuclear Physics with High Power Lasers C.J. YANG (ELI-NP), K. SPOHR (ELI-NP), P. TOMOSSINI (ELI-NP), Y. FUKADA (Kansai Photon Science Institute), V. HORNY (ELI-NP), L. GIZZI (INO), D. DOMENICO (ELI-NP)
26.2-1.3	Inaugural Workshop on Nuclear Astrochemistry N. MASON (University of Kent), D. BEMMERER (HZDR), E. MASHA (HZDR), D. MIFSUD (Atomk)	8-12.7	Synergies between LHC and EIC for Quarkonium Physics F. CELIBERTO (Universidad de Alcalá), C. VAN HULSE (Universidad de Alcalá), J.P. LANSBERG (CNRS), D. KIKOLA (Warsaw University of Technology), D. BOER (University of Groningen), E. GONZALES-FERREIRO (IGFAE), C. FLORE (University of Turin)
<b>MARCH</b> 04-08.2	EDMs: Complementary Experiments in Theory Connections S. DEGENKOLB (University of Heidelberg), P. SCHMIDT-WELLENBURG (Paul Scherrer Institute), G. PIGNOL (LPSC), J. DE VRIES (University of Amsterdam), R. BERGER (Philipps-Universität Marburg)	15.7-2.8	DTP/TALENT: Training In Advanced Low Energy Nuclear Theory: Nuclear Theory for Astrophysics A. ARGONES (TU Darmstadt & GSI), B. GIACOMAZZO (University of Milano-Bicocca), J. PIEKAREWICZ (Florida State University)
<b>APRIL</b> 15-19.4	Bridging Scales: At the Crossroads among Renormalisation Group, Multi-Scale Modelling, and Deep Learning R. MENICCHETTI (University of Trento), F. PEDERIVA (University of Trento), R. POTESIO (University of Trento), A. ROGGERO (University of Trento)	<b>AUGUST</b> 5-9.8	Towards Improved Hadron Tomography with Hard Exclusive Reactions M. BOER (Virginia Tech), A. CAMSONNE (Jlab), J. WAGNER (NCBJ)
22-26.4	The Physics of Strongly Interacting Matter: Neutron Stars, Cold Atomic Gases and Related Systems A. SCHWENK (TU Darmstadt), F. FERLAINO (University of Innsbruck), C. PETHICK (Niels Bohr Institute), A. WATTS (University of Amsterdam)	19-23.8	The Nuclear Interaction: Post-Modern Developments R. TIMMERMANS (University of Groningen), J. MCGOVERN (University of Manchester), M. PIARULLI (Washington University), U. VAN KOLCK (JLab)
<b>MAY</b> 7-10.5	Quantum Science Generation 2024 D. DE BERNARDIS (INO-CNR), V. PANIZZA (University of Trento), L. VESPUCCI (University of Trento), A. BALDAZZI (University of Trento), V. AMTRANO (University of Trento), C. BENAVIDES-RIVEROS (INO-CNR), A. BERTI (INO-CNR), A. NARDIN (University of Trento)	<b>SEPTEMBER</b> 9-13.9	New Developments in Studies of the QCD Phase Diagram H. DING (Central China Normal University), F. KARSCH (University of Bielefeld), M.P. LOMBARDO (INFN Florence), P. PETRECZKY (BNL)
13-17.5	SPICE: Strange Hadrons as a Precision Tool for Strongly Interacting Systems J. POCHODZALLA (University of Mainz), C. CURCEANU (INFN-LNF), B. DOENIGUS (University of Frankfurt), L. FABBETTI (TU Munich), S. NAKAMURA (University of Tokyo), F. SAKUMA (RIKEN), I. VIDANA (INFN Catania)	16-20.9	Spin and Quantum Features of QCD Plasma F. BECATTINI (University and INFN Florence), X. HUANG (Fudan University), D. RISCHKE (Goethe University Frankfurt), Y. YIN (CAS)
20-24.5	Beyond-Eikonal Methods in High-Energy Scattering J. JALLIAN-MARIAN (Baruch College), A. CZAJKA (NCBJ), Y. KOVCHEGOV (Ohio State University)	30.9-4.10	KAMPAI - Kaonic, Antiprotonic, Muonic, Pionic and "onia" exotic Atoms: Interchanging Knowledge A. SCORBO (INFN Frascati), P. INDELICATO (Laboratoire Kastler Brossel), J. OBERTOVA (Czech Technical University, Prague), C. CURCEANU (INFN-LNF), A. KNECHT (PSI), M. SKURZOK (Jagiellonian University of Krakow), T. HASHIMOTO (JAEA)
27-31.5	Machine Learning and the Renormalization Group J. URBAN (MIT), D. HACKETT (Fermilab), A. HASENFRATZ (University of Colorado Boulder), J. PAWLOWSKI (Heidelberg University), B. LUCINI (Swansea University)	<b>OCTOBER</b> 14-25.10	Measuring Neutrino Interactions for Next-Generation Oscillation Experiments S. DOLAN (CERN), C. WILKINSON (LBNL), C. WRET (University of Oxford), L. PICKERING (Rutherford Appleton Laboratory)
<b>JUNE</b> 3-7.6	A Modern Odyssey: Quantum Gravity meets Quantum Collapse at Atomic and Nuclear Physics Energy Scales in the Cosmic Silence C. CURCEANU (INFN-LNF), A. BASSI (University and INFN Trieste), L. BAUDIS (University of Zurich), A. MARCIANO (Fudan University China), K. PISCICCHIA (CREP & Centro Ricerche Enrico Fermi), L. DIOSI (Wigner, University of Budapest)	<b>NOVEMBER</b> 4-8.11	Universal Themes in Bose-Einstein Condensation J. CARUSOTTO (INO-CNR BEC Center), T. GIAMARCHI (University of Geneva), G. FERRARI (University of Trento), D. SNOKE (University of Pittsburgh), P. LITTLEWOOD (University of Chicago), F. M. MARCHETTI (UAM), N. PROUKAKIS (University of Newcastle)
10-14.6	Diffraction and Gluon Saturation at the LHC and the EIC C. ROYON (University of Kansas), M. HENTSCHINSKI (Universidad de las Americas Puebla), A. SABIO VERA (Universidad Autonoma de Madrid), S. SCHLICHTING (University of Bielefeld), A. DESHPANDE (Stony Brook University)	<b>DECEMBER</b> 02-06.12	Penetrating Probes of Hot High- $\mu_B$ matter: Theory Meets Experiment E. SCOMPARIN (INFN Turin), T. GALATYUK (TU Darmstadt), M.P. Lombardo (INFN Florence), R. RAPP (Texas A&M University), G. USAI (University Cagliari)

The ECT\* is part of the Fondazione Bruno Kessler. The Centre is funded by the Autonomous Province of Trento, funding agencies of EU Member and Associated states, and by INFN-TIFPA and has the support of the Department of Physics of the University of Trento. The Interim Director of ECT\* is Prof. Gert Aarts (ECT\* and Swansea University).  
For information: staff@ectstaff.eu | www.ectstar.eu

# 2024 Activities

23 workshops and collaboration meetings from February to December

**Doctoral Training Program/TALENT School:**  
Nuclear Theory for Astrophysics

7 workshops supported by



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093



# DTP 2024: Nuclear Theory for Astrophysics

15 July - 2 Aug 2024

organizers:

- Almudena Arcones (TU Darmstadt)
- Bruno Giacomazzo (U Milano-Bicocca)
- Jorge Piekarewicz (Florida State U)

26 participants selected from 51 applicants



supported by



Theory Alliance  
FACILITY FOR RARE ISOTOPE BEAMS





# Meetings in 2024 supported by



- $\alpha_s(2024)$ : Workshop on precision measurements of the strong coupling constant (07/2)
- New jet quenching tools to explore equilibrium and non-equilibrium dynamics in heavy-ion collisions (12/2)
- The physics of strongly interacting matter: neutron stars, cold atomic gases and related systems (22/4)
- SPICE: Strange hadrons as a Precision tool for strongly InteraCting systEms (13/5)
- Beyond-Eikonal Methods in High-Energy Scattering (20/5)
- Saturation and Diffraction at the LHC and the EIC (10/6)
- Synergies between LHC and EIC for quarkonium physics (08/7)

# Summary of **STRONG-2020**



## activities overall

- total number of workshops supported: **48**
  - in-person: 33
  - online: 11
  - hybrid: 4
- total number of participants supported: **504**
- total number of participants at STRONG-2020 workshops: **2294**
  - in-person: 1180 (25-30 participants/workshop)
  - online: 1114 (increased reach during pandemic)





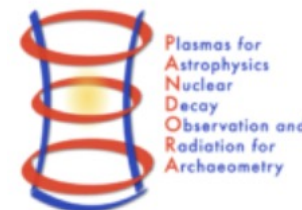
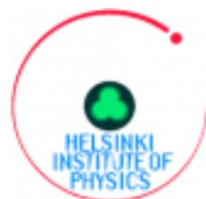
# Funding



FONDAZIONE  
BRUNO KESSLER



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093



# CALL FOR 2025 PROJECT PROPOSALS

We welcome proposals for projects to take place at ECT\* in 2025. Projects can be workshops or collaboration meetings. Other formats can be proposed and will be evaluated by the Board on a case-by-case basis. Decisions on approvals will be made at the Scientific Board meetings in May and October. Proposals submitted before the May meeting may be approved in May or in October, depending on the quality of the proposal and the number of applications received.

The topics of the planned activities should be in line with the main scientific interests of ECT\*, i.e. Nuclear Physics in a broad sense (see Research). This involves low-energy Nuclear Physics and Nuclear Structure, Quantum Chromodynamics, Hadron Physics, Physics of Matter under Extreme Conditions, Ultra-Relativistic Heavy-Ion Collisions. Related areas of research include topics in Astrophysics, Particle Physics, Condensed Matter Physics and Many-Body Theory, Methods of Field Theory, Physics of Ultra-Cold Atomic Gases, Machine Learning and Quantum Information/Technology.

The Scientific Board encourages Organizing Committees to reflect diversity and consist of a combination of Established and Early-Career researchers.

Deadline submission workshop proposals May Board meeting: May 15, 2024.

## ECT\* WORKSHOP PROPOSAL

Please, fill in this form in order to submit your Workshop proposal.

next call: September

<https://www.ectstar.eu/activities/workshops/call-for-2025-project-proposals/>



# All areas of nuclear physics and more

- hard, hot & dense QCD
- hadronic physics
- nuclear structure and reactions
- nuclear astrophysics
- symmetries & fundamental interactions
- related areas, e.g.  
cold atoms, gravitational waves, quantum computing, machine learning, ...

ECRs are particularly invited to co-organise workshops



# VISITING PROGRAM

ECT\* offers an exciting research environment, with a strong group of local researchers and lively workshops on a variety of topics. We also welcome visitors who can further enhance European and local research efforts. Visitors are selected on the basis of academic excellence and their expected contribution to ECT\*.

## Short- and medium-term visitors

ECT\* intends to support local expenses for a few visitors. For visits of one or two weeks, hotel and meals can be supported. Longer stays might be accommodated albeit with reduced support.

If you are interested, please fill in this [form](#).

## Call “Visiting in Trentino 2024” of the Province of Trento

In 2024, the Province of Trento is offering significant support for visits of 6 to 9 months by scientists who will strengthen its research centers in various areas, including physics.

For more information, click [here](#)

## Call for expressions of interest for Marie Skłodowska Curie Individual Fellowships 2024

For more information, click [here](#)



Questions/comments?

