# XVIth Quark Confinement and the Hadron Spectrum


**Sunday 18 August 2024 - Saturday 24 August 2024**

**Cairns, Queensland, Australia**

# Scientific Programme

**Parallel Sessions/Tracks - talk durations**
Days 1-4, 14:00-15:30 (30mins / 20mins / 20mins / 20mins)
Days 1-4, 16:00-17:30 (20mins / 20mins / 20mins / 30mins)
Day 5, 14:00-15:00 (30mins / 30mins)

All parallel talks have common durations and start and end times,
across all Sessions/Tracks.

**Plenary Speakers**
JACKIE BONDELL
University of Melbourne, Australia
*Bridging Scientists and Students with Regional School Partnerships*

JOHANNES HEINRICH WEBER
Humboldt University of Berlin, Germany
*In-medium heavy-quark interactions from lattice QCD*

KARL JANSEN
DESY, Germany
*Quantum Computing: a future perspective for scientific computing*

KAZUYA AOKI
KEK, Japan
*Physics Overview of J-PARC*

MARK WISE
California Institute of Technology, United States
*Hadronic vacuum polarization and some atomic binding effects relevant for the MUonE experiment*

NORA BRAMBILLA
Technical University of Munich, Germany
*Summary talk*

RAIMOND SNELLINGS
Utrecht University and Nikhef, Netherlands
*Recent experimental results on QGP formation and properties from the LHC*

RAJAN GUPTA
Los Alamos National Lab, United States
*Nucleon charges from Lattice QCD and their Implications for BSM Physics*

RAUL BRICENO
UC Berkeley & LBNL, United States
*Three-hadron systems*

TETSUO HATSUDA

RIKEN iTHEMS, Japan
*Hadron-Hadron Interactions from Lattice QCD: Theory meets Experiments*

TETSUO HYODO
Tokyo Metropolitan University, Japan
*Femtoscopy for exotic hadrons and nuclei*

VERONICA DEXHEIMER
Kent State University, United States
*Neutron stars and Constraints for the Equation of State of Dense Matter*

YIOTA FOKA
GSI, Switzerland
*IPPOG and spin-offs from particle and nuclear physics*

YUKINAO AKAMATSU
Osaka University, Japan
*Complex potential and open system applications in heavy-ion and cold atoms*

ALESSANDRO STRUMIA
University of Pisa, Italy
*Solving the strong CP problem*

ANDRE WALKER-LOUD
Lawrence Berkeley National Laboratory, United States
*Beta decay as probe of new physics*

ANDREAS KRONFELD
Fermi National Accelerator Lab., United States
*Perturbation theory, power corrections, renormalons, and precise extraction of quark masses and α_s*

ANTONIO VAIRO
Technical University of Munich, Germany
*30 years highlight of NREFTs for quarkonium*

CATALINA CURCEANU
INFN-LNF, Italy
*Carlo Guaraldo Memorial Talk*

CHENGPING SHEN
Fudan University, China
*Experimental review of exotic states discoveries in the last 20 years*

CLAUDIA RATTI (University of Houston, United States

*Lattice and phenomenology of the Quark Gluon Plasma*

CRAIG ROBERTS
Nanjing University, China
*Hadron Structure: Perspective and Insights*

DOMENEC ESPRIU CLIMENT
Universitat de Barcelona, Spain
*A tribute to Alexander Andrianov: a life for physics*

FABIAN RENNECKE
Justus Liebig University Giessen, Germany
*The QCD phase structure and its signatures from functional approaches*

FINN STOKES
University of Adelaide, Australia
*Review of muon g-2: lattice, dispersive, and data-driven results*

FRANCESCO SANNINO (University Federico II, Denmark) Strong Dynamics: A Treasure Trove for Standard Model Physics and Beyond

FRANCISCO MATORRAS
Instituto de Fisica de Cantabria, Spain
*Open Questions in Statistical Practice for Particle Physics*

GERNOT EICHMANN
University of Graz, Austria
*Functional methods for hadron spectroscopy*

HUEY-WEN LIN
Michigan State University, United States
*Parton Distributions from Lattice and Impacts on Global QCD Analysis*

**Round Table Discussions**
*Round Table 1* (session C), Tuesday August 20th, 09:00-10:00
*XYZ twenty years later: the known and the unknown*
Chair: Nora Brambilla
Panel: Bruce Yabsley, Christopher Thomas, Makoto Oka, Thomas Mehen, Roberto Mussa

*Round Table 2* (session B), Wednesday August 21st, 12:00-13:00
*Precision QCD : What we know, what we don't know*
Chair: Janwei Qiu
Panel: Ian Cloët, Zein-Eddine Meziani, Wei Wang

*Round Table 3* (session E), Friday August 23rd, 12:00-13:00

*QCD and New Physics in Extreme Astrophysical Environments - in Neutron Stars and their Mergers*
Chair: Nicole Bell
Panel: Susan Gardner, Anthony W. Thomas, Stephen Harris

**Poster Session Information**
The conference poster session will be held on Wednesday August 21st 2024, 18:30-20:00, in the Plenary 1 & 2 room, with drinks and nibbles provided on the Mezzanine Exhibition level.

# A: Vacuum Structure and Confinement

Mechanisms of quark confinement (vortices, monopoles, calorons…) and the structure of the vacuum in non-Abelian gauge theories. Chiral symmetry breaking, and the Dirac spectrum in the low-momentum region. Studies of ghost and gluon propagators. Confining strings and flux tubes, their effective actions. Renormalons and power corrections. Interface between perturbative and non-perturbative physics.

Conveners: D. Antonov (ITP, U. Heidelberg), J. Greensite (San Francisco State U.), M. Faber (Technical U., Vienna), T. Cohen (U. Maryland) Local Convener: D. Leinweber (U. Adelaide)

# A*: VSC Focus Subsection

Topology and confinement at borderlines of particle physics and condensed matter: emergent confinement in cold atoms and Anderson criticality in the QCD deconfinement transition.

Conveners: I. Horvath (U. Kentucky), J. C. Halimeh (Ludwig Maximilian U. of Munich), M. C. Diamantini (U. Perugia)

# B: Light Quarks

Chiral and soft collinear effective theories; sum rules; lattice calculations; Schwinger-Dyson equations; masses of light quarks; light-quark loops; phenomenology of light-hadron form factors, spectra and decays; structure functions and generalised parton distributions; exotics and glueballs; experiments.

Conveners: B. Ketzer (Bonn U.), M. Constantinou (Temple U.), H. Sazdjian (IJCLab, Orsay), N. G. Stefanis (Ruhr U. Bochum) Local Conveners: J. Zanotti, A. Kizilersu (U. Adelaide)

# C: Heavy Quarks

Heavy-light mesons, heavy quarkonia, heavy baryons, heavy exotics and related topics: phenomenology of spectra, decays, and production; effective theories for heavy quarks (HQET, NRQCD, pNRQCD, vNRQCD, SCET); sum rules for heavy hadrons; lattice calculations of heavy hadrons; heavy-quark mass determinations; experiments.

Conveners: H. S. Chung (Korea U.), R. Mussa (INFN Torino), J. Soto (U. Barcelona), A. Vairo (Technical U. Munich), F. Knechtli (U. Wuppertal) Local Convener: U. Can (U. Adelaide)

# D: Deconfinement

QCD at finite temperature; quark-gluon plasma detection and characteristics; jet quenching; transport coefficients; lattice QCD and phases of quark matter; QCD vacuum and strong fields; heavy-ion experiments; experiments.

Conveners: P. Foka (GSI), J. Ghiglieri (SUBATECH, Nantes), P. Petreczky (BNL), F. Ringer (JLab), J. Pawlowski (U. Heidelberg)

# E: QCD and New Physics

Physics beyond the Standard Model from hadronic physics, including precision experimental data and precision calculations.

Conveners: W. Detmold (MIT), S. Gardner (U. Kentucky), W. Marinkovic (ETH Zürich), G. Ricciardi (U. Napoli), W. Korsch (U. Kentucky) Local Convener: R. Young (U. Adelaide)

# F: Nuclear and Astro-Particle Physics

Nuclear matter; nuclear forces; quark matter; neutron and compact stars.

Conveners: M. Alford (Washington U. St. Louis), D. Blaschke (U. Wroclaw), J. Marton (SMI Vienna), A. Schmitt (U. Southampton), E. Epelbaum (Ruhr U. Bochum) Local Conveners: A.W. Thomas (U. Adelaide), W. Melnitchouk (JLab, USA & U. Adelaide)

# G: Strongly-Coupled Theories and Dark Matter

Hints on the confinement/deconfinement mechanisms from supersymmetric and string theories; strongly-coupled theories beyond the Standard Model; applications of nonperturbative methods of QCD to other fields; strongly-coupled scenarios of BSM and Dark Matter.

Conveners: D. Espriu (U. Barcelona), Z. Fodor (U. Wuppertal), R. Pasechnik (Lund U.), V. Vento (U. Valencia), M. Spannowsky (U. Durham) Local Convener: A.G. Williams (U. Adelaide)

# H: Statistical Methods for Physics Analysis in the XXIst Century

Machine learning techniques; data fitting and extraction of signals; new developments in unfolding methods; averaging and combination of results.

Conveners: T. Dorigo (U. Padova), S. V. Gleyzer (U. Alabama), E. Rinaldi (RIKEN iTHEMS) Local Convener: M. White (U. Adelaide)