

SYMMETRIES AND ORDER:

Algebraic Methods in Many Body Systems

In honor of

Professor Francesco Iachello



J.W. Gibbs Professor of Physics
Professor of Chemistry

On the occasion of his retirement

October 5-6, 2018

Yale University, New Haven, CT

Participants

Clementina Agodi (INFN-LNS Catania, Italy)
Yoram Alhassid (Yale University)
Thomas Appelquist (Yale University)
Ani Aprahamian (University of Notre Dame)
Kelly Backes (Yale University)
O. Keith Baker (Yale University)
Baha Balantekin (University of Wisconsin-Madison)
Charles Baltay (Yale University)
Catherine Barabas (Yale University)
Bruce R Barrett (University of Arizona)
Roelof Bijker (ICN-UNAM, Mexico)
Frederic Bonnet (Yale University)
Sidney Cahn (Yale University)
Helen Caines (Yale University)
Francesco Cappuzzello (University of Catania / INFN-LNS)
Mark Caprio (University of Notre Dame)
Rick Casten (Yale University / MSU-FRIB)
Sultan Catto (CUNY)
Flavio Cavanna, (Fermilab / Yale University)
Pavel Cejnar (Charles University)
Jolie Cizewski (Rutgers University)
Chrysovalantis Constantinou (Monmouth College)
Kimmy Cushman (Yale University)
Christopher Davis (Yale University)
Satish Dhawan (Yale University)
Jonathan Engel (Univ. of North Carolina at Chapel Hill)
Paul Fanto (Yale University)
Lea Ferreira dos Santos (Yeshiva University)
Jacopo Ferretti (Yale University)
Frank Firk (Yale University)
Bonnie Fleming (Yale University)
George Fleming (Yale University)
Alejandro Frank (C3 UNAM)
Moshe Gai (University of Connecticut)
José-Enrique García-Ramos (Universidad de Huelva)
Joseph Ginocchio (Los Alamos National Laboratory)
John W. Harris (Yale University)
Karsten Heeger (Yale University)
Jay Hirshfield (Yale University)

Participants

Francesco Iachello (Yale University)
Ako Jamil (Yale University)
Jay Hyun Jo (Yale University)
Jan Jolie (Universität zu Köln)
Jenni-Mari Kotila (University of Jyväskylä)
Dimitri Kusnezov (NNSA DOE)
Danielle Larese (U.S. FDA)
Amiram Leviatan (The Hebrew University)
Jingping Li (Yale University)
Tong Liu (Yale University)
Michal Macek (The Czech Academy of Sciences)
Reina Maruyama (Yale University)
David Moore (Yale University)
Stefano Oss (Università di Trento)
Takaharu Otsuka (University of Tokyo / RIKEN)
Ornella Palamara (Yale University / Fermilab)
Jonathan Parr (Yale University)
Francisco Pérez-Bernal (Universidad de Huelva)
Norbert Pietralla (Technische Universität Darmstadt)
Stuart Pittel (University of Delaware)
Daniel Prober (Yale University)
Michael Rios (Quantum Gravity Research)
Wouter Ryssens (IPN Lyon / Yale University)
Sophia Sánchez-Maes (Yale University)
Elena Santopinto (INFN Genova)
Olaf Scholten (KVI-CART, Univ. of Groningen)
Shalom Shlomo (Texas A&M University)
Danielle Speller (Yale University)
Paul Tipton (Yale University)
Aurora Tumino (Università degli studi di Enna “Kore”)
Meg Urry (Yale University)
Patrick Vaccaro (Yale University)
Piet van Isacker (GANIL)
Lorenza Viola (Dartmouth)
Volker Werner (Technische Universität Darmstadt / Yale)
Shilo Xia (Yale University)
Victor Zamfir (Nat'l Inst. for Physics & Nuclear Engineering Bucharest)
Larry Zamick (Rutgers University)
Michael Zeller (Yale University)

Friday, October 5, 2018

Sloane Physics Lab, Room 57

9:00 a.m. **Introduction**

Reina Maruyama, *Local Organizing Committee Chair*
Peter Schiffer, *Vice Provost for Research*
Paul Tipton, *Chair of the Yale Department of Physics*
Karsten Heeger, *Director of Wright Laboratory*

9:30 a.m. **Nuclear Structure I** (J. W. Harris, *Chair*)

Richard Casten: *Symmetries and regularities in nuclei:
Order out of seeming chaos*
Taka Otsuka: *Atomic nucleus loves symmetries*

10:20 a.m. **Coffee Break** outside Room 57

10:50 a.m. **Nuclear Structure II** (M. Gai, *Chair*)

Roelof Bijker: *Symmetries and Order in Cluster Nuclei*
Aurora Tumino: *The surprising ^{12}C nucleus: from alpha
structure to its burning*

11:40 a.m. **Symposium group photograph** at SPL grand staircase

12:00 p.m. **Luncheon** at New Haven Lawn Club

2:00 p.m. **Nuclear Structure III** (A. Aprahamian, *Chair*)

Norbert Pietralla: *Symmetry and order in nuclear structure
from the proton-neutron degree of freedom*

2:25 p.m. **Molecular & Hadronic Structure I** (S. Catto, *Chair*)

Elena Santopinto: *Beauty and symmetry in hadron physics*
Stefano Oss: *Italian dynamical symmetries and molecular
connections*

3:15 p.m. **Coffee Break** outside Room 57

3:45 p.m. **Molecular & Hadronic Structure II** (J. Ginocchio, *Chair*)

Patrick Vaccaro: *Lie algebras, dynamical symmetries, & Casimir
operators Oh my! A chemist's trek through the Vibron Forest*
Francisco Perez-Bernal: *The molecular-and algebraic-Jailhouse
Rock: application of an algebraic theory of endohedral diatomic
molecules to $\text{H}_2@C_{60}$*

4:35 p.m. **Short Remarks** (R. Maruyama, *Chair*)

6:30 p.m. **Banquet Dinner** at Union League Café

Saturday, October 6, 2018

Sloane Physics Lab, Room 57

9:00 a.m. **Neutrino Physics & Double Beta Decay I** (T. Appelquist, *Chair*)

Baha Balantekin: *Symmetries of neutrino physics*

Jonathan Engel: *Double-beta decay: Approaches from algebraic to ab initio*

9:50 a.m. **Neutrino Physics & Double Beta Decay II** (Y. Alhassid, *Chair*)

Jenni-Mari Kotila: *Fascinating puzzle called double beta decay*

Olaf Scholten: *Neutrino astrophysics*

10:40 a.m. **Coffee Break** outside Room 57

11:00 a.m. **Symmetries & Phase Transitions I** (J. Cizewski, *Chair*)

Piet van Isacker: *Isospin invariant description of double-beta decay in the IBM*

Jan Jolie: *Experimental evidence for nuclear dynamical supersymmetries as illustrated by ^{195}Pt*

12:00 p.m. **Luncheon** at New Haven Lawn Club

2:00 p.m. **Symmetries & Phase Transitions II** (S. Pittel, *Chair*)

Ami Leviatan: *Dynamical symmetries and beyond: Lessons from Iachello's heritage*

Alejandro Frank: *Symmetries, criticality & signs of auto organization*

2:50 p.m. **Symmetries & Phase Transitions III** (B. Barrett, *Chair*)

Lorenza Viola: *My journey through symmetries*

Dimitri Kusnezov: *Symmetries and order: A view from Washington*

3:40 p.m. **Coffee Break** outside Room 57

4:10 p.m. **Symmetries & Phase Transitions IV** (V. Zamfir, *Chair*)

Mark Caprio: *Excited state quantum phase transitions in two-level systems*

Pavel Cejnar: *Static vs. dynamic phases of quantum many-body systems*

5:00 p.m. **Concluding Remarks**

Conference Organizers:

Reina Maruyama – Yale

Mark Caprio – University of Notre Dame

Roelof Bijker – Universidad Nacional Autónoma de Mexico

Baha Balantekin – University of Wisconsin

Local Organizing Committee:

Helen Caines

Richard Casten

Bonnie Fleming

John W Harris

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Reina Maruyama

David Moore



Wright
Laboratory

Yale Department of Physics

Yale Department of Chemistry