

TSRC - Quantum Frontiers in Molecular Science (7/20/2020-7/24/2020)

Organizers: Ignacio Franco (ignacio.franco@rochester.edu) and Joel Yuen-Zhou (jyuenzhou@ucsd.edu)

Updated: July 15, 2020

Website

<https://tinyurl.com/ybnvpmnp>

Slack Channel

https://join.slack.com/t/quantumfronti-elp4592/shared_invite/zt-g690ooog-xUI0pxr6kwTF6wL1T8kTUA

Meeting times:

Meeting begins at 8 AM California (PDT) / 9 AM Telluride (MDT)/ 11 AM New York (EDT)/ 5 PM Brussels (GMT+2)
Meeting will be held throughout 7/20-7/24 from 9 to 11:30 AM MDT (Telluride, Colorado time zone).

Dynamics:

1. Owing to the Covid-19 pandemic, this will be a remote meeting run via Zoom. The virtual address will be shared by email with the participants.
2. There are 5 tutorial talks (40 min each) that will be uploaded in advance for everyone to watch asynchronously. The authors of these tutorials will also have 25 min allocated for a synchronous summary of the tutorial talk (10 min) followed by an open discussion (15 min).
3. All other talks will be held synchronously (20 min presentation + 5 min discussion).
4. There will be 1 min teasers of contributed presentations on Tuesday and Thursday.
5. To enhance discussions during the sessions and beyond we have created a Slack channel. This will be the place to have the equivalent of hallway/bar/dinner/Colorado Ave. discussions.

Pre-meeting Event: Telluride Science Lecture Series

FRIDAY 7/17

10:00 MDT

Alexandra Olaya-Castro, (UC London)

11:00 MDT

Tom Weinacht (Stony Brook)

<https://tinyurl.com/yaahyaoo>

Vibronic Coherence and Synchronisation of Molecular Motions

Time-Resolved Spectroscopy of Molecular Dynamics: Comparing Different Approaches

PROGRAM

MONDAY 7/20

Quantum Coherence & Control

Chairs: Joel Yuen (UCSD) & Ignacio Franco (U. Rochester)

Tutorial Talk

Christiane Koch (FU Berlin)

What chiral molecules can teach us about quantum control

8:45-9:00 MDT

Opening Remarks

Tutorial discussion

9:00-9:25 MDT

Christiane Koch (FU Berlin)

Coherent control of internal conversion in strong field molecular ionization

9:25-9:50 MDT

Tom Weinacht (Stony Brook)

Dissipative dynamics of emitters strongly coupled to localized surface plasmons

9:50-10:15 MDT

Daniel Finkelstein Shapiro (Lund)

Quantum Coherence in Chemistry: Tackling the Decoherence Challenge

10:15-10:40 MDT

Ignacio Franco (Rochester)

A New Formulation of Quantum Mechanics using Complex Trajectories: Application to

10:40-11:05 MDT

David Tannor (Weizmann)

Wavepacket Revivals, Optical Excitation and High Harmonic Generation

11:05-11:30 MDT

Craig Martens (UC Irvine)

Zombie cats at the quantum-classical frontier: Coherent quantum dynamics in the

11:30-12:00 MDT

Breakout/Slack Discussions

semiclassical limit—and beyond

TUESDAY 7/21

Quantum Sensing and Metrology

Chair: Johannes Flick (Simons Foundation)

Tutorial Talk

9:00-9:25 MDT

9:25-9:50 MDT

9:50-10:15 MDT

10:15-10:40 MDT

10:40-11:05 MDT

11:05-11:30 MDT

11:30-12:00 MDT

Andrew Jordan (Rochester)

Andrew Jordan (Rochester)

Alexandra Olaya (University College London)

Ben Sussman (NRC)

Scott Cushing (Caltech)

Eric Bittner (Houston)

1 min teasers

Breakout/Slack Discussions

WEDNESDAY 7/22

**Quantum Electrodynamics:
Molecular Polaritonics****Tutorial Talk**

9:00-9:25 MDT

9:25-9:50 MDT

9:50-10:15 MDT

10:15-10:40 MDT

10:40-11:05 MDT

11:05-11:30 MDT

11:30-12:00 MDT

Jonathan Keeling (St. Andrews)

Jonathan Keeling (St. Andrews)

Joel Yuen (UC San Diego)

Randall Goldsmith (Wisconsin)

Johannes Flick (Simons Foundation)

Agnes Vibok (Debrecen)

Frank Huo (Rochester)

Breakout/Slack Discussions

THURSDAY 7/23

Quantum Probes in Biosystems**Tutorial Talk**

9:00-9:25 MDT

9:25-9:50 MDT

9:50-10:15 MDT

10:15-10:40 MDT

10:40-11:05 MDT

11:05-11:30 MDT

11:30-12:00 MDT

Paul Brumer (Toronto)

Paul Brumer (Toronto)

Vladimiro Mujica (Arizona State)

David Beratan (Duke)

Jianshu Cao (MIT)

Ulrich Kleinekathofer (Bremen)

Overall Discussion

Zoom Beer Hour

FRIDAY 7/24

Quantum Information and Chemistry**Quantum measurement - recent developments**

Tutorial discussion

Quantum optical signatures of vibronic coherence in biomolecules

Quantum sensing and processing with ultrafast light

Entangled light-matter interactions and spectroscopy

Measuring many-body correlations and collective dynamics with quantum light

Contributed Presentations (see list below)

Chair: Daniel Finkelstein Shapiro (Lund U)**Modelling organic polariton condensates**

Tutorial discussion

Polariton chemistry: thermally-activated and photoinduced scenarios

Photonic materials for studying and altering molecular behavior

First-principle approaches to strong light-matter coupling in molecular and extended systems

Light-induced conical intersections in diatomic and polyatomic systems

Polarized Fock states and the gauge invariance in molecular cavity quantum electrodynamics

Chair: Scott Cushing (Caltech)**Excitation of Biomolecules with Incoherent Light: A Paradigm Shift and a Return to Nature**

Tutorial discussion

Reservoir Engineering: Preserving Coherence in Biological Electron Transfer Reactions.

Bifurcating Electrons Without Invoking Maxwell's Demon

Coherence in non-equilibrium transport: symmetry and polaron effects

A time-dependent view on energy transfer in protein-pigment complexes

Chair: Frank Huo (U. Rochester)

Tutorial Talk

9:00-9:25 MDT

Mike Wasielewski (Northwestern)

Mike Wasielewski (Northwestern)

9:25-9:50 MDT

Sabre Kais (Purdue)

9:50-10:15 MDT

Felix Fischer (UC Berkeley)

Charge and Energy Transfer

10:15-10:40 MDT

Seogjoo Jang (CUNY)

10:40-11:05 MDT

Eric Heller (Harvard)

11:05-11:30 MDT

Final Remarks/Overall Discussion

Exploiting chemistry and chemical systems for quantum information science

Tutorial discussion

A quantum algorithm for evolving open quantum dynamics on quantum computing devices

The road from Semiconductors to Metals: Controlling Quantum Effects in Nanographene

Mechanistic investigation of non-Förster resonance energy transfer dynamics in donor-bridge-acceptor system

Blochbusters: new foundations of electrical resistivity

Contributed Presentations

Kristin Arnardottir (St. Andrews)

Finite size effects in organic polariton condensation

Sutirtha Chowdhury (Rochester)

State-Dependent Ring Polymer MolecularDynamics for Investigating Excited Nonadiabatic Dynamics

Georg Engelhardt (Beijing)

Floquet response theory and spectroscopy of periodically-driven systems: semiclassical and quantum light

Marwa Farag (Rochester)

Polariton Induced Conical Intersection and Berry Phase

Gerald Fux (St. Andrews)

Tensor networks for non-Markovian open quantum systems

Antonio Garzón Ramírez (Rochester)

Stark Control of Electrons at Interfaces (SCELI)

Chang Woo Kim (Rochester)

Decomposing the dissipation in open quantum systems

Arkajit Mandal (Rochester)

Polariton Mediated Electron Transfer

Leopoldo Mejia (Rochester)

Incoherent transport through molecular junctions

Feng Pan (U. Wisconsin)

Elucidating energy dynamics and tailoring plasmonic-photonic interaction in a coupled cavity

Sindhana S. Pannir Sivajothi (UC San Diego)

Enantioselective distillation using incoherent pumping

Juan Perez (UC San Diego)

Photon down-conversion via nonadiabatic dynamics in molecular polaritons

Dominic Rouse (St. Andrews)

An organic quantum battery

Michael Sabatini Mattei (U. Wisconsin)

Additive Manufacturing of Topological Photonic Crystals and their Applications in Molecular Spectroscopy

Kai Schwennicke (UC San Diego)

Optical Activity due to the Exciton Aharonov-Bohm Effect: a Floquet Engineering Approach

Jesus Valdiviezo (Duke)

Switching electron transport between flickering resonance and incoherent mechanisms in nucleic acids

Jing Yang (Rochester)

Heat transport across a weakly nonlinear chain in the strong-coupling regime

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List of Participants - Updated July 15, 2020

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