

**Solvay Workshop on**  
**“Nonlinear phenomena and complex systems”**  
**in memory of Grégoire Nicolis**  
**June 14 - 16, 2021**

**MONDAY 14 JUNE**

---

09:00 - 09:15	Online log-in
09:15 - 09:30	Welcome and Introduction
09:30 - 10:00	In memoriam
10:00 - 10:15	Welcome by Marc Henneaux (Director of the Solvay Institutes, Brussels)

**Session 1: Hydrodynamics, chaos and atmospheric science - Chair: Pierre Gaspard**

10:15 - 10:45	<b>Yves Pomeau</b> <i>Turbulence in fluids: from deterministic equations to statistical picture</i>
10:45 - 11:00	<b>Yves Elskens</b> <i>Critical exponent for the Lyapunov exponent and phase transition</i>
11:00 - 11:30	COFFEE BREAK
11:30 - 11:45	<b>Benoit Scheid</b> <i>Dripping or not dripping in suspended falling films</i>
11:45 - 12:00	<b>Priya Verma</b> <i>Chemical Reaction Induced Viscous Fingering in a Radial Displacement Flow</i>
12:00 - 12:15	<b>Stéphane Vannitsem</b> <i>Extratropical low-frequency variability with El-Niño-Southern Oscillation forcing: A reduced-order coupled model study</i>
12:15 - 13:30	LUNCH BREAK

**Session 2: Reaction-diffusion patterns and nonlinear oscillations - Chair: Anne De Wit**

13:30-13:45	<b>István Szalai</b> <i>Reaction-diffusion patterns in a simple hydrogel device with flow-through channels</i>
13:45-14:00	<b>Judit Horváth</b> <i>A New Aldehyde - Sulfite - Lactone Type pH-Oscillator</i>
14:00-14:15	<b>Ljiljana Kolar-Anić</b> <i>Investigation of the Bray-Liebhafsky oscillatory reaction</i>
14:15-14:30	<b>Dezső Horváth</b> <i>Oscillatory dynamics in the model of reactive oxygen species in the rhizosphere</i>
14:30-15:00	COFFEE BREAK

- 15:00-15:30 **Irving Epstein**  
*Turing patterns on growing domains*
- 15:30-16:00 **Kenneth Showalter**  
*Transition from spiral wave chimeras to phase cluster states*
- 16:00-16:30 **Raymond Kapral**  
*Active matter meets nonlinear dynamics*
- 16:30-16:45 **Marcello Budroni**  
*Between dissipative structures and applied processes: chemohydrodynamic (and not only) oscillatory systems*
- 16:45-17:00 **Seth Fraden**  
*The Symmetry Basis of Pattern Formation in Reaction-Diffusion Networks with Heterogeneity*
- 17:00-17:15 BREAK - GROUP PHOTO
- 17:15 - 18:30 Personal testimonies (Chair: Claude Baesens)**

## TUESDAY 15 JUNE

---

### Session 3: Regulatory networks and biocomplexity - Chair: Geneviève Dupont

- 09:00-09:30 **Kunihiko Kaneko**  
*Macroscopic Theory for Adaptation and Evolution: Multilevel Consistency, Dimensional Reduction, and Fluctuation-Response Relationship*
- 09:30-10:00 **Annie Lemarchand**  
*A thermostatted kinetic theory model of tumor growth*
- 10:00-10:30 **Edda Klipp**  
*Entropic regulation of dynamical metabolic processes*
- 10:30-11:00 COFFEE BREAK

### Session 4: Complex systems - Chair: Thomas Gilbert

- 11:00-11:30 **Annick Lesne**  
*Concepts from nonlinear dynamics for the analysis of symbolic sequences*
- 11:30-12:00 **Robert MacKay**  
*Thermoeconomics*
- 12:00-12:15 **Igor Franovic**  
*Emergent Dynamics in Populations of Active Rotators, with Diversity*
- 12:15-13:30 LUNCH BREAK

## Session 5: Synchronization and chimera states - Chair: Jean-Louis Deneubourg

- 13:30-14:00      **Astero Provata**  
*Complex synchronization patterns in spatially correlated networks of coupled oscillators*
- 14:00-14:30      **Katharina Krischer**  
*Between Synchrony and Turbulence: Intricate Hierarchies of Coexistence Patterns*
- 14:30-14:45      **Maximilian Patzauer**  
*Self-Organized Multifrequency Clusters in an Oscillating Electrochemical System with Strong Nonlinear Coupling*
- 14:45-15:00      **Maria Masoliver**  
*Embedded Chimera States in Recurrent Neural Networks*
- 15:00-15:30      COFFEE BREAK

## Session 6: Self-organization, from chemistry to biology - Chair: Dominique Maes

- 15:30-16:00      **Oliver Steinbock**  
*From Chemobrionics to Self-propelled Tubes*
- 16:00-16:30      **Peter Vekilov**  
*Harnessing the complexity of crystal nucleation: nucleation control by manipulating the amorphous precursors*
- 16:30-17:00      **John Tyson**  
*A Dynamical Paradigm for Molecular Cell Biology*
- 17:00-17:15      BREAK - GROUP PHOTO
- 17:15 - 18:30**      **Personal testimonies (Chair: Claude Baesens)**

## WEDNESDAY 16 JUNE

---

## Session 7: Thermodynamics and non-equilibrium systems - Chair: Yannick De Decker

- 09:00-09:30      **Massimiliano Esposito**  
*Stochastic Thermodynamics from the mid 80s to now*
- 09:30-10:00      **Valérie Voorsluijs**  
*Energetic cost of the cross-talk between calcium dynamics and mitochondrial metabolism*
- 10:00-10:15      **Sandip Saha**  
*Suppressing birhythmicity by parametrically modulating nonlinearity in limit cycle oscillators*
- 10:15-10:30      **Enrique Abad**  
*Peculiarities of nanoparticle diffusion in polymer melts*
- 10:30-11:00      COFFEE BREAK

## Session 8: Spatially extended systems and networks - Chair: Yannick De Decker

- 11:00-11:30 **Manuel G. Velarde**  
*Variations on the quasiparticle (dressed particle) concept: from entropy to polaron and to soliton (with a bonus: a novel field effect transistor)*
- 11:30-11:45 **Hans Dierckx**  
*A novel view on the topology of wave patterns in the heart*
- 11:45-12:00 **Jerzy Gorecki**  
*Information processing with networks of coupled chemical oscillators*
- 12:00-12:15 **Jean-François Kemmter**  
*Symmetry breaking induced by self-recruitment random walks on regular networks*
- 12:15-13:30 LUNCH BREAK

## Session 9: Nonlinear dynamics and beyond - Chair: Claude Baesens

- 13:30-14:00 **Pierre Coulet**  
*Ibn Sahl and Kepler: the search for « Anaclastic » and the refraction law*
- 14:00-14:15 **Jean-Marc Ginoux**  
*A physical memristor based Muthuswamy-Chua-Ginoux system*
- 14:15-14:30 **Juan Perez-Mercader**  
*From Equations to Artificial Life in a Test Tube*
- 14:30-14:45 **Yannis Kevrekidis**  
*Disentangling (the parametrization of) relations*
- 14:45-15:00 **Léon Brénil**  
*On an equivalence between deterministic nonlinear dynamical systems and stochastic urn processes*
- 15:00-15:30 COFFEE BREAK

## Session 10: Neural networks - Chair: Claude Baesens

- 15:30-16:00 **Xiao-Jing Wang**  
*Slope bifurcation: how cognitive functions arise from canonical cortical microcircuits*
- 16:00-16:30 **Alain Destexhe**  
*Complexity of spontaneous and evoked brain dynamics*
- 16:30-17:00 **Andrey Shilnikov**  
*Cooperative Rhythm Generation in Neural Networks*

**17.00** **Conclusions and farewell**