Cardiovascular and Cardiorespiratory Interactions – From Physiological Mechanisms to Clinical Applications

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Day One: Monday, November 2, 2026
— Scientific Presentations and Brainstorming Session I —
13:00–14:00 – Informal Discussions over Lunch: Introduction of Research Groups and Main Topics of Interest (Library of the Department of Physiology, JFM CU, Malá Hora 4C, 2nd floor)
14:00–14:30 – Michal Javorka (Comenius University, Slovakia): *Cardiovascular Network: Physiological Background, Data Sets and Future Perspectives*
14:30–15:30 – Beata Graff (Medical University of Gdańsk, Poland) and Paweł Pilarczyk (Gdańsk University of Technology, Poland): Joint Extended Lecture *Analysis of Respiratory Heart Rate Variability Using Ordinal Patterns with Ties and Tolerance*
15:30–16:00 – Zoltán Somogyvári (HUN-REN Wigner Research Centre for Physics, Hungary): *Data Analysis Methods Based on Dynamical Systems Theory: Unicorns, Dimensions and Higher-Order Hidden Drivers*
16:00–16:30 – coffee break
16:30–17:15 – Visit to the laboratory for autonomic nervous system research
17:15–18:45 – Brainstorming Session I: Research Questions, Methodological Challenges and New Scientific Directions
18:45–19:00 – Summary of the Day

Day Two: Tuesday, November 3, 2026
— Morning Scientific Session —
10:00–10:30 – András Telcs (HUN-REN Wigner Research Centre for Physics, Hungary): *Causal Discovery, Markov Chains, and the Degrees-of-Freedom Method*
10:30–11:00 – Gerard Cybulski (Warsaw University of Technology, Poland): *Applications of Impedance Cardiography (ICG) Signals in Analysis of Cardiovascular System Diagnosis and Description*
11:00–11:30 – coffee break
11:30–12:00 – Marcel Młyńczak (Warsaw University of Technology, Poland): *Bridging Global and Local Causal Discovery in Physiology: From Observational Networks to Dynamic Cardiorespiratory Interactions*
12:00–12:30 – Teodor Buchner (Warsaw University of Technology, Poland): *Respiratory Instability in Heart Failure and Hypertension: A Cross-Species Mathematical Model and Direct Observation of Intermittency in Anaesthetized SHR Rats*
— Open Scientific Session —
13:00–13:20 – Beata Graff (Medical University of Gdańsk, Poland): *Between the Heartbeats: What Heart Rate Variability (HRV) Reveals – From ECG to Smartwatches*
13:20–13:40 – Michal Javorka (Comenius University, Slovakia): *Interactions in a Selected Four-Node Network of Cardiorespiratory Parameters*
13:40–14:00 – Zoltán Somogyvári (HUN-REN Wigner Research Centre for Physics, Hungary): *From Understanding to Control: A Dynamical Systems Approach in Physiology*
14:00–14:20 – Laura Sparacino (Comenius University, Slovakia): *Cerebrovascular Interactions in Relation to Orthostatic Syncope*
14:20–14:30 – General Discussion and Questions from the Audience
— Afternoon Program —
14:30–15:30 – Break, Networking, Transfer to Lunch-Dinner Venue
15:30–18:00 – Informal Discussions over Lunch/Dinner: Methodological Approaches to Causality Analysis, Available Datasets, Data Sharing, Joint Research Projects and Future Collaboration Opportunities

Day Three: Wednesday, November 4, 2026
— Scientific Presentations, Brainstorming Session II and Future Collaboration —
9:30–10:00 – Dorota Wejer (University of Gdańsk, Poland): *Methods for Analyzing Cardiovascular Signal Asymmetry in Healthy Individuals and Patients with OSA*
10:00–10:30 – Laura Sparacino (Comenius University, Slovakia): *Hierarchically-Organized Interactions in Dynamic Physiological Networks*
10:30–11:00 – Marcell Stippinger (HUN-REN Wigner Research Centre for Physics, Hungary): *Dimensional Causality: Revealing Hidden Shared Drivers in Cardiovascular Recordings*
11:00–11:30 – coffee break
11:30–13:00 – Brainstorming Session II: Joint Research Projects, Future Publications and Collaborative Research Directions
13:00–13:40 – Action Plan: Defining Research Priorities, Responsibilities and Next Steps
13:40–14:00 – Final Discussion, Workshop Summary and Closing Remarks