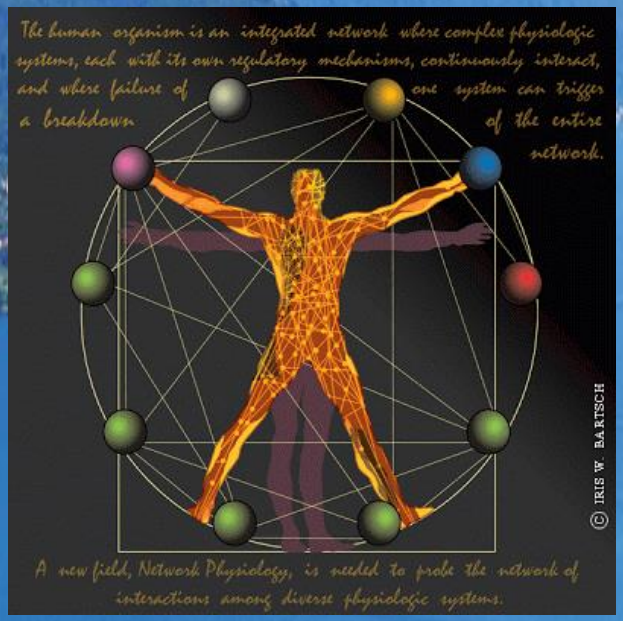
First International Summer Institute on Network Physiology (ISINP)

Lake Como School of Advanced Studies, 24 – 29 July, 2017

WELCOME!



Fondazione
Alessandro Volta

fondazionealessandrovolta.it

Alessandro Volta
(1745-1827)

WE THANK Fondazione Alessandro Volta

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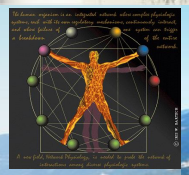

Battery
Inventor

$$V = I \cdot R$$

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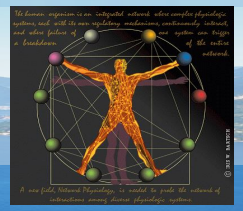

WE THANK

Physiological Measurement
iopscience.org/pmea

W.M. KECK FOUNDATION

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IOP Publishing

epl

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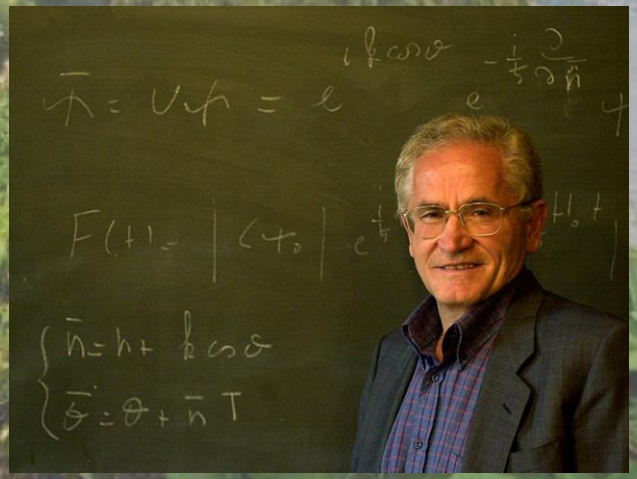
IPEM Institute of Physics and Engineering in Medicine

LAKE COMO SCHOOL OF ADVANCED STUDIES

WE THANK

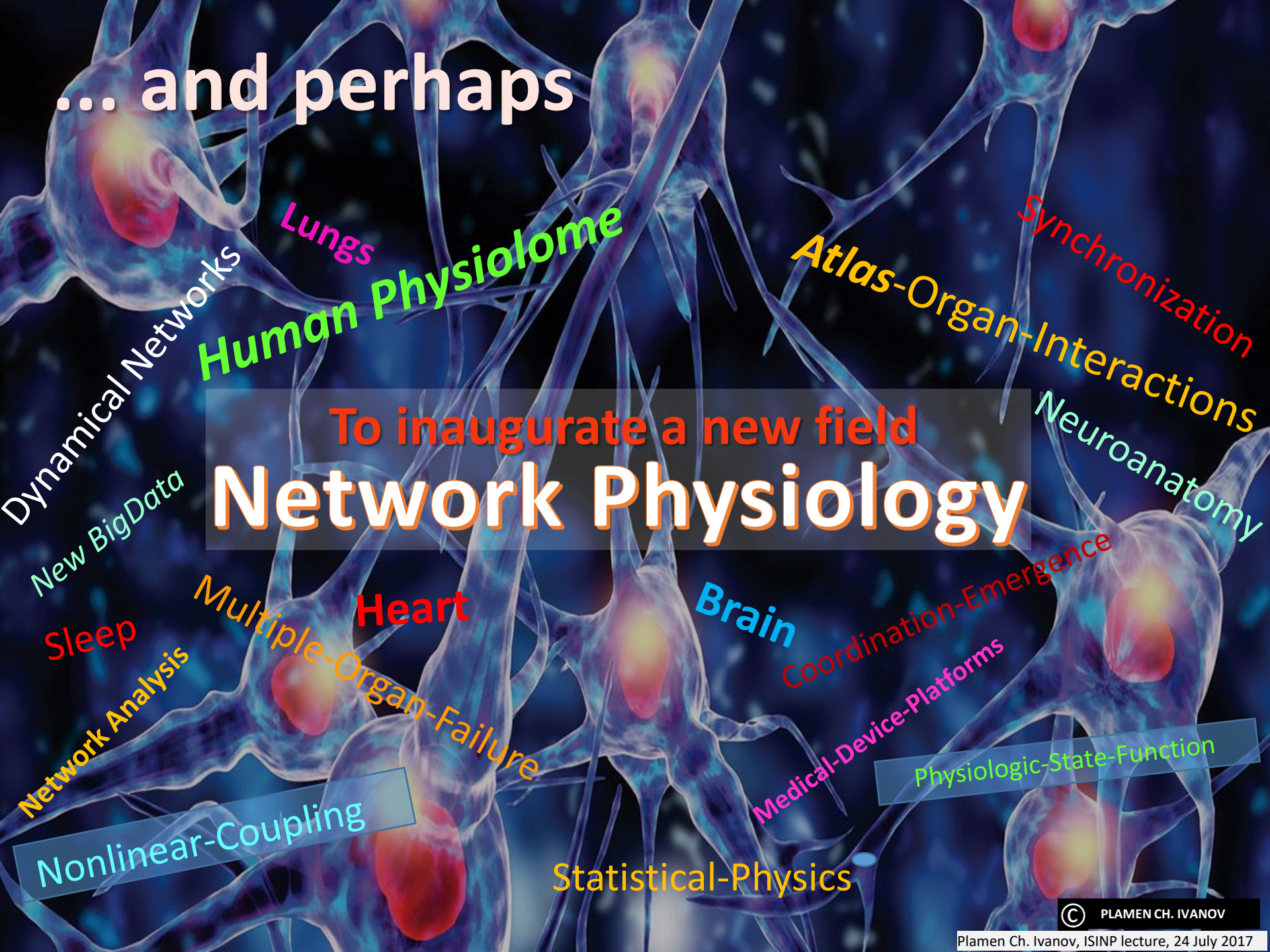
Special thanks to
Prof. Giulio Casati
Scientific Director



Why are we here?


Of course for...

Actually for that...




Why a new field?

What is a field?

- A group of closely-related fundamental questions
- Distinctive approach
- Specific analytic formalism and theoretical framework
- Broad relevance to many systems and states

In the discipline of Physics

Classical Mechanics ⟷ Quantum Mechanics ⟷ Statistical Mechanics

The new field of Network Physiology

Fundamental Questions:

- Nature of communication between organ systems?
- How organs dynamically coordinate and synchronize their functions?
- How states and conditions at the organism level emerge out of physiologic network interactions?
- Basic principles and control mechanisms of the “body internet”?

The new field of Network Physiology

Distinctive approach:

- Depart from phenomenalogical observation of organ interactions
- Quantitative physical description of physiologic coupling
- Shift focus from single organ system to entire physiologic network
- Identify relation between physiologic state, behavior and function & networks of organ interactions
- BigData of high-frequency synchronized continuous recordings

The new field of Network Physiology

Requires new analytic formalism & theoretical framework:

- To identify and quantify coupling from noisy, non-linear and transient physiologic signals
- To descirbe global behavior in networks of diverse dynamical systems
- Establish principles of control in networks of dynamical systems
- Define a "*set of equations*" that describes physiologic state and function at the organism level

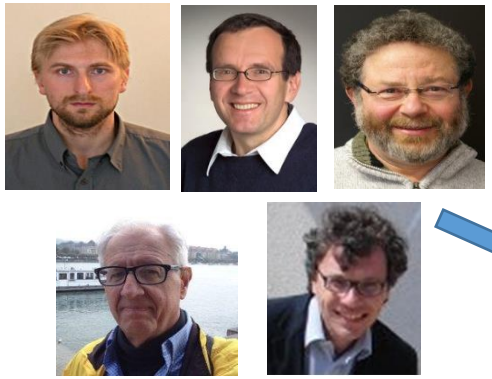
The new field of Network Physiology

Broad relevance & implications:

- For basic human physiology and living systems in general
- To understand, treat and predict adverse clinical events and diseases
- Extend principles of physiologic network interactions to non-living systems with “smart” behavior
- Analytic/computational tools to quantify and predict global behaviors in multi-component comlpex systems
- Facilitate development of new biomedical devices and integrated platforms
- Generate new kind of BigData - *The Human Physiolome*

Large-scale interdisciplinary effort

Physics & Applied Math

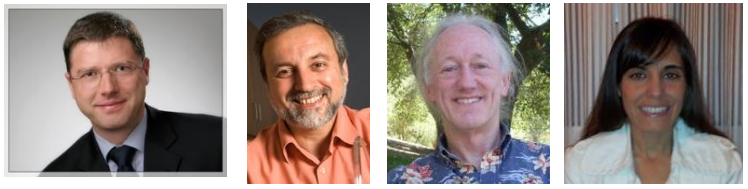


Neuroscience

Physiology/Medicine

Network Physiology

Biomedical Engineering



Computational & Data Science

Large-scale interdisciplinary effort


USA


Mexico


UK


Spain


France


Germany


Italy


Switzerland

ISINP 2017

69 participants from 16 countries

Bulgaria


Slovakia


India


China


Japan


Hungary


Israel


Romania

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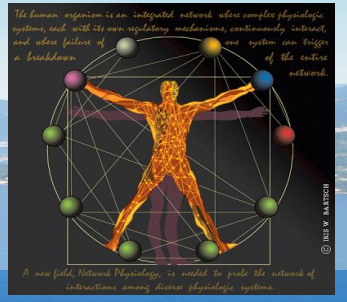


Focus issue on network physiology now open in the journal

Physiological Measurement

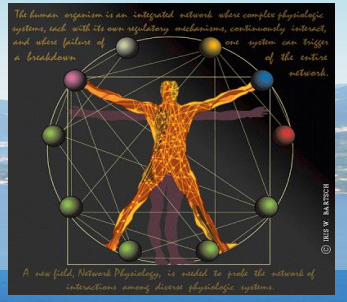
iopscience.org/pmea

IPEM Institute of Physics and Engineering in Medicine

Editor-in-Chief
J R Moorman
University of Virginia, Charlottesville, USA

Focus issue title

"The new field of Network Physiology: redefining health and disease through networks of physiological interactions"



Announcements

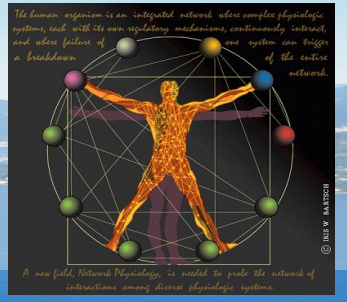
Program

Round Table Discussions

- Round Table I 17:35-18:20h, Monday, 24 July, 2017
- Round Table II 17:35-18:20h, Thursday, 27 July, 2017

Poster Sessions

- Poster Session I 17:35-19:00h, Tuesday, 25 July, 2017
- Poster Session II 17:35-19:00h, Wednesday, 26 July, 2017



Announcements

Social events

Classical music concert

- Como Opera Theater
  Teatro Sociale di Como
  19:00h, Friday, 28 July, 2017

Dinner

- Osteria l'Angolo del Silenzio
  20:30h, Friday, 28 July, 2017