

# **Hungarian participation in PHENIX**

## **10 years - 10 minutes**

**Csörgő, Tamás**

**Principal Investigator of PHENIX-Hungary (2003-2013)**

**Wigner RCP, Budapest, Hungary**

**PHENIX**

**Meeting**

**First Hungarian contributions**

**Milestones**

**Events**

**Results**

**Thanks**

# Meeting, connections

**Gyulassy, Miklós (Columbia University, New York, NY):**

**Expert in correlations (theory)**

**Advanced Research Award, Hungarian-US Fulbright Foundation**

**Question from dr. Brückner & answer**



**Professor Shoji Nagamiya:**

**Founding spokesperson of PHENIX**

**Chair, Dept. Physics, Columbia University**

**Founder of PHENIX**

**(to become Founder of Hungarian Judo Museum)**



**Professor W. A. Zajc:**

**Expert of correlations (experiment)**

**Becoming second spokesperson of PHENIX**

**Alumni Initiatives Award, Fulbright Foundation**

**Start of PHENIX-Hungary, MoU**

**(to become Chair, Dept. Physics, Columbia University)**

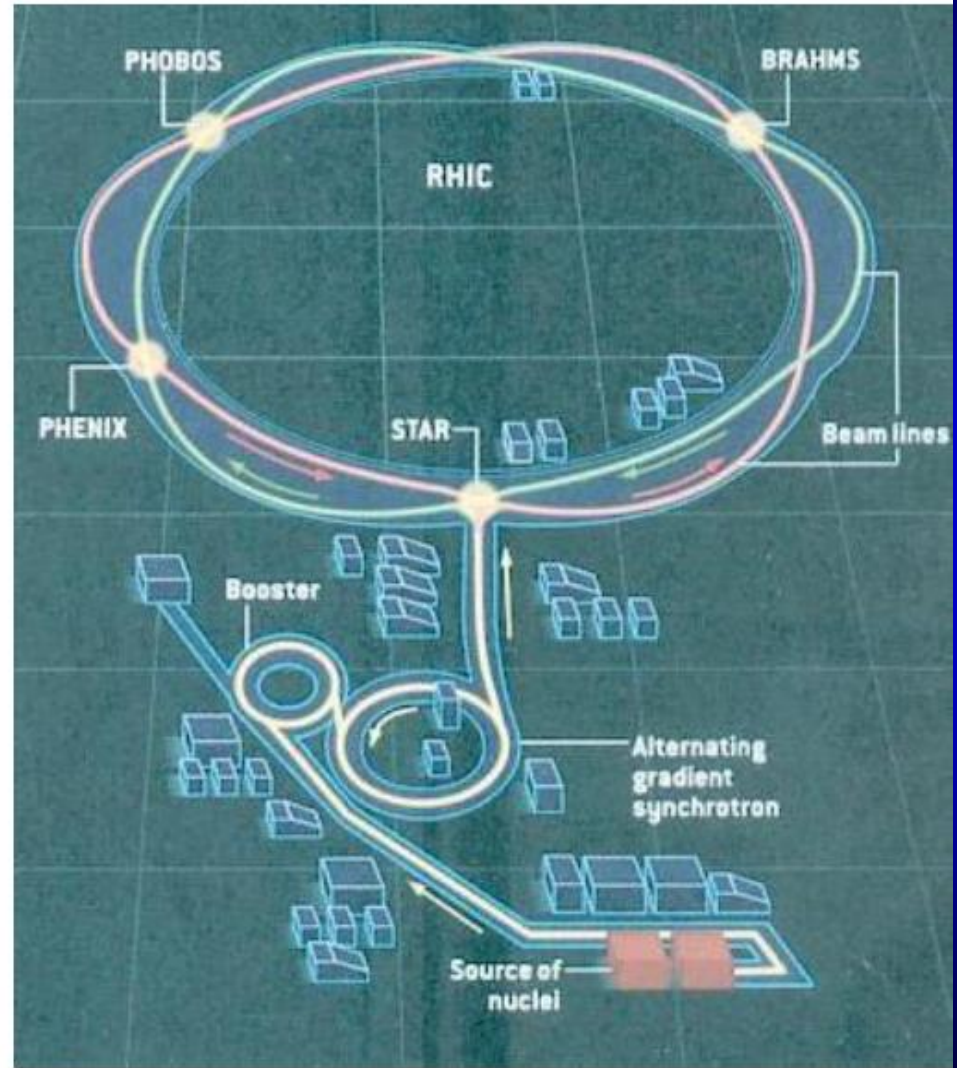
# PHENIX in a Nutshell

## PHENIX @ RHIC

- Au+Au, Cu+Cu,  $p\uparrow+p\downarrow$ , d+Au
- 7 to 200 (500) GeV
- Upgrade to eRHIC
- BRAHMS, STAR, PHENIX, PHOBOS
- PHENIX: few 100 participants from 14 countries
- Official Hungarian participation



PHENIX 14 countries, 73 institutions, January 2013



**First Hungarian on PHENIX papers: A. Ster (2002-)**

# Summary: Light of Au+Au at RHIC

## In Au+Au at RHIC

- New phenomena
- New form of matter
- Perfect fluid
- Fluid of quarks

## Properties:

Opaque,  $R_{AA} \sim 0.2$

Attenuation  $\sim 2$  fm

$c_s = 0.35 \pm 0.05$

$\eta/s \leq$  superfluid He/5

$T_{init} \geq 300$  MeV

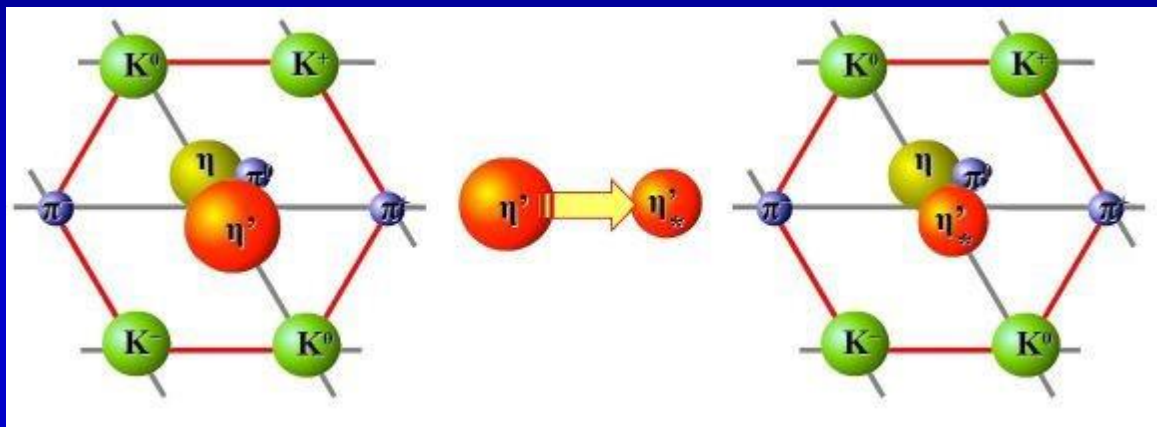
$\epsilon_{init} \geq 10-15$  GeV/fm<sup>3</sup>

$p_{init} \geq 1$  GeV/fm<sup>3</sup>

## Cross-over transition:

$\Delta m_{\eta'} \geq 200$  MeV

$\eta'$  meson mass drop by 200 MeV  
a lost symmetry is restored



this happens in hadronic matter  
deconfinement and U<sub>A</sub>(1)  
restoration happens at different T!

T. Cs, R. Vertesi, J. Sziklai  
Phys.Rev.Lett.105:182301,2010

see also M. Vargyas's talk  
at the 2013 Zimányi School

# **„Expect the unexpected”**

## **- a PHENIX design principle (Bill Zajc)**

- A. Ster/PHENIX: top cited Hungarian in physics
- Perfect Fluid: hottest matter is a fluid
- Quark Matter conf. in Budapest (August 2005)
- Nobel prize of R.J. Glauber (Oct 2005)
- AIP Top Physics Story, 2005
- Prof. S. Nagamiya, PHENIX Founding spokesman:  
Hungarian judo black belt
- Hungary: ranked no. 1 for citations/papers
- Hungarian **Judo Order of Merit** to **PHENIX**  
**Founding Spokesperson: S. Nagamiya**
- ...

# Thanks are especially due to



all of you, who helped PHENIX-Hungary,  
among others, and in particular



**Tamás Csörgő**  
(Wigner RCP),  
group leader,  
member since  
2003



**Márton Nagy**  
(Eötvös U.),  
member since  
2005



**András Ster**  
(Wigner RCP),  
member since 2001



**Márton Vargyas**  
(Wigner RCP),  
member since  
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(Eötvös U.),  
member since  
2003



**József Zimányi**<sup>†2006</sup>,  
(Wigner RCP),  
member 2003-2006



# Thanks for 10+ wonderful years

Member of Academy of Europe: 1

Order of Merit, Knight's Cross of Hungary: 1

Hungarian PhDs in PHENIX: (CsM, TP, NM, VR, NN)

Fulbright Fellowships: 4 (CsT, CsT, CsM, VR)

Hungarian M.Sc-s in PHENIX: 4 (CsM, NM, VM, KM)

Zimányi Schools in Hungary: 13

Black belts in martial arts

Thanks are due to:

All members of PHENIX and PHENIX-Hungary

Shoji Nagamiya (RIKEN-KEK), Founding Spokesperson

W. A. Zajc (Columbia University), Spokesperson Perfect

Barbara Jacak (SUNY at Stony Brook), Spokesperson Hottest

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DOE, Fulbright, HAESF, NSF

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We appreciate all support – and need it for future.

# Thanks to funding agencies

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### PHENIX

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US-Hungarian Fulbright Foundation  
U.S.-Israel Binational Science Foundation  
Ministry of Science, Education, and Sports (Croatia)  
Physics Department, Lahore University of Management Sciences (Pakistan)

### STAR

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National Science Center of Poland  
National Research Foundation of the Republic of Croatia  
Ministry of Science, Education and Sports of the Republic of Croatia  
Polish State Committee for Scientific Research  
Science and Technology Assistance Agency of Slovakia

[About STAR](#)



### PHOBOS

U.S. National Science Foundation  
Polish Committee for Scientific Research  
National Science Council of Taiwan

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### BRAHMS

Danish Natural Science Research Council  
Research Council of Norway  
Romanian Ministry of Education and Research

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