

Quantumelectronics Lab

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Department of Physics, BME

<http://nanoelectronics.physics.bme.hu/>





NANOELECTRONICS RESEARCH LAB
Department of Physics



ATOMIC AND MOLECULAR ELECTRONICS

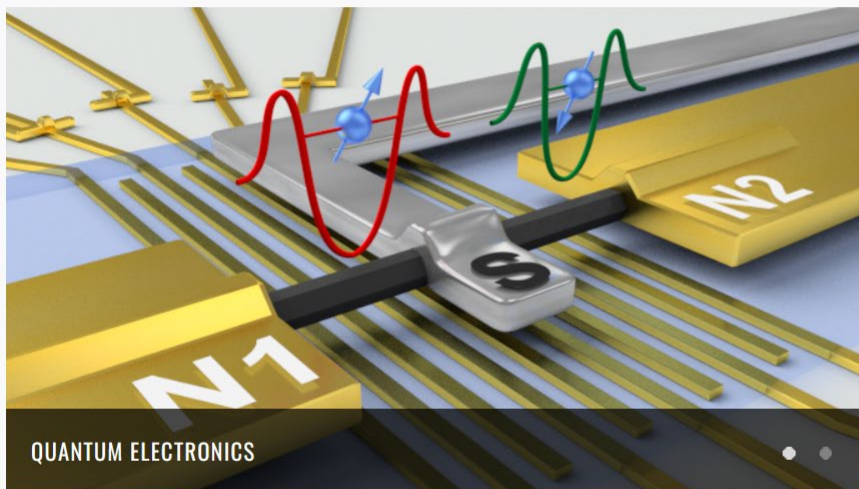
QUANTUM ELECTRONICS

LAB TOUR

EDUCATION

CONTACT

BEYOND PHYSICS



GRAPHENE WORKSHOP 6

The graphene workshop organized for the 6th times was a great success with leading scientists from all over Europe. See you next year!

CONGRATULATIONS TO DR. BÁLINT FÜLÖP



Congratulations on successfully defending his thesis work titled "v.d.Waals heterostructures: from fabrication to hydrostatic pressure experiments"

GROUP LEADERS



András
Halbritter



Szabolcs
Csonka



Péter
Makk

SEMINARS / EVENTS

2022. 11. 07. 10:15
SPIN-WAVE-BASED COMPUTING FOR FUTURE ELECTRONICS
Csaba György (Pázmány)

2022. 10. 17. 09:15
ROLE OF E-E INTERACTION IN ANDREEV SPIN QUBITS
Zoltán Scherübl

2022. 10. 10. 09:15
ROLE OF E-E INTERACTION IN ANDREEV SPIN QUBITS
Zoltán Scherübl

2022. 09. 27. 14:30
THE MATTER OF QUANTUM

Sz. Csonka



P. Makk



Email:

makk.peter@ttk.bme.hu

csonka.szabolcs@ttk.bme.hu

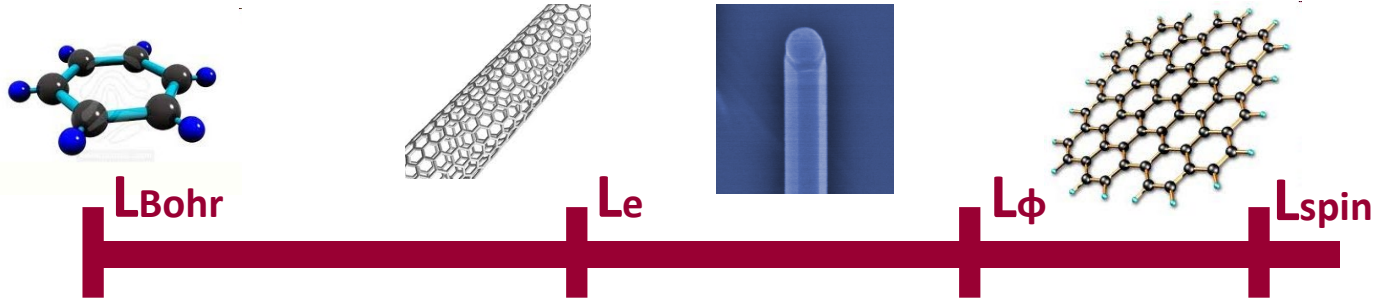
<http://nanoelectronics.physics.bme.hu/>



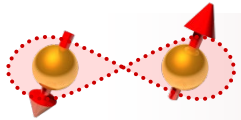
The Quantum electronics team



**6 senior researchers, 12 PhD
students, 2 MSc, and 2 BSc**



Experimental techniques



Quantum electronics

E-beam lithography



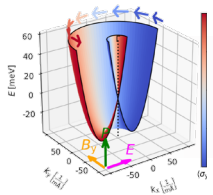
Spintronics

Ultra low T



Cavity Quantum ED

High frequency techniques

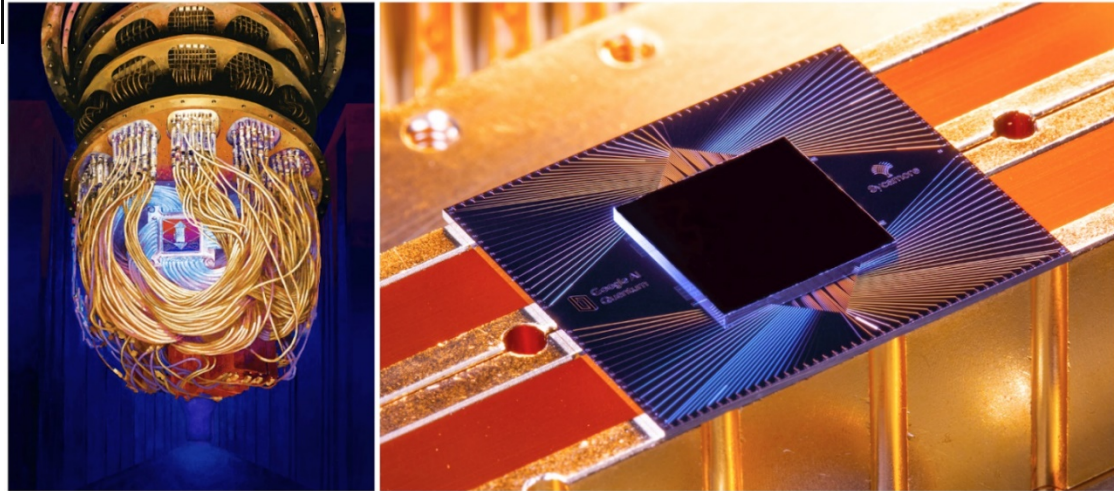


Novel materials: 2D, correlations

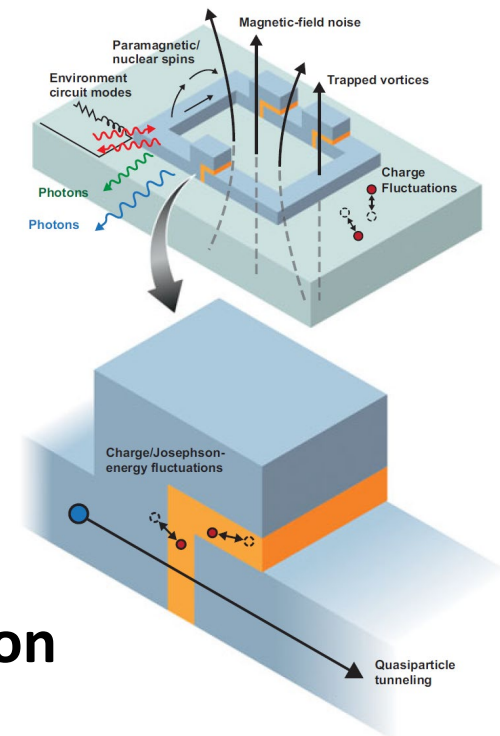
Pressure cell



Google says quantum computer completed 10,000-year task in 3 minutes, 20 seconds



Information loss



Quantum computation and topological protection

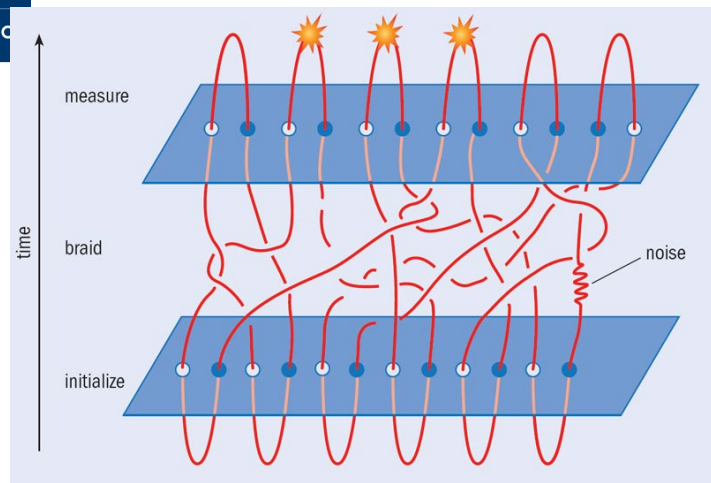
MAGYAR TUDOMÁNYOS AKADÉMIA

MTÜ COVID MTA Köztestület Kutatás Hírek Pályázatok Keresés

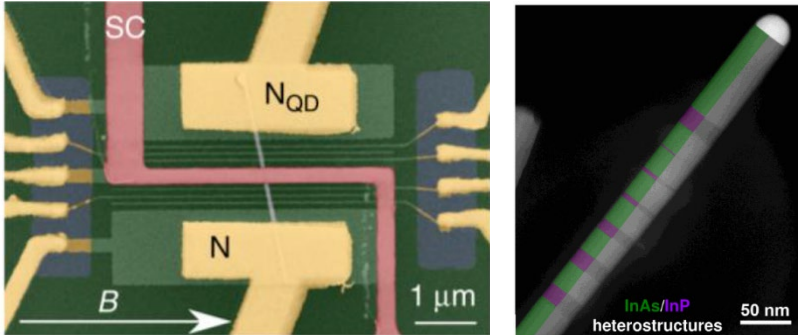
Lendületes kutatók mesterséges atomokra építenék a jövő kvantumszámítógépet

A kvantumszámítógépek alapját jelentő kvantumbitek gyakorlati megvalósítása a mai napig hatalmas technológiai kihívás. A BME-n működő Nanoelektronika és Egzotikus Kvantumfizikusok Lendület-kutatócsoportok új eredménye szerint az általuk előállított mesterséges atomok használata vezethet el egy iparilag is hatékonyan alkalmazható gyártási eljárásához.

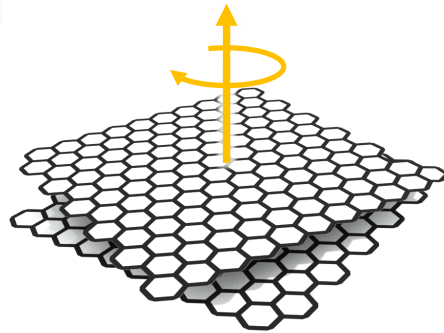
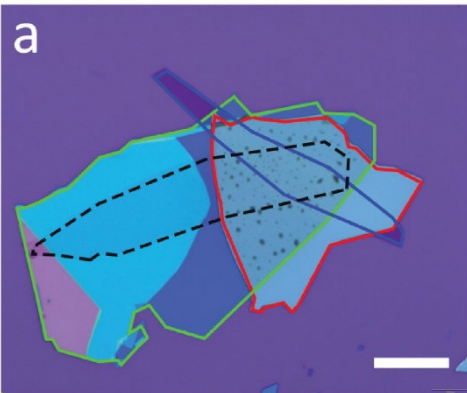
2020. JÚLIUS 22.



Novel quantum materials are required



1D wire-based architectures



2D material-based architectures



2D materials LEGO

Semiconductors (e.g. MoS₂) Graphene

Superconductors
(e.g. NbSe₂)



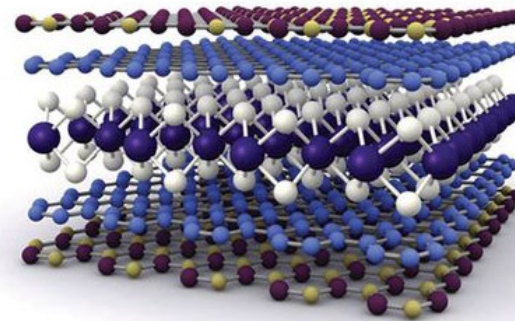
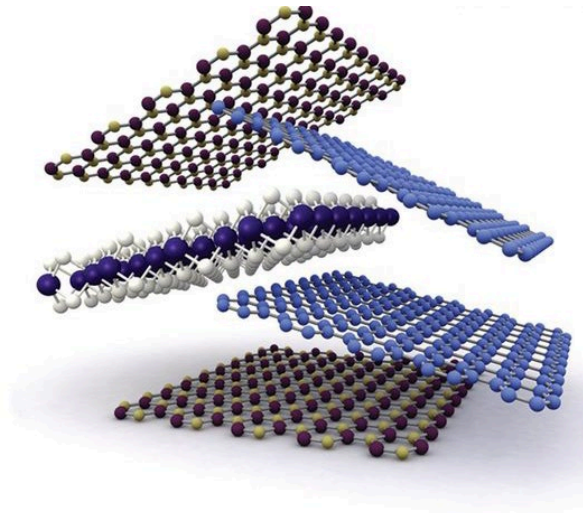
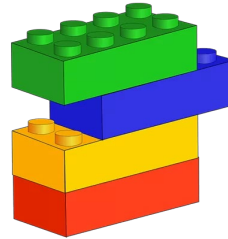
Insulators (e.g. hBN)



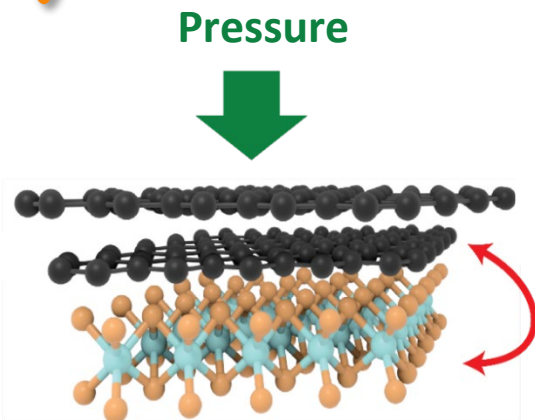
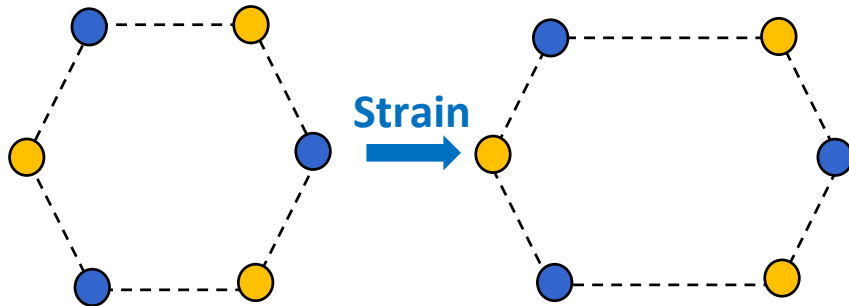
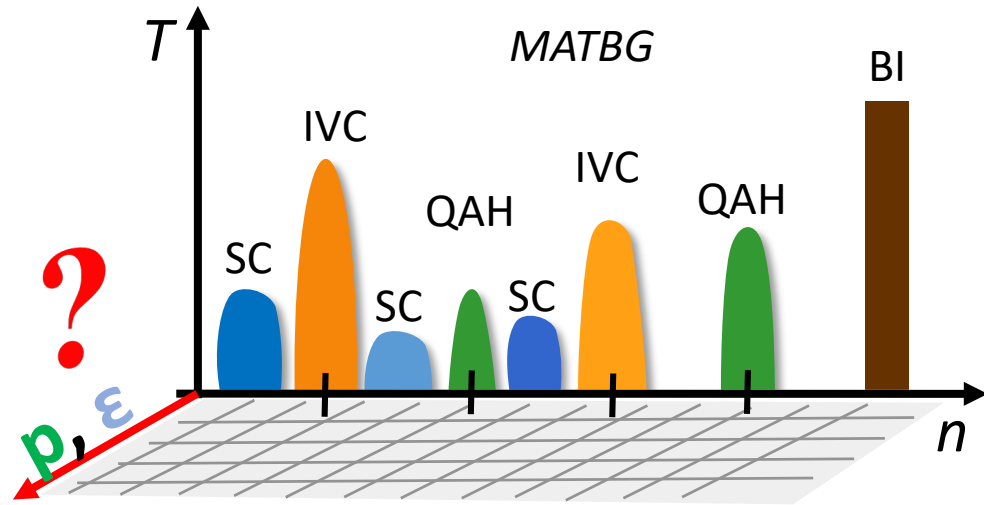
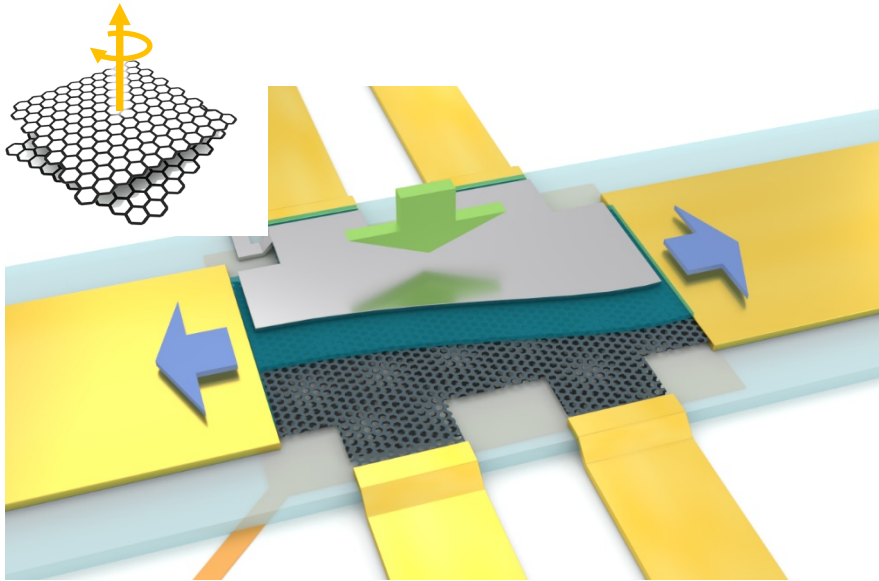
Topological materials
(e.g. WTe₂)



Magnetic materials
(e.g. CrI₃)



K. Novoselov, Science 353, 6298 (2016)



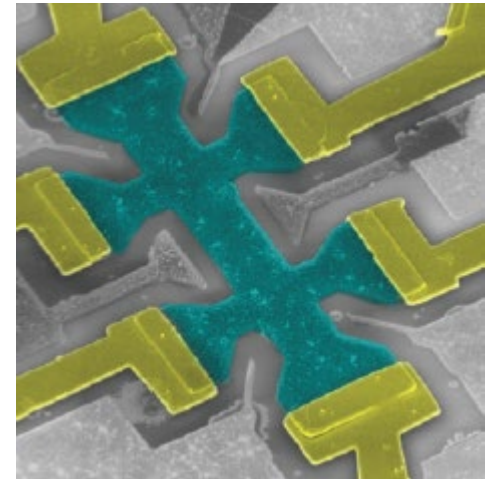
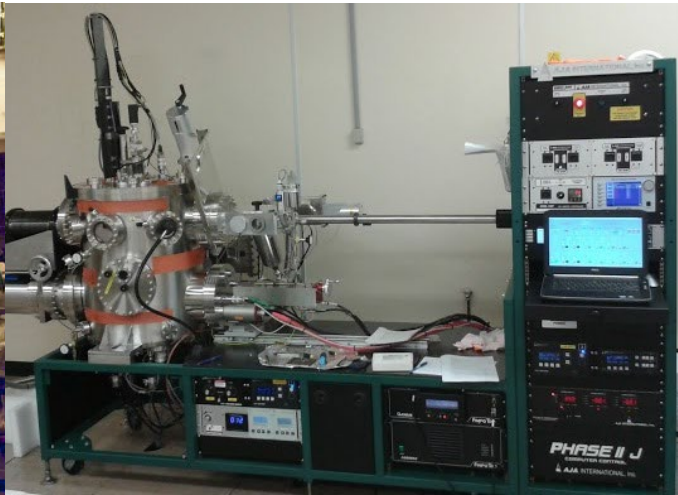
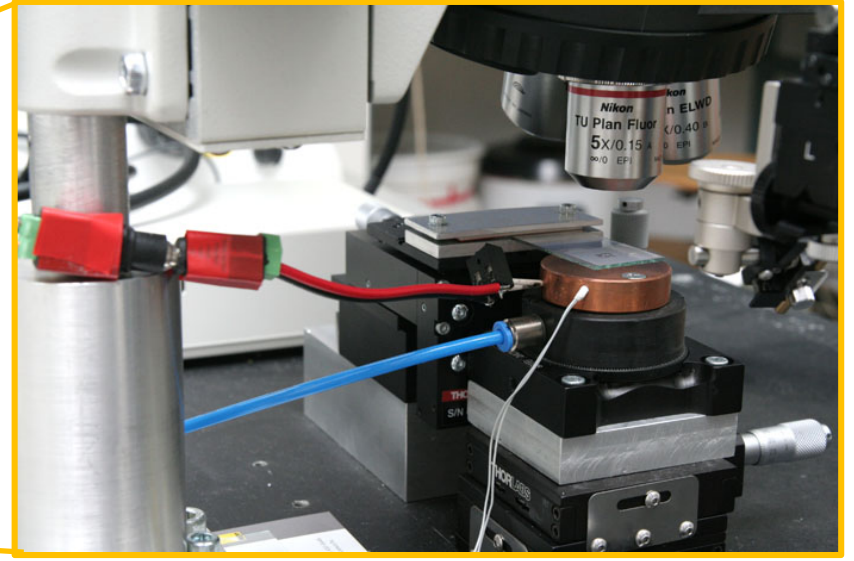
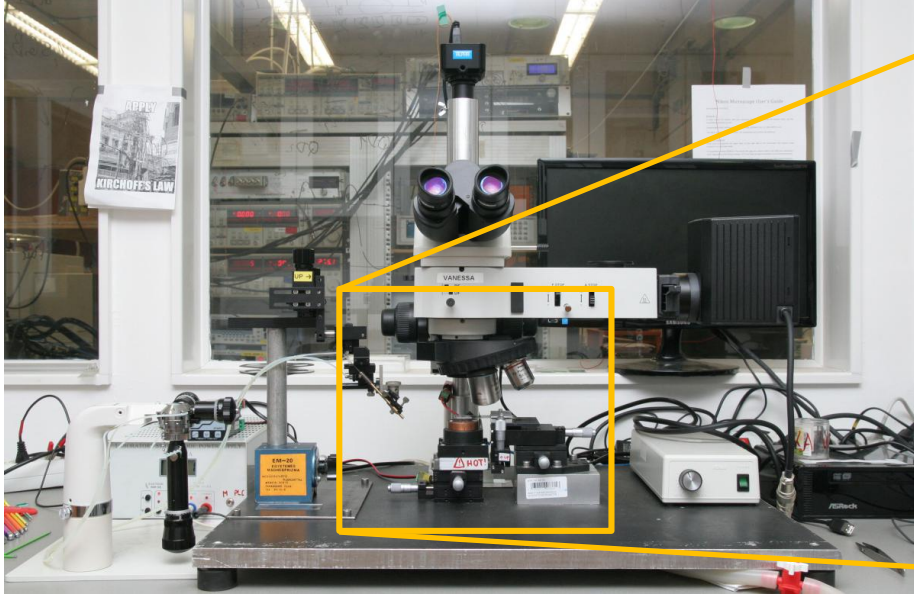
Realize new states of matter using novel tuning knobs:

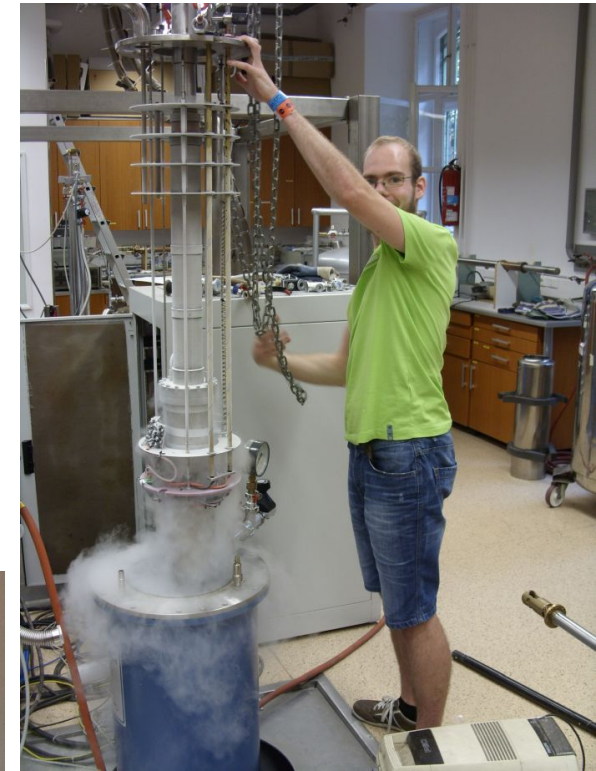
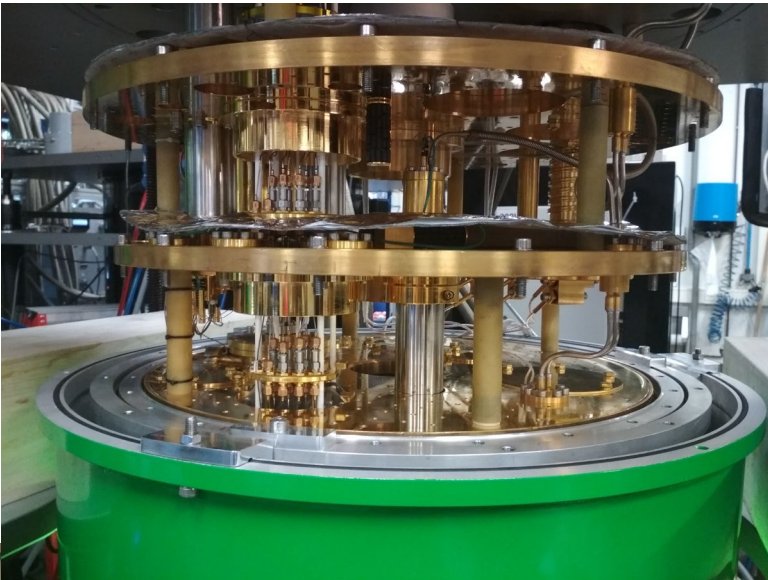
strain

and

pressure

and study them by **transport experiments**





Fridge, $T_{\text{fridge}} \approx 7\text{mK}$
RF lines
3D Vector magnet:
6-2-2T

National and international collaborations



Study here!



Nanophysics seminar

The schedule of the seminar (spring, 21)

Previous seminars

Recent interesting articles

Interesting articles for future seminars

Contents [hide]

- 1 Samuel d'Hollosy (EA), Fülöp Bálint(J)
- 2 2013. április 12.
- 3 Fülöp Bálint(EA), Pósa László (JC) 20
- 4 Pasco Moca (EA), Scherübl Zoltán (JC
- 5 Thomas Müller (EA), Gubicza Ági (JC)
- 6 Palotás Krisztián (EA), Tóvári Endre (J
- 7 Pósa László (EA), Balogh Zoltán (JC)
- 8 Rakya Péter (EA), Fülöp Gergő (JC) 2
- 9 Tóvári Endre (EA), Sárkány Lőrinc (JC
- 10 Gubicza Ági (EA), Pósa László (JC) ;
- 11 Balogh Zoltán (EA), Gubicza Ágnes (
- 12 Asbóth János (EA), Tóvári Endre (JC
- 13 Balogh Zoltán (JC), Makk Péter (EA)
- 14 Scherübl Zoltán (JC), Fülöp Bálint (E
- 15 Fülöp Gergő (JC), Pósa László (EA)
- 16 Csontos Mihály (JC), Magda Gábor (

BMETE11MF53

Course data

Course name: Fundamentals of Nanophysics

Neptun ID: BMETE11MF53

Responsible teacher: András Halbritter

Department: *Department of Physics*

Programme: Courses for Physicist MSc students

Course data sheet: *BMETE11MF53*

Requirements, Informations

COURSE INFORMATION

- **Lecturers:** András Halbritter, Szabolcs Csonka, Peter Makk

TDK

Kezdőlap > Természettudományi Kar > Kísérleti fizika

Kísérleti fizika

I. helyezett Pro Progressio alapítvány különdíja

Szupravezetők kapuzásának vizsgálatára keresztkorrelációval

Szerző: Berke Martin

Konzulens: Dr. Csonka Szabolcs (Fizika)



Quantum Computing Architectures

Course Information, 2018

- **Lecturers:** András Pályi, Péter Makk
- **Responsible lecturer:** András Pályi
- **Language:** English
- **Location:** building H, room H601
- **Time:** Wednesdays, 12:15-13:45
- **Schedule:** first lecture: Sep 5; no lecture o
- **Neptun Code:** BMETE15MF60
- **Credits:** 3
- **Exam:** Short written test + oral exam.

BMETE11MF24

Course data

Course name: Transport in Complex Nanostructures

Neptun ID: BMETE11MF24

BMETE11MF58

Tantárgy adatok

Tárgy címe: Nanotechnológia és anyagtudomány

Neptun kód: BMETE11MF58

Felelős oktató: Dr. Csonka Szabolcs

Felelős tanszék: *Fizika Tanszék*

Képzés: MSc fizikus

Tantárgy adatlapja: *BMETE11MF58*

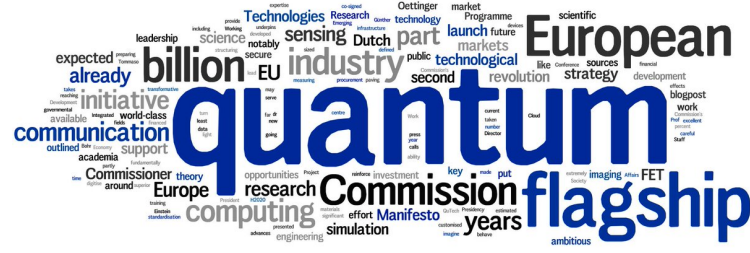
Slides

After studies:

ETH, Princeton, Uni Basel, Tech. Univ. Delft, Univ. Manchester, Grenoble,...



Lendület program





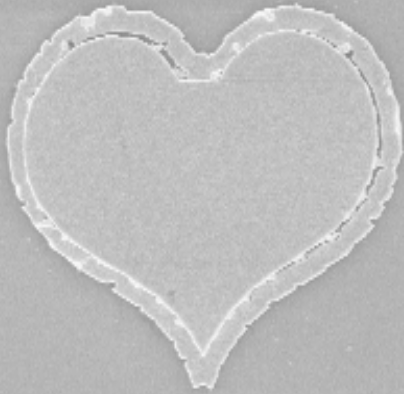
Beyond physics...

Group Meeting

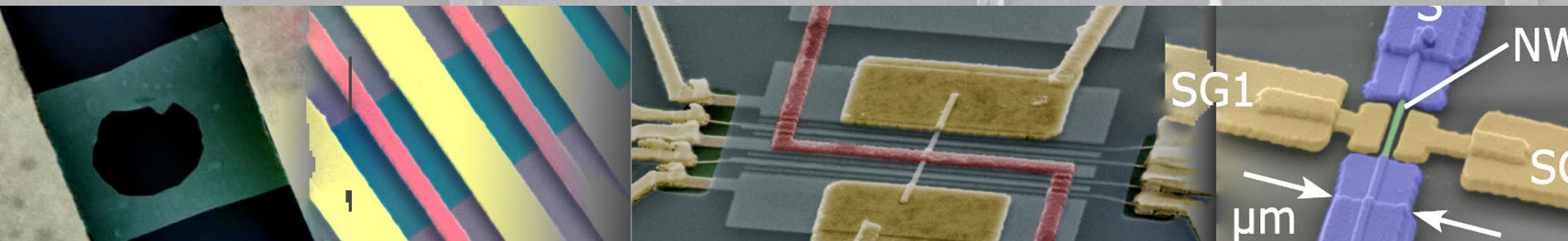


Thank you!

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nano



Email: csonka.szabolcs@ttk.bme.hu, makk.peter@ttk.bme.hu