

1. Scientific News

Nicolas Brunner's and Nicolas Gisin's group, Geneva

Experimental certification of millions of genuinely entangled atoms in a solid: Quantum theory is unequivocal: it predicts that a vast number of atoms can be entangled and intertwined by a very strong quantum relationship even in a macroscopic structure. Until now, however, experimental evidence has been mostly lacking, although recent advances have shown the entanglement of 2,900 atoms. Nicolas Gisin's group together with Nicolas Brunner have recently

demonstrated the entanglement between 16 million atoms in a crystal. This was done based on the novel theoretical approach of certifying genuine multipartite entanglement for multiatomic ensembles interacting with light.

- F. Fröwis, P. C. Strassmann, A. Tiranov, C. Gut, J. Lavoie, N. Brunner, F. Bussi eres, M. Afzelius, N. Gisin. *Nature Communications* **8**, 907 (2017), [link](#)
- in the news: [Uni Geneva press release](#)

Nicolas Brunner's group, Geneva and Stefan Wolf's group, Lugano

Autonomous Quantum Clocks: Does Thermodynamics Limit Our Ability to Measure Time? Time remains one of the least well-understood concepts in physics, most notably in quantum mechanics. A central goal is to find the fundamental limits of measuring time. Here, we explore these questions by introducing a model of time measurements that is complete and autonomous. Specifically, our autonomous quantum clock consists of a system out of thermal equilibrium - a prerequisite for any system to function as a clock - powered by minimal

resources, namely, two thermal baths at different temperatures. We find that the laws of thermodynamics dictate a trade-off between the amount of dissipated heat and the clock's performance in terms of its accuracy and resolution. More generally, this provides a natural framework for the exploration of fundamental questions about time in quantum theory and beyond.

- P. Erker, M. T. Mitchison, R. Silva, M. P. Woods, N. Brunner, M. Huber; *Phys. Rev. X* **7**, 031022 (2017) [link](#)

Anna Fontcuberta i Morral's group, Lausanne

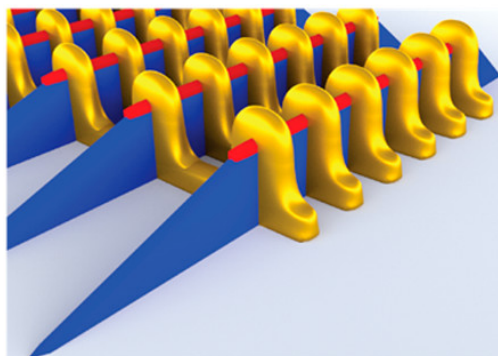
Bi-stability of contact angle and its role in achieving quantum-thin self-assisted GaAs nanowires: We demonstrate the existence of two stable contact angles during the radius modulation of self-assisted GaAs nanowires in the form of nanoneedles with the stable radius down to 10 nm. Our theoretical model is able to predict the NW-to-NN shape evolution quite accurately. The demonstrated quantum-thin structures can be very useful in applications with a requirement for strong lateral confinement of carriers, such as quantum light sources and detectors.

- W. Kim, V. G. Dubrovskii, J. Vukajlovic-Plestina, G. Tütüncüoğlu, L. Francaviglia, L. Güniat, H. Potts, M. Friedl, J.-B. Leran, A. Fontcuberta i Morral; *Nano Lett.* **18**, 49 (2017) [link](#)

Template-Assisted Scalable Nanowire Networks:

Topological qubits based on Majorana Fermions have the potential to revolutionize the emerging field of quantum computing by making information processing significantly more robust to decoherence. Nanowires are a promising medium for hosting these kinds of qubits, though branched nanowires are needed to perform qubit manipulations. Here we report a gold-free templated growth of III-V nanowires by molecular beam epitaxy using an approach that enables patternable and highly

regular branched nanowire arrays on a far greater scale than what has been reported thus far.



Model of an array of contacted linear NM/NW structures used in magnetotransport measurements.

- M. Friedl, K. Cervený, P. Weigele, G. Tütüncüoğlu, S. Martí-Sánchez, C. Huang, T. Pałtatiuk, H. Potts, Z. Sun, M. O. Hill, L. Güniat, W. Kim, M. Zamani, V. G. Dubrovskii, J. Arbiol, L. J. Lauhon, D. M. Zumbühl, and A. Fontcuberta i Morral; *Nano Lett.*, **18** (4), 2666 (2018) [link](#)

Anisotropic-Strain-Induced Band gap Engineering in Nanowire-Based Quantum Dots: Tuning light emission in bulk and quantum structures by strain constitutes a complementary method to engineer functional properties of semiconductors. Here, we demonstrate the tuning of light emission of GaAs

nanowires and their quantum dots up to 115 meV by applying strain through an oxide envelope.

- L. Francaviglia, A. Giunto, W. Kim, P. R. Gomez, J. Vukajlovic-Plestina, M. Friedl, H. Potts, L. Güniat, G. Tütüncüoğlu, A. Fontcuberta i Morral; *Nano Lett.*, **18** (4) 2393 (2018) [link](#)

Nicolas Gisin's group, Geneva and Nicolas Sangouard's group, Basel

A Review on Macroscopic Quantum Effects: Large-scale quantum effects have always played an important role in the foundations of quantum theory.

With recent experimental progress and the aspiration for quantum enhanced applications, the interest in macroscopic quantum effects has been reinforced. A collaboration between the universities of Basel, Geneva and Innsbruck led to a review paper in which we critically analyze and discuss measures aiming to quantify various aspects of macroscopic quantumness. We survey recent results on the difficulties and prospects to create, maintain and detect macroscopic quantum states. The role of macroscopic quantum states in foundational questions as well as practical applications is outlined. Our manuscript was published in Review of Modern Physics and [covers the April 2018 issue](#).



- F. Fröwis, P. Sekatski, W. Dur, N. Gisin, N. Sangouard; *Rev. Mod. Phys.* **90**, 025004 (2018) [link](#)

Sebastian Huber's group, Zurich

Observation of a phononic quadrupole topological insulator: ETH physicists have developed a silicon wafer that behaves like a topological insulator when stimulated using ultrasound. They have thereby succeeded in turning an abstract theoretical concept into a macroscopic product.

M. Serra-Garcia, V. Peri, R. Süssstrunk, O.R. Bilal, T. Larsen, L.G. Villanueva, S.D. Huber. *Nature* **555**, 342 (2018), [link](#)

- K. H. Matlack, M. Serra-Garcia, A. Palermo, S. D. Huber, C. Daraio. *Nature Materials*, **17**, 323 (2018), [link](#)

- News and Views: [Nature](#), [Nature materials](#)

- in the news: [D-Phys News](#)

Mutual information, neural networks and the renormalization group: Physical systems differing in

their microscopic details often display strikingly similar behavior when probed at macroscopic scales. Those universal properties, largely determining their physical characteristics, are revealed by the powerful renormalization group (RG) procedure, which systematically retains 'slow' degrees of freedom and integrates out the rest. However, the important degrees of freedom may be difficult to identify. Here we demonstrate a machine-learning algorithm capable of identifying the relevant degrees of freedom and executing RG steps iteratively without any prior knowledge about the system.

- M. Koch-Janusz, Z. Ringel. *Nature Physics* **14**, 578 (2018), [link](#)

- in the news: [ETH News](#)

Atac Imamoglu's group, Zurich

Signatures of a dissipative phase transition in photon correlation measurements: Understanding and characterizing phase transitions in driven-dissipative systems constitutes a new frontier for many-body physics. A generic feature of dissipative phase transitions is a vanishing gap in the Liouvillian spectrum, which leads to long-lived deviations from the steady state as the system is driven towards the transition. Here, we show that photon correlation measurements can be used to characterize the

corresponding critical slowing down of non-equilibrium dynamics. We focus on the extensively studied phenomenon of optical bistability in GaAs cavity polaritons, which can be described as a first-order dissipative phase transition.

- T. Fink, A. Schade, S. Höfling, C. Schneider, A. Imamoglu, *Nature Physics*, **14**, 365 (2018) [link](#)

Atac Imamoglu's and Werner Wegscheider's group, Zurich

Polaron polaritons in the integer and fractional quantum Hall regimes: Elementary quasiparticles in a two-dimensional electron system can be described as exciton polarons since electron-exciton interactions ensures dressing of excitons by Fermi-sea electron-hole pair excitations. A relevant open question is the modification of this description when the electrons occupy flat bands and electron-electron interactions become prominent. Here, we perform cavity spectroscopy of a two-dimensional electron system in

the strong coupling regime, where polariton resonances carry signatures of strongly correlated quantum Hall phases. By measuring the evolution of the polariton splitting under an external magnetic field, we demonstrate the modification of polaron dressing that we associate with filling factor dependent electron-exciton interactions.

- S. Ravets, P. Knüppel, S. Faelt, O. Cotlet, M. Kroner, W. Wegscheider, and A. Imamoglu; *Phys. Rev. Lett.* **120**, 057401 (2018) [link](#)

Renato Renner's group, Zurich

Practical device-independent quantum cryptography via entropy accumulation In quantum cryptography, the laws of quantum mechanics are exploited to send messages with higher security than is possible in conventional cryptographic schemes based on classical physical phenomena. In principle, quantum communication enables absolute security — that is, no adversary can intercept messages or tinker with them. But in practice such unconditional security is not realizable. One main route for an unauthorized person to 'listen in' is to manipulate in advance the communication devices that will be used later. Writing in *Nature Communications*, Rotem Arnon-Friedman and colleagues from Renato Renner's group prove that there exist quantum-cryptographic protocols that ensure nearly optimal security even if the devices are manipulated, and that such device-independent quantum

cryptography should be possible with current quantum technology.

– R. Arnon-Friedman, F. Dupuis, O. Fawzi, R. Renner, and T. Vidick; *Nature Communications* **9**, 459 (2018) [link](#)

- in the news: [ETH News](#)

Fundamental Work Cost of Quantum Processes:

Information processing requires a lot of energy. Energy-saving computer systems could make computing more efficient, but the efficiency of these systems can't be increased indefinitely, as physicists from Renato Renner's group show.

– P. Faist and R. Renner; *Phys. Rev. X* **8**, 021011 (2018) [link](#)

- in the news: [ETH News](#)

Nicolas Sangouard's group and Philipp Treutlein's group, Basel

Bell correlations in a many-body system with finite statistics: A collaboration between the Sangouard group and the Treutlein group led to the first experiment reporting on the violation of a Bell correlation witness in a many-body system [*Science* 352, 441 (2016)]. Following discussions in this paper, we recently addressed the question of the statistics required to witness Bell correlated states, i.e. states violating a Bell inequality, in such experiments. From new Bell inequalities, we built up improved witnesses able to

detect Bell-correlated states in many-body systems using two collective measurements only with an arbitrarily low amount of spin squeezing. We then established an upper bound on the statistics needed to convincingly conclude that a measured state is Bell-correlated.

- S. Wagner, R. Schmied, M. Fadel, P. Treutlein, Nicolas Sangouard, and J.-D. Bancal, *Phys. Rev. Lett.* **119**, 170403 (2017) [link](#)

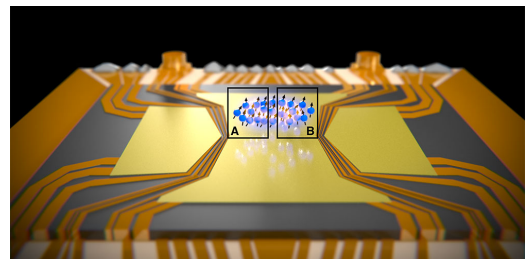
Philipp Treutlein's group, Basel

Einstein-Podolsky-Rosen paradox observed in many-particle system for the first time: Physicists from the University of Basel have observed the quantum mechanical Einstein-Podolsky-Rosen paradox in a system of several hundred interacting atoms for the first time. The phenomenon dates back to a famous thought experiment from 1935. It allows measurement results to be predicted precisely and could be used in new types of sensors and imaging methods for electromagnetic fields.

- M. Fadel, T. Zibold, B. Décamps, P. Treutlein

Science **360**, 409 (2018) [link](#)

- in the news: [Uni Basel News](#)



A cloud of atoms is held above a chip by electromagnetic fields. The EPR paradox was observed between the spatially separated regions A and B (Illustration: University of Basel, Department of Physics)

Andreas Wallraff's group, Zurich

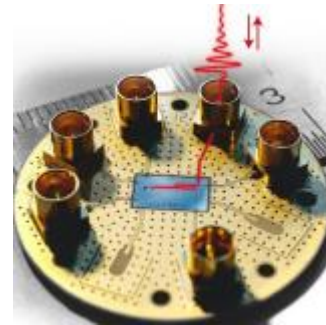
Deterministic quantum state transfer and remote entanglement using microwave photons: Sharing information over computer networks for private, business or science-related communication is part of our everyday lives. In the future, we may use protocols based on quantum physics to realize secure communication or to perform distributed quantum information processing exceeding the capabilities of classical computers and communication networks. In our work, we take a key step toward a future quantum network by realizing a fully deterministic quantum communication protocol between two remote superconducting quantum circuits. We accomplish this protocol by emitting a single, time-symmetric, itinerant microwave photon from one node of the network and absorb at another one to transmit a quantum bit of information and establish entanglement between two distant quantum nodes on-demand.



- P. Kurpiers, P. Magnard, T. Walter, B. Royer, M. Pechal, J. Heinsoo, Y. Salathé, A. Akin, S. Storz, J. - C. Besse, S. Gasparinetti, A. Blais, and A. Wallraff, *Nature* **558**, 264 (2018) [link](#)

Single-Shot Quantum Non-Demolition Detection of Individual Itinerant Microwave Photons:

Information is often transmitted using electromagnetic radiation, the quantum units of which are photons. In the microwave regime, detecting single itinerant photons at the receiving end of a transmission channel is challenging since microwave photons possess 5 orders of magnitude less energy than their optical counterparts.



In this work, we show how to transfer the information content of a propagating photon into an excitation of a stationary qubit. By reading out the state of the latter, we acquire knowledge about the photon's presence without destroying it. This 'non-demolition' aspect opens up new possibilities of detecting the photon in flight while allowing it to travel on towards another destination. Such schemes are potentially useful for realizing logic gates between propagating photons and for creating quantum networks.

- J. - C. Besse, S. Gasparinetti, M. C. Collodo, T. Walter, P. Kurpiers, M. Pechal, C. Eichler, and A. Wallraff, *Phys. Rev. X* **8**, 021003 (2018) [link](#)

Oded Zilberber's, Gianni Blatter's, Thomas Ihn's and Klaus Ensslin's group, Zürich

Cavity-mediated coherent coupling between distant quantum dots: Scalable architectures for quantum information technologies require one to selectively couple long- distance qubits while suppressing environmental noise and cross talk. In semiconductor materials, the coherent coupling of a single spin on a quantum dot to a cavity hosting fermionic modes offers a new solution to this technological challenge. Here, we demonstrate coherent coupling between two spatially separated quantum dots using an electronic cavity design that takes advantage of whispering-gallery

modes in a two-dimensional electron gas. The cavity-mediated, long-distance coupling effectively minimizes undesirable direct cross talk between the dots and defines a scalable architecture for all-electronic semiconductor-based quantum information processing.

- G. Nicolí, M. S. Ferguson, C. Rössler, A. Wolfertz, G. Blatter, T. Ihn, K. Ensslin, C. Reichl, W. Wegscheider, and O. Zilberberg, *Phys. Rev. Lett.* **120**, 236801 (2018) [link](#)

Several PIs and collaborators of QSIT research groups

have contributed to the **European Quantum Technologies Roadmap**. This document's purpose is to serve as a scientific document that gathers the major achievements and state-of-the-art of the different areas of Quantum Information Science at this moment in time, as well as the challenges and short-, mid- and long- term

goals tracing (possible) routes for the future development of the field.

- full document, [link](#)

- summary: [arXiv:1712.03773](https://arxiv.org/abs/1712.03773)

2. Technology Transfer

qstarter awards 2018: The fifth qstarter awards event took place on January 22, 2018, at the Villa Hatt in Zurich. Followed by the traditional pitch talks presenting the 11 projects and start-up ideas, the inventors discussed intensely their projects with representatives of QSIT's industry partners (Nanosurf, Sensirion, Zurich Instruments, ABB, Nanonis SPECS) during a buffet lunch. The winners were:

- **Damian Steiger and Thomas Häner** for [ProjectQ](#)
- **Mathieu Munsch** for [Qnami](#)
- **Lidia del Rio** for [Quantum Journal](#)

Webpage: [qstarter](#)

In February 2018 **ID Quantique SA (IDQ)** announced a strategic investment plan of US\$ 65 million from investor SK Telecom, the South Korean telecom giant. The investment will strengthen ID Quantique's position as the global leader in quantum safe cryptography and quantum sensing solutions. It will also help IDQ to continue to develop global markets and partnerships.

[ID Quantique press release](#)

[SK Telecom press release](#)

[NZZ article](#)

News from the start-ups: [IRsweep](#) (start-up emerging from the Faist group) joined forces with our qstarter partner Sensirion and moved to a new head quarter in Stäfa. IRsweep was selected in the top 8 startups for the Award of Swiss MNT Network.

3. Equal Opportunity

INSPIRE Potentials – QSIT Master Internship Award: A QSIT initiative to enhance the place for women in science. The INSPIRE Potentials Master internship award aims at attracting excellent female students who will conduct their Master thesis in a laboratory belonging to the NCCR QSIT network.

We proud to announce the following awardees:

15.07.17 Tianqi Zhu (Kippenberg/Galland)

Stefania Balasiu (Wallraff)

15.01.18 Maryse Ernzer (Home)

15.04.18 Qianqian Chen (Zumbühl)

Nicole Widmer (Home)

Märta Tschudin (Maletinsky)

The next deadline for applications is October 15, 2018. Please find all details for the application procedure at the [QSIT webpage](#).

From July 1st, 2018 **Anna Fontcuberta i Morral** will be president of the WISH foundation at EPFL ([WISH: Women in Science, Engineering and Humanities](#)).

[QZabre](#), start-up emerging from the Degen group, offers a unique scanning probe that enables researchers to perform NV magnetometry experiments.

We congratulate our qstarter winners of 2018 [QNAMI](#), start-up emerging from the Maletinsky group, for winning the Venture Kick I-III and growing team accordingly.

[LiGenTec](#), start-up emerging from the Kippenberg group, was able to win the PIC Award 2018, the company award for Photonic Integrated Circuits Platform.

Exhibitions and fairs: [LiGenTec](#), one of the first 3 ESA BIC Switzerland projects winner, and [QNAMI](#), currently supported by a QSIT Technology Transfer Grant have successfully attended the Hannover Industry Fair with the support of NCCR QSIT and the SNSF.

[Hannover Messe](#)

Together with QSIT [IRsweep](#), [QNAMI](#), [QZabre](#) and [MicroRsystems](#), attended the [Swiss Nanoconvention 2018](#) exhibition.

Quantum Industry day: The Quantum Industry Day in Switzerland ([QIDiS](#)) will push the industrial R&D to exchange and accelerate the development of new quantum products together with the QSIT academic partners. Don't miss the event on the 11.10.18 in Zurich!

Ladies Lunch Meeting: Once per semester QSIT offers a get together for female MSc/PhD students and postdocs in order to discuss challenges and advantages of the next career steps.



On June 28, 2018 **Rachel Grange**, assistant professor at ETH, discussed different aspects of her career, starting with a short talk entitled: *How did I land on nonlinear nanophotonics?* 19 young women joined the sandwich lunch and participated in a lively discussion. [Link](#)

4. Promotions and Awards

14.06.2018 - [QNAMI](#) (startup emerging from the Maletinsky group) is one of the two winners of the full CHF 130,000 at the latest Venture Kick final. QNAMI uses cutting-edge quantum technologies (and synthetic diamonds) to improve imaging techniques and diagnostics. Their turn key solutions allow universities to study fundamental material properties down to the nanoscale and companies in the electronics industry to perform a more accurate failure analysis, a necessity for the development of the next magnetic memories.



[Venture Kick](#)

1.6.2018 - The CSF Award of the conference on Quantum Systems and Technology at the Congressi Stefano Franscini in Monte Verità, was presented to **Paul Magnard und Philipp Kurpiers** for their poster entitled “Deterministic Quantum State Transfer and Remote Entanglement using Microwave Photons”, [link](#).

January 2018 - BRIDGE is a joint program conducted by the Swiss National Science Foundation (SNSF) and Innosuisse - the Swiss Innovation Agency. It offers new funding opportunities at the intersection of basic research and science-based innovation, thereby supplementing the funding activities of the two organizations.

Discovery is aimed at experienced researchers who aim to explore and implement the innovation potential of research results. In the first round 8 research groups are funded from which 4 belong to the QSIT Network, namely **Anna Fontcuberta, Tobias Kippenberg, Jérôme Faist, and Hugo Zbinden & Nicolas Brunner**. [Bridge News](#)

17.12.2017 - An ERC Consolidator Grant is awarded to **Sebastian Huber** for his Project entitled Topological Mechanical Metamaterials. Many applications rely on affecting wave propagation in materials, from sound insulation to information processing in quantum computers. Sebastian Huber, Assistant Professor of Condensed Matter Theory, researches design principles for materials whose behavior can be explained using the quantum Hall effect. All existing studies in this area have been limited to two-dimensional structures. Huber is now aiming to overcome this limitation in the course of his ERC project: he will design new three-dimensional materials on the drawing board and examine them experimentally. The results may enable the construction of new waveguides that can be used under extreme conditions.

[ETH News](#)

[ERC Communication](#)

8.12.2017 - **Lucas Güniat**, is winner of the 2017 competition in ‘my thesis in 180 s’, at EPFL level, 2017 [link](#). Furthermore, Lucas participated on June 7, 2018 in the Swiss final of ‘my thesis in 180 s’. He received the prize of the public and the 2nd prize of the jury.

[EPFL News](#)

13.10.2017 - At its Dies Academicus the University of Geneva awarded the Innovation Medal to ID Quantique represented by **Nicolas Gisin, Grégoire Ribordy** and **Hugo Zbinden**. Founded by professors Nicolas Gisin and Hugo Zbinden, Department of Applied Physics of the Faculty of Sciences of UNIGE, as well as Grégoire Ribordy, current CEO of the company, ID Quantique is the world leader in quantum cryptography, designed to ensure the protection of data exchange.

[UNIGE, dies academicus 2017](#)

[Médaille de l'innovation](#)

30.8.2017 - **Martin Friedl**, ICAM – Award for Encouragement in Research for his poster entitled “Horizontally–Oriented InAs Nanowires Grown by MBE on GaAs”. He was also awarded with the ICAM – ACS Omega Award given to 6 top posters. [link](#)

2.6.2017 - **Mahdi Zamani**, Award for best poster at the Nanowire Week in Lund (2017) [link](#)

5. Recent Events

<http://www.nccr-qsit.ethz.ch/news/conferences-events.html>

QSIT Special Lecture for students

June 12, 2018, ETH Zurich

Once a semester an outstanding lecturer is invited to give a lecture at an appropriate level for students. This semester QSIT invited Thomas Ihn to present

Topology in Physics –

from geometry to condensed matter systems

The lecture was attended by ~80 MSc and PhD students. In order to allow external, not ZH-based students to attend, too, we scheduled the event for the late morning/early afternoon.



Here a feedback from one of the attendees: *I really enjoyed Thomas Ihn's pedagogical lecture series about topology in quantum physics. He took great care to introduce the topic via basic geometry which helped me to develop an intuition for the key quantities. After relating the concepts to quantum systems, he explained interesting physical effects and their realization which enables us to browse the vast literature.* [Link](#)

Junior Meeting 2018

June 4 - 6, 2018, Passugg, Graubünden

This year's Junior Meeting was organized by Felix Tebbenjohanns and Eric Bonvin, both from Lukas Novotny's group. 31 participants from ETH Zürich, EPF Lausanne, University of Basel, and University of Geneva joint the conference. The three-day program featured talks by all participants, a poster session, and a lot of time for discussion and networking.



Feedback: *The QSIT Junior Meeting was a nice possibility for me to get an insight in the research done by other QSIT groups. The quality of the over 30 talks given during the meeting was very high. Every talk was evaluated by two other participants, who gave their feedback to the speaker. This feedback together with the recording of my talk gave me valuable information to improve my presentation skills.*

[Link](#), [program](#), [booklet](#).

Swiss Nanomechanics Meeting 2018

June 5, 2018, ETH Zurich, Höggerberg

The first [Swiss Nanomechanics Meeting](#) was a great success. 50 enrolled participants and a few spontaneous listeners met yesterday on the Höggerberg and listened to very high quality talks, presented by young researchers. QSIT was represented by the groups Novotny, Degen, Kippenberg, Maletinsky, Poggio, Zilberberg and Chitra. The meeting covered a wide range from the very latest results in quantum mechanics to commercial products (Nanosurf).

The feedback was very good and the organizers hope there will be an SNM in Lausanne or Basel next year.

[Program](#), [flyer](#), [impressions](#)

Quantum Systems and Technology, link

May 27 - June 1, 2018, Monte Verità, Ascona

Organizers: Gianni Blatter, Tilman Esslinger, Klaus Ensslin, Andreas Wallraff

The CSF international conference on Quantum Systems and Technology has brought together leading experts in the field for scientific exchange and future collaboration.

Talks were organized in 17 short sessions with a total of 35 invited speakers. We have made a special effort to invite female and junior speakers and have arrived at an exceptionally high female representation with 13 colleagues (37 % of all the speakers). Junior speakers were selected from NCCR QSIT research groups in order to give them an international exposure.

The whole of Wednesday has been devoted to a special session on *Building a Quantum Computer*, with an exceptional representation of industry, Microsoft, Google, Rigetti, and IonQ; a Panel Discussion with guests from Swiss Academia and Swiss Science Management provided an open forum to discuss the amazing progress of the recent years in building a true quantum machine.

[Webpage](#), [program](#), [Twitter](#)

QSIT General Meeting

February 7 – 9, 2018, Waldhotel, Arosa

With more than 200 attendees the 8th QSIT General Meeting took place as every year in Arosa. The program included two invited talks: In our traditional technology transfer session Matthias Troyer gave an overview on “Quantum computing in academia and business”. And on Friday morning Martino Poggio featured “Scanning probe microscopy with Quantum Sensors”.

This year a special talk was dedicated to equal opportunity. On Thursday evening Anna Fontcuberta I Morral tried to raise the awareness of unconscious bias in her talk entitled: *Turning the unconscious to conscious, a gender question?*

Furthermore, the program covered 23 talks by young scientist from all across the network. The participants took the chance to discuss with their colleagues during plenty of time in two poster sessions. 55 posters were

presented giving an overview of the research covered in the NCCR QSIT. In addition, there were many opportunities to make new contacts in the evening and during social events.

Feedback: *We really appreciate and profit from the general meetings of QSIT in Arosa. Compared to some other international conferences, the scientific content in the Arosa meetings has a very high standard and is very well presented. Thus, each talk reflects also the excellent pre-selection of outstanding research groups leading to high quality contributions. The networking among the groups works well for us. After each Arosa meeting, our old collaborations are refreshed and new possibilities to learn and use the expertise of other groups open up. Fabiana Settembrini, Gian Lorenzo Paravicini-Bagliani & Janine Keller, Group Prof. Faist*

[Link](#).

QSIT Winter School

Feb.5 -7, 2018, Waldhotel, Arosa

The 7th QSIT Winter School featured six lectures:

- Quantum Information, Renato Renner
- Quantum Computing with Trapped Ions, Jonathan Home

6. Outreach

23.4.2018 - **Anna Fontcuberta i Morral - I'm grateful that I am naïve:** Anna Fontcuberta i Morral joins the [Nanovation](#) podcast to talk about compound semiconductors and their nanostructures. The Nanovation podcast is a forum to address the big questions, challenges, and opportunities of nanotechnology. Topics lie at the intersection of nanoscience, manufacturing, technology, business, and society. The podcast is conversational in format and aimed at a general, yet technically-savvy audience. Nanovation is hosted by Michael Filler from the Georgia Institute of Technology, [link](#).

1.-3.9.2017 - **Scientifica:** The 5th edition of [Scientifica](#) was again a big success: more than 30'000 visitors took the opportunity to experience research of the ETH Zurich and the University of Zurich from firsthand. The subject of this year's "Zürcher Wissenschaftstage" was "Was Daten verraten".



- Quantum Sensing, Christian Degen
- Topological Insulators, Thomas Ihn
- Quantum Communication, Nicolas Sangouard
- Programming a Quantum Computer, Matthias Troyer

At the poster session on Monday evening 22 posters were presented by the young scientists, giving ample time to the students for discussion. The Winter School was very well attended with over 60 participants. [Link](#)

2 Workshops on Presentation skills & Improv Theatre for women scientists

Jan 23 -24, 2018, Geneva and Zurich

NCCR SwissMAP, joined by NCCR MARVEL, NCCR PlanetS, and NCCR QSIT, organized workshops for PhD students and postdocs on presentation skills (one in Zurich and one in Geneva) and a workshop for young female scientists on using improvisation theatre techniques in their scientific careers. It was taught by Elena Kaufmann - a stage performer and lecturer who specializes on such workshops for scientists. [Link](#)

The NCCR QSIT presented a booth showing experiments on the duality of wave and particle nature of light. During the 2 days 20 PhD students and postdocs from different QSIT research groups explained theory and experiments.



This year QSIT presented a new experiment, designed by Alexander Eichler, Degen group, featuring parametric driving techniques, common in quantum measurements.

29.10.2017 - **Treffpunkt Science City:** ETH Zurich's [Treffpunkt Science City](#) is a science program designed for everyone. It offers an insight into the world of research through lectures, science talks, demonstrations, exhibitions and laboratory tours, giving you the chance to discover how new knowledge is generated and how it affects our world.



The focus of one of the autumn 2017 weekends was “Expedition to the unknown”, where Klaus Ensslin gave a talk on ”[Die Quantenwelt entdecken](#)“. Experiments for the public and lab-tours accompanied his lecture.

7. Mini-sabbaticals

Each PhD student and post-doc associated with the NCCR QSIT has the opportunity to work one week per year in another NCCR group of his/her choice. This step will promote collaboration and exchange between the younger researchers and will also serve the purpose of general education. These research stages will be centrally financed by the NCCR and are open for all young researchers working on NCCR-related projects in the participating research groups, even if NCCR resources do not directly provide the salary of these researchers.

Please contact your supervisor or the NCCR office for further information.

Here a report from Luca Francaviglia’s mini-sabbatical in Richard Warburton’s group (Basel), Dec. 17 – 21, 2017, on the subject: Optical coupling between quantum dots in nanowires and Rubidium atoms – The mini-sabbatical was an intense period of collaboration. It resulted in a great opportunity to:

- Learn the use of a different optical setup and discuss with scientists in a different research field

15.2.2108 - **QSIT on Twitter:** Since mid-February the NCCR QSIT is present on Twitter: [@NCCR_QSIT](#). This new information channel is managed by Dr. Andreas Trabesinger (trabi@ethz.ch), an experienced science communicator.

In order to get your QSIT-relevant news to be tweeted, please send your information to Andreas (and as usual to Ilona Blatter, for the webpage news!!).

- Carry out measurements for which we don’t have the necessary equipment in our lab

A second mini-sabbatical is planned in the same group to conclude the measurements started during the first one.

8. For your agenda

<http://www.nccr-qsit.ethz.ch/news/conferences-events.html>

October 11, 2018

Quantum Industry Day in Switzerland

[QIDiS2018](#)

[Agenda, Registration](#)

Technopark Zurich, Switzerland

November 15 - 16, 2018

NCCR QSIT Site Visit

ETH Zurich, Hönggerberg

February 4 - 6 2019

QSIT Winter School

Waldhotel, Arosa

February 6 - 8, 2019

QSIT General Meeting

Waldhotel, Arosa

9. New Collaborators



Benedikt Kratochwil: PhD student in Klaus Ensslin's group, working on the coupling of quantum dots to superconducting resonators.



Peter Rickhaus: postdoc, in Klaus Ensslin's group, who did his PhD in the Schönenberger group and now works on topological states in twisted bilayer graphene.

Annika Kurzmann: postdoc in Klaus Ensslin's group, working on bilayer graphene quantum dots.



Henrik Wilming is a researcher in Renato Renner's group. His main research focus deals with using tools and concepts from quantum information theory in the context of thermodynamics, statistical physics and many-body theory.

