

Newsletter #2

CRC 1461 – Neurotronics: Bio-inspired Information Pathways

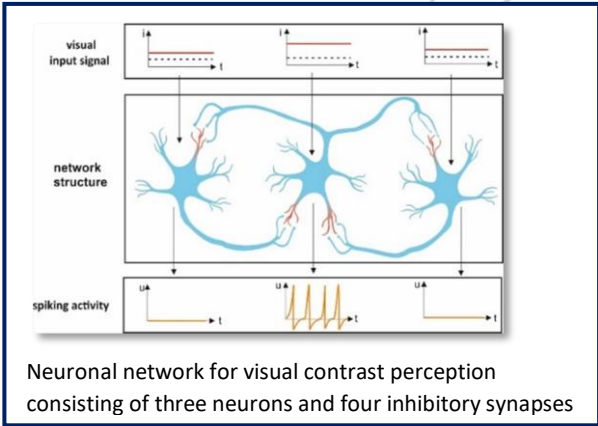
Dear members and friends of the CRC 1461,

our second newsletter is already the last one in 2021. The first year of the CRC 1461 comes to an end. This was not an easy year for many and we all had to struggle with initial difficulties in one way or another. Nonetheless, we hope you all managed this year in a happy, healthy and productive way and look optimistically towards 2022!

Science News

News from Sebastian and Karlheinz (RUB, A1):

We recently designed a simple memristor-based synapse model able to act as either excitatory or inhibitory synapse. Based on this model, we considered a small neuronal network as an example of the visual system, where neighboring neurons were interconnected by inhibitory synapses. This can be seen as an example of the visual contrast perception, as the neuron with the strongest visual input signal inhibits the directly neighboring neurons.



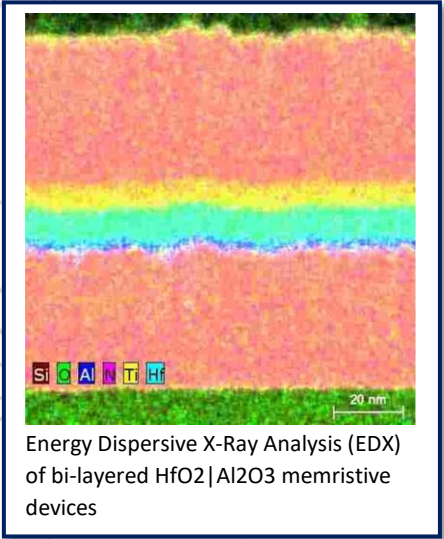
News from Bakr (BTU, B1) – You probably all remember the colorful European map from the fall retreat:



Oscillator-based Ising machines are a promising approach for solving NP-complete problems. Put simply, these are problems whose solution times grows exponentially with the number of decision variables. Project B1 has recently been able to successfully solve several optimization problems, with the help of a wave digital solve a max-cut problem [presented at MWSCAS 2021], a vertex-cover problem [presented at DPG 2021], but also a large graph coloring problem involving the European map. The figure demonstrates an interpretation of the Ising machine's solution of the graph coloring problem involving the European map.

News from Christian (IHP, B5):

Oxide-based memristive devices are considered as promising candidates for emerging non-volatile memory applications. Additionally, memristive devices can also emulate the performance of the biological synapses in neuromorphic hardware architectures. In general, memristive devices consist of Metal-Insulator-Metal (MIM) stacks. Ongoing studies of CMOS compatible memristive materials paved the way for doped memristive layers, bi-layers, tri-layers and even multi-layer memristive devices. For the first time, 1T-1R integrated memristive bi-layered devices consisting of HfO₂|Al₂O₃ were fabricated in the 130 nm CMOS process line of IHP, as shown the figure below. The electrical characterization of the bi-layered memristive devices is ongoing.



Thank you for your contributions!
Please send your Science News (highlights of your research) to Sonja any time!

SFB 1461

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Info from the Office

The grant request for the first quarter of 2022 was timely submitted to the DFG.

Please remember to hire HiWis in 2022!

The CRC-office will be closed for Christmas and New Year. Leonie and Herman will be available again on January 3, 2022. Sonja will be back on January 10. Here is a reminder of the upcoming admin-deadlines in March 2022:

Mar. 1 - 11, 2022 Submission of grant request (Q 2, 2022) by external partners

Mar. 15, 2022 Deadline annual status report for external partners

Mar. 31, 2022 Final deadline annual status report (submission to DFG)

Upcoming Events

Jan. 27, 2022, 16:00 h CRC 1461 Colloquium: *Research topics of the CRC 1461: An international survey* – Hermann Kohlstedt

Feb. 07 – 08, 2022 ATM B3 and C7 (TU Ilmenau): *FPGA programming for adaptive sensing / MEMS design and simulation*

Feb. 09 - 10, 2022 ATM C4: *Preparation, analysis and evaluation of memristive/neuronal devices by means of TEM or SEM*

Feb. 09 - 10, 2022 Lecture by Philip Hövel: *Nonlinear Dynamics, networks, and machine learning*

Feb. 10 – 11.2022 ATM C1 (TU Ilmenau): *X-Ray diffraction to measure film thickness and lattice constants*

Please check OLAT for ATMs planned in March 2022!

Apr. 27 - 28, 2022 **CRC Spring Retreat** (place to be announced)

Jun. 29 – Jul. 01, 2022 Intelligent Materials Conference (CAU Kiel)

Sep. 05 – 08, 2022 **CRC International Workshop** (CAU and ColorLine)

Members of the CRC

In the future, we would like to use this section to introduce all members and work groups of the CRC. For now, we, the organization-team of the CRC will start. This also gives us the opportunity to say “Good bye” and “Thank you” to Henning who will leave the CRC by the end of the year.



The CRC-organization team: Hermann (back), Henning and Leonie (middle), and Sonja (front)
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Herman is the CRC's spokesperson and since 2009 head of the chair of nanoelectronics at the Faculty of Engineering in Kiel. He also managed the CRC's successor project FOR2093 "Memristive Devices for neuronal Systems". Henning did his PhD with Hermann and was already involved in writing the CRC-proposal. When the CRC started he became the scientific coordinator and iRTG-manager. In May he reduced his working hours to work as the chief technology officer at nascit GmbH.

Luckily, in March Leonie had already started to manage the CRC-office, helping a great deal that things continued smoothly. Finally, Sonja joined the CRC in September 2021 as Henning's successor. Before she worked in the third-party funding department in the administration of Kiel University and before that as a scientific coordinator at GEOMAR.

Who wants to be next? Please contact Sonja!

Last but not least...



We wish you Merry Christmas and a Happy New Year 2022!
Enjoy your holidays!

The next newsletter will be available in the third week of January!

Cheers,

Sonja, Leonie and Hermann

CRC 1461 - Publication Performance

Journal papers (peer-reviewed)	15
Conference papers (peer-reviewed)	5
Conference contributions	13
Total	33