



Centre de Nanosciences et de Nanotechnologies - C2N
10 Boulevard Thomas Gobert
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Postdoc offer FunComp 12 months

Propagation of excitations and logical gates in coupled neuromorphic micropillar lasers

Neuromorphic photonics aims at combining the neuron-like properties of specific devices with photonics technologies for novel concepts of computing. We have developed at the C2N a neuromimetic micropillar laser which behaves as an optical neuron: whenever it is excited above a given threshold, it emits a spike and returns back to a quiet state. The emitted spike is the optical equivalent of the electric action potential in biological neurons, but is a million times shorter in duration. This may open new avenues for neuromorphic computing.

One interesting configuration is when the micropillar lasers are coupled side-by-side (evanescently). In that case, a spike excited on one end of a chain can propagate through the chain without attenuation: this is called saltatory propagation. This propagation mode is especially interesting since the speed of the spike can be controlled externally. Also, when two spikes are counter-propagating and collide, unlike linear waves which would simply interfere and cross, they both disappear. Based on these mechanisms, logical gates can be built, and also on-chip pattern recognition circuits which can recognize simple patterns of spike timings [1].

The aim of the postdoc will be to study these phenomena. First the candidate will study the propagation of the spikes in simple structures. Then they will study the collision of spikes to form logical gates.

The fabrication of the samples will take place at the C2N clean-room facility. The host team laboratory is fully equipped with optics and fast acquisition instruments. The postdoc will be supervised by Sylvain Barbay, Research Director at CNRS and will be funded by the FunComp European project for a duration of 12 months.

The candidate is expected to have completed their PhD and to have some background in nonlinear photonics and/or neuromorphic photonics and/or nanofabrication. The work will consist in participating to the fabrication, and taking in charge the modeling and experimental activities as well as participating to the dissemination of results. Salary will be inline with CNRS policy and past experience.

[1] [Photonic computing with single and coupled spiking micropillar lasers](#) V. A. Pammi, K. Alfaro-Bittner, M. G. Clerc, S. Barbay, **IEEE J. Sel. Top. Quantum Electron.** **26**, 1500307 (2020).

For more information: <https://toniq.c2n.universite-paris-saclay.fr/fr/activites/smila/neuromimetic-photonics/>

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