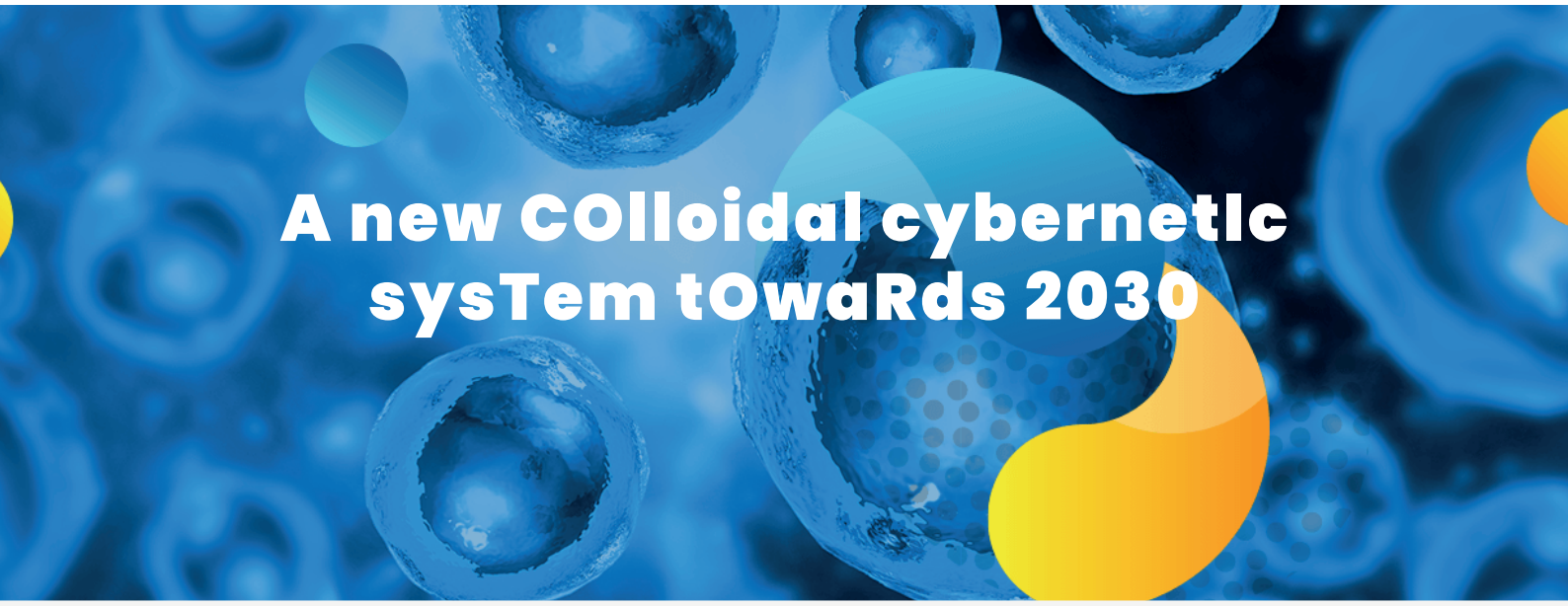
COgITOR



A new COlloidal cybernetIc sysTem tOwaRds 2030

LETS' FIND OUT MORE ABOUT COGITOR LAST ACHIEVEMENTS!

COgITOR is a project funded under the topic H2020-FETOPEN-2018-2020 / H2020-FETOPEN-2018-2019-2020-01 programme, aiming at developing a liquid state cybernetic system prototype. Holonomic memory and computing, pressure sensing, and energy harvesting from thermal gradients will be achieved using colloids. The prototype will be tested in extreme environments for potential space applications.

During the last six months of activity, the consortium has reached the maximum operational capacity with the last group of experts hired. The experimental activity was boosted in all directions, particularly: the development of self-healing soft skins for protecting the functional colloids, the exploitation of photothermal effect in TiN colloids for the energy harvesting of thermal gradients, the exploration of memory and computing properties of ZnO colloids and ferrofluids. This last activity has featured the most exciting developments, particularly the demonstration of: Pavlovian learning in colloids, an analog 16 bit memory, an artificial recurrent neural network, and a reservoir computer, all at liquid state. All of the complete results have been self-archived to be available to the scientific community as open access resources (before peer review), and submitted to some top journals (currently mostly under review). In October some members of the consortium participated to a science-art festival in Bristol (UK), giving our project a high visibility to the broad public.

EVENTS

ECOMONDO 2022 COGITOR PARTICIPATION AT CIAOTECH BOOTH

The COgITOR Project was showcased at the CiaoTech projects' hub at the ECOMONDO event, taking place in Rimini (Italy) from 8 to 11 November.

The project dissemination manager Valentina Cinti from CiaoTech was there to provide more information about the COgITOR Project, which aims at developing a liquid state cybernetic system prototype: holonomic memory and computing, pressure sensing, and energy harvesting from thermal gradients will be achieved using colloids. It was possible to join her at D1/189 at the exhibition centre!

COGITOR AT DLA ANNUAL CONFERENCE

Implementing Daylight Research in Society: Chances and Challenges

We are glad to inform that the COgITOR project was presented at the DayLight Accademy (DLA) Annual Conference & General Assembly 2022, in Duebendorf (Switzerland). Dr. Qing Chen has partecipated to a poster and a flash presentation during the conference. PhD candidate Matteo Bevione, Dr. Kwanele Kunene, Dr. Ryzhkov Nikolay and Mrs. Aleksandra Marczyk have presented the poster and the labs to the attendees. More information about the conference can be found here.

COGITOR AT EUROPEAN RESEARCHER NIGHT IN GENOA

In October, Erik Garofalo participated in the 2022 European Researchers' Night -SHARPER Night in Genova, together with Rodrigo de Oliveira, presenting the COgITOR Project coordinated by Alessandro Chiolerio of Istituto Italiano di Tecnologia.

It was an interesting opportunity to bring research and researchers closer to the public and increase the interest of young people in science and research careers. More info about the event can be found here.

FESTIVAL BRISTOL, CO-ORGANIZED WITH OTHER H2020 INITIATIVES

COgITOR Project joined the Festival of Unconventional Computing, Proto-cognition, Arts and Sounds, organized from September 28th to October 2nd at Bristol. More info can be found here.

WORKSHOP AT BRISTOL, UK

On July 4th the first COgITOR workshop on Liquid / Colloid Cybernetic Systems was jointly organized by IIT (the project coordinator) and the University of the West of England (UWE Bristol). It was hosted by Andy Adamatzky from UWE and chaired by Alessandro Chiolerio (IIT) and gathered many selected stakeholders active in the fields of holonomic memory and computing, pressure sensing, and energy harvesting from thermal gradients using colloids. More information can be found here.

NEWS AND UPDATES

CONGRATS TO OUR COLLEAGUE MATTEO BEVIONE

We are glad to announce that, on June 10th 2022, Matteo Bevione successfully passed his candidacy exam. Now he is officially a PhD candidate in the Photonics Doctoral Program. Great job Matteo!

CONGRATS TO ERIK GAROFALO

At the end of October, our team member, Erik Garofalo, successfully defended his PhD thesis entitled "Energy harvesting of low-grade waste heat with colloid-based technology" and he was awarded a doctoral degree cum laude by Politecnico di Torino.

The work set the basis for the WP4-Energy harvesting of COgITOR and represents a milestone in the colloidal energy harvesting devices domain.

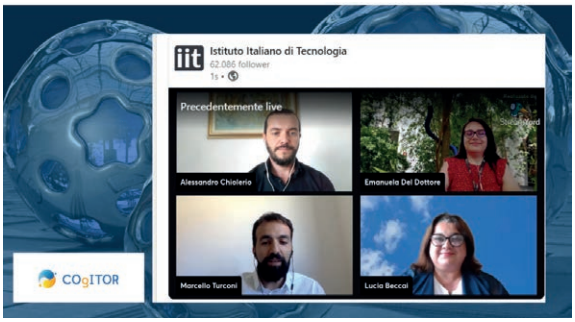
The dissertation involved the mentoring of Alessandro Chiolerio, project coordinator, and the contribution of Carlos Lodeiro Y Espiño and Sergey Suslov for the evaluation, and of Andrew Adamatzky, Marco Masoero and Yuji Tasaka as members of the examination committee.

Congrats, Erik!

NEWS FROM MEDIA: ALESSANDRO'S INTERVIEW ON LINKEDIN

Using a fresh format of online LinkedIn interviews, Istituto Italiano di Tecnologia is promoting European funded projects through their coordinator words.

An interesting overview of liquid and soft robotics, involving Alessandro Chiolerio in the presentation of COgITOR can be found here.



PAPERS & REPORTS RELEASED

NEW PLASMACHEM REPORT ON THE USE OF TITANIUM NITRIDE: PHOTOTHERMAL CONVERSION IN TIN BASED NANOFLUIDS

COgITOR Empa EPFL

Laboratory of Nanoscience for Energy Technologies
Swiss Federal Laboratories for Materials Science and Technology

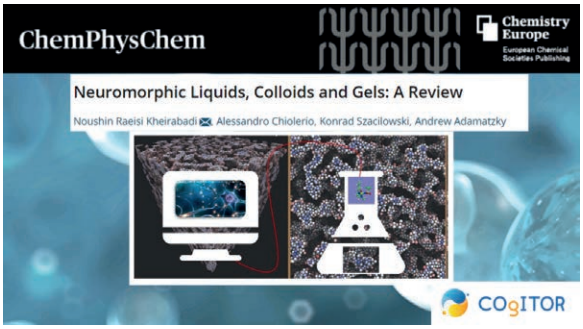
Report on the use of titanium nitride (20nm) provided by PlasmaChem: Photothermal conversion in TiN based nanofluids.

In May 2022, the first steps toward the harvesting of solar radiation for COgITOR soft robot energy supply have been performed. The work on oil-based alternative plasmonic colloid have shown great capabilities of photothermal conversion, giving interesting insights on future exploitation of stored energy. Multiphase fluids are the next target to tackle the problem addressed as light to light conversion.

You can find the full report here!

FIRST COGITOR PAPER NOW PUBLISHED!

We are happy to announce that the COgITOR consortium has published the first review paper on liquid neuromorphic materials and devices! The first Author, Dr. Noushin Raeisi Kheirabadi from UWE, masterfully drafts a future where devices are unbound from their solid state semiconducting heart, and explore a wide horizon of novel aggregation forms, particularly colloids, gels and liquids in general, offering easily reconfigurable logics and neuromorphic functionalities. A must-read paper!



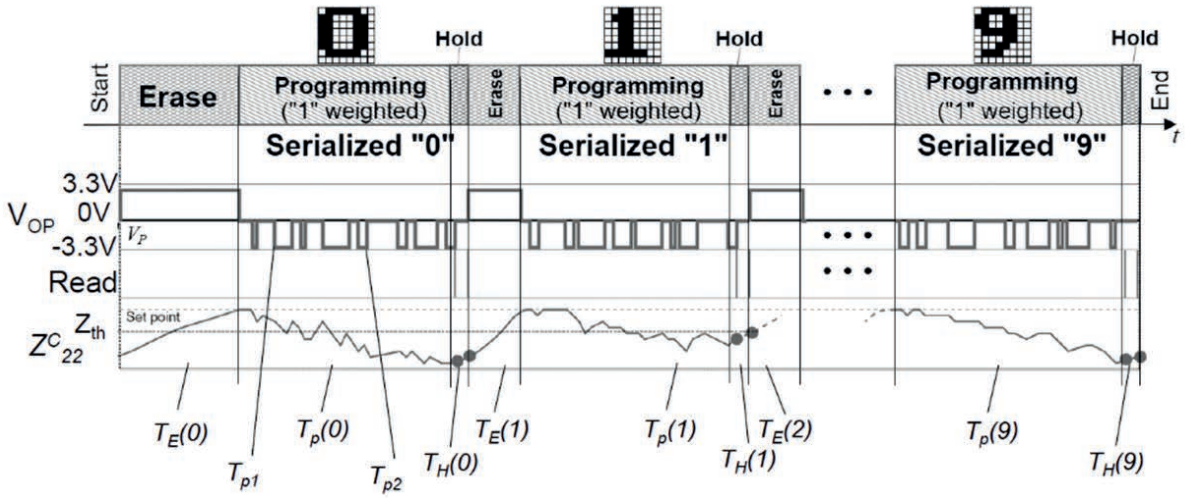
..AND OTHER NEW PAPERS RELEASED!

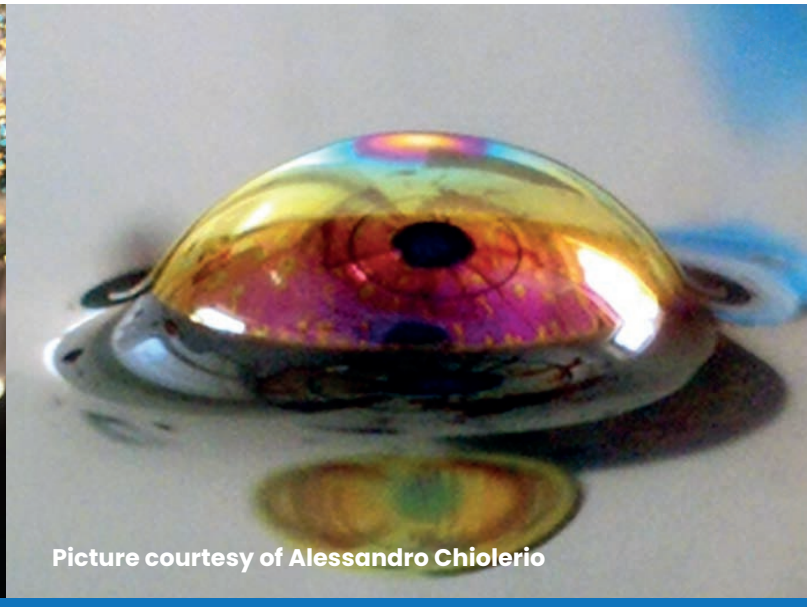
We are glad to announce that the COgITOR consortium has posted two important pre-prints on ArXiV at the following links: https://arxiv.org/abs/2211.06699

Thanks to the work of Noushin Raeisi Kheirabadi, Alessandro Chiolerio, and Andrew Adamatzky. As a first step towards designing and prototyping colloidal neuromorphic computing systems, Pavlovian reflexes have been observed and confirmed in liquid state colloidal suspensions based on ZnO nanoparticles.

Moreover, thanks to the work of Marco Crepaldi, Charanraj Mohan, Erik Garofalo, Andrew Adamatzky, Konrad Szaciłowski, and Alessandro Chiolerio. Notwithstanding relevant advancements in the study of ferrofluids, there was no evidence for their computation capability, before this research. Here, a ferrofluid was exploited to perform electrical analog computing and programming, observing its short and long-term information storage capacity and plasticity. The colloid was capable of classifying digits of an 8x8 pixel dataset, and through Physical Reservoir Computing (PRC) by training a readout layer.

Check out this link https://arxiv.org/abs/2211.08152, and do not miss such breakthroughs!





Picture courtesy of Alessandro Chiolerio

STAKEHOLDER ANALYSIS PERFORMED BY CIAOTECH

The systematic stakeholder analysis aimed at identifying the most important stakeholders for COgITOR innovations and assessing their position towards the project's results to set up more focused engagement strategies.

CTECH and all partners jointly defined and brainstormed about the relevant stakeholder categories for COgITOR and defined a set of keywords useful for the stakeholder analysis. A mapping of the relevant stakeholders, i.e., the groups outside the project who are affected in some way by the decisions and actions of the COgITOR project, was made at EU level by CTECH. Then selected stakeholders were invited to participate in an online survey, designed to measure their characteristics, e.g., their interest, attitude, influence and knowledge relevant for the project.

A first version of the survey was prepared in English by CTECH, then refined with the support of all partners. The survey was published online and circulated by the involved partners through different communication means: partners corporate communication channels (including partners newsletters) and by direct emails to identified stakeholders.

Data of the survey was collected and maintained with full confidentiality, analyzed and reported collectively. Based on the results of the survey analysis, more targeted dissemination and exploitation actions can be implemented.

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