

Newsletter No. 2: Oct 2020 - Aug 2021

MaNaCa in a nutshell

The MaNaCa project aims to develop the scientific and technological capacity as well as raise the research profile of the Institute for Physical Research of the National Academy of Sciences (IPR-NAS) in Armenia. From a scientific standpoint, MaNaCa will focus on the structural and magnetic characterization of magnetic nanohybrids and their application for cancer therapy. The project's aim will be accomplished by networking IPR-NAS with two internationally-leading research organisations: the Aristotle University of Thessaloniki (AUTH) in Greece and the University of Duisburg – Essen (UDE) in Germany. Throughout the project, the research partners will be supported with the management and dissemination activities by Intelligentsia Consultants Sàrl (INT), a consultancy company based in Luxembourg, which has already collaborated on several occasions with IPR-NAS during the FP7 and H2020 programmes.

From 2019-2023, the partners will carry out a research and innovation strategy with the following objectives:

1. Stimulate scientific excellence and innovation capacity of IPR-NAS with regard to magnetic nanohybrids for cancer therapy.
2. Improve the career prospects of early stage researchers of IPR-NAS and the Twinning partners
3. Raise the research profile of IPR-NAS and the Twinning Partners

These objectives will be centred around a research and innovation strategy focused on two sub-topics:

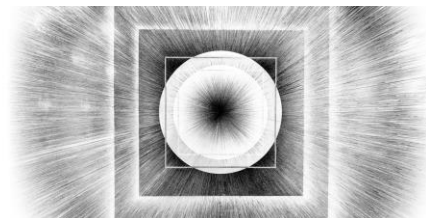
- A. Structural and magnetic characterization of nanohybrids
- B. Magnetic particle hyperthermia

In order to accomplish this, the consortium partners will implement a comprehensive set of actions:

- Exchange of senior researchers;
- Exchange of early stage researchers; and
- Dissemination and outreach.

In addition to staff exchanges, the project activities will also include technical training, joint publications, joint participation to conferences, organization of summer schools, workshops and an international conference.

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News

November 2020, Training Seminar Series

During the month of November, the MaNaCa partners have held a series of weekly online training seminars for the young researchers involved in the project.



The seminars covered the following topics:

- "[Magnetic Particle Hyperthermia: Principles & Fundamentals](#)", Prof. Makis Angelakeris
- "[Hints and Tips in Magnetic Hyperthermia Measurements](#)", Dr. Antonios Makridis
- "[Magnetic Nanostructure Characterisation Technology and Applications](#)", Dr Eirini Myrovali

March 2021, Twinning Projects' Online Event

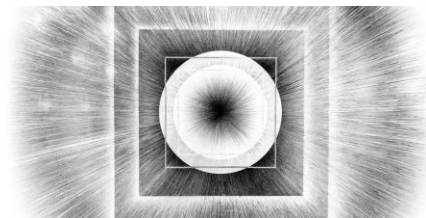
MaNaCa project coordinator, Dr. Aram Manukyan, participated in a Twinning Projects' online event organised by the H2020 ELICSIR project. During the event, Dr. Manukyan presented the activities of the MaNaCa project and also discussed with the other participants the challenges and opportunities in implementing H2020 Twinning projects during the Covid-19 pandemic.



March 2021, Paper presented at APS March Meeting

Several MaNaCa scientists were among the co-authors of the research paper "*Structure and Magnetism of Fe/Fe₃C Nanoparticles in Carbon Spheres*" presented recently at the prestigious APS March Meeting 2021.





News (continued)

Winter 2021, Seminar Series

Over the course of the winter of 2021, with continued travel restrictions across much of Europe, the MaNaCa consortium has run regular online seminars especially targeting the needs of their early-stage researchers. The seminar series has provided a welcome opportunity for the young researchers to practise presenting their scientific work as well as to learn from their more experienced colleagues. The table below provides an overview of the seminars that have taken place.

Date	Researcher	Seminar Title
03.12.2020	Harutyun Gyulasaryan	Synthesis of Carbon-coated Fe-Fe ₃ C Nanoparticles
10.12.2020	Michael Farle	Ferromagnetic resonance: Resonant magnetic response of a ferromagnet to excitation with microwave radiation
04.02.2021	Finn Ambrosius and Hendrik Wenzel	Magnetic Hyperthermia: Introduction to the NanoTherics Device and First Attempts
11.02.2021	Narek Sissakian	Literature seminar <i>ACS Nano</i> 2019, 13, 3, 2870–2878 Water-Dispersible and Biocompatible Iron Carbide Nanoparticles with High Specific Absorption Rate
18.02.2021	Aram Manukyan	Structural and magnetic properties of the sample H20
11.03.2021	Harutyun Gyulasaryan	Magnetic characteristics of the H20 ($T_{pyr}=850\text{ C}$, $T_{pyr}=5\text{ min}$) sample before and after annealing
18.03.2021	Narek Sissakian	Literature seminar <i>RSC Adv.</i> , 2018, 8, 32146 Silica coated iron nanoparticles: synthesis, interface control, magnetic and hyperthermia properties
25.03.2021	Harutyun Gyulasaryan Marina Spasova	Discussion of magnetic properties of the H20 sample TEM studies of Fe/Fe ₃ C nanoparticles fabricated by solid state pyrolysis

May 2021, Training videos published

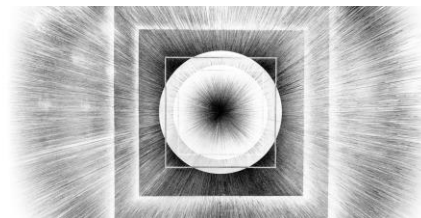
The MaNaCa consortium published a series of training videos showing the preparation of samples and running of magnetic nanoparticle hyperthermia experiments.

The [first video](#) shows how phantom samples are prepared. Phantom samples possess physiochemical features similar to human tissue and serve as test samples to perform real condition evaluation. Depending on its concentration, agarose gel may imitate either soft tissue (below 2 mg/mL) or hard tissue (above 4 mg/mL).

The [second video](#) shows how ex-vivo samples are prepared. Ex-vivo samples comprise of animal tissues together with magnetic nanohybrids, which are used to check the distribution and performance of the magnetic nanohybrids under realistic conditions prior to in-vitro studies.

The [third video](#) shows how a typical magnetic particle hyperthermia experiment is run on a liquid suspension containing magnetic nanohybrids.

In the [final video](#), a real-time thermal mapping is shown for magnetic nanohybrids - prepared in the MaNaCa project - subjected to an alternating magnetic field. When the temperature rise exceeds 41 degrees centigrade, the systems are very promising as magnetic heat mediators in modern cancer treatments.

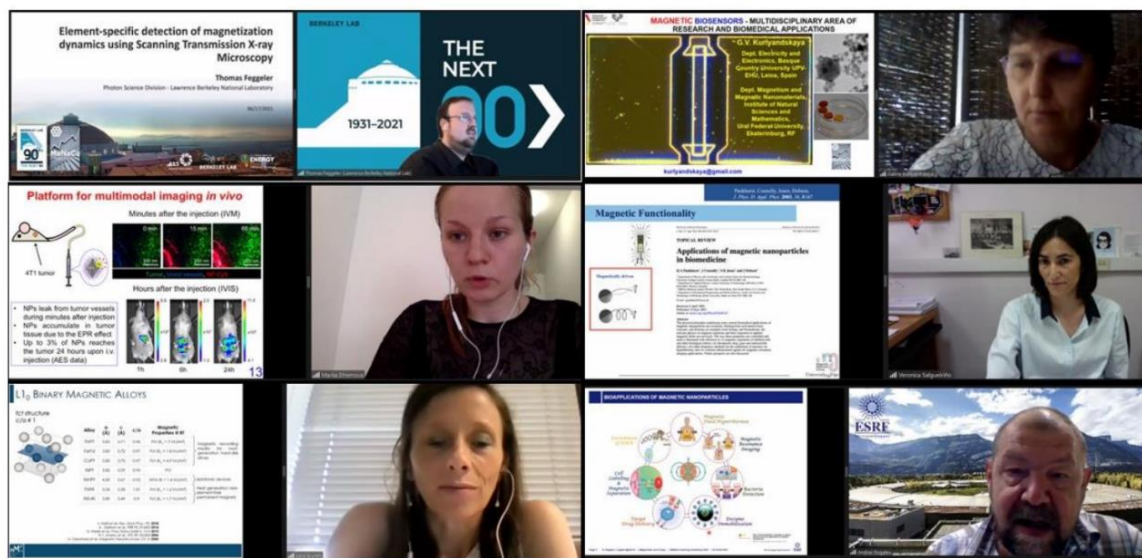


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June 2021, Third Training Workshop and Second Summer School

The third training workshop combined with the second summer school were held during 16-18 June 2021 as an online event. The training workshop aimed at providing information and training that will help to improve the career prospects of early-stage researchers of IPR NAS and the twinning partners: UDE and AUTH. The training workshop included talks on creativity and problem solving, academic career paths in Germany and Europe. The current EU funding programs for early-stage researchers were presented by the EU officer of the Science Support Centre of UDE, Dr. Sara Letzner. Several talks addressed the correct processing and analysis of experimental data. 98 people from 13 countries attended the Workshop. Among them were 70% graduated and postgraduate students, 48% of participants are female.

The second summer school aimed at providing a thorough understanding of magnetism based on fundamental lectures while offering the latest insights into up-to-date aspects of research on magnetic nanoparticles for theranostics and bio-sensing. The school was addressed to graduate and PhD students, as well as to post-doc and young researchers. The school's programme consisted of two-days of tutorial lectures devoted to bio-applications of magnetic nanoparticles and advanced methods for magnetic characterization. The lectures were provided by prominent scientists active in today's research.



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