ISSUE 1: MARCH 2020

NOAH NEWSLETTER

Inside this issue:

Letter from the Editors,

The field of supramolecular chemistry has seen major growth in recent years. Latest advancements have lead to a shift in focus, from understanding the basic concepts of molecular encapsulation to pursuing the controlled uptake and/or release of molecules, with the aim to identify and develop new applications in several fields such as drug delivery, catalysis or functional materials. However, with an ever-increasing toolbox of molecular motifs to be used as hosts, and a broadening list of potential applications, there is a need to join forces to advance in the field. This is why **NOAH** was created: **N**etwork of functional m**o**lecular cont**a**iners with controlled switch**a**ble abilities. **NOAH** Innovative Training Network brings together a multimodal network of recognised academic research groups and relevant non-academic partners with complementary areas of expertise.

Kicking-off in April 2018, the network has recruited ten Early-Stage-Researchers (ESRs) and has provided them with an individualized scientific training programme. **NOAH** wants to generate skilled researchers with expertise in molecular encapsulation systems and awareness of their wide range of functional properties and applications. **NOAH** was designed to contribute to the development of new molecular capsules and their exploitation as functional materials for chemical, biological and environmental applications.

In this, our premier issue of the **NOAH newsletter**, five of our ESRs introduce themselves summarizing their research projects. Moreover, they also , recall the **1st NOAH Summer School** (2019), share their publications and dissemination activities, as well as their experiences performing outreach activities during the last year.

Finally, in celebration of International Women's Day we highlight women in Science by bringing to you some of the most recent outstanding results in Supramolecular Chemistry achieved by women researchers. We hope you enjoy the **1st NOAH Newsletter**!

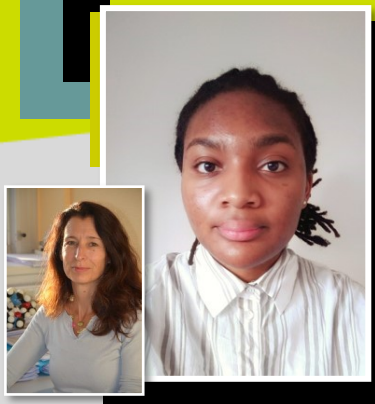
From the Editors of this issue:

Amy EDO-OSAGIE (ESR7)

Cristina MOZACEANU (ESR4)

Meet our ESRs

In the first two NOAH newsletter issues we will be introducing our ten ESRs: ESR1 Pedro Ferreira, ESR2 Santiago Pons, ESR3 Daniel Stares, ESR4 Cristina Mozaceanu, ESR5 Daniel Sánchez Resa, ESR6 Arturo Llamosí Fornés, ESR7 Amy Edo-Osagie, ESR8 Dylan Serillon, ESR9 Quentin Bouvier, and ESR10 Chiara Mirabella.



University of Strasbourg

Amy EDO-OSAGIE

Our project is based on the synthesis and study of new receptors, able to bind and release guest molecules in a controlled manner. Control is achieved via binding (at a separate distinct site) of an "effector". The so-called effector is a molecule that pre-organises the receptor when bound, and regulates its binding affinity towards a guest. We aim to control the release of the guest using different stimuli, e.g. pH or redox.

Hobbies: Reading, playing the ukulele, and rugby

Supervisor: Prof. Valérie Heitz

The Institute of Chemical Research of Catalonia (ICIQ)

Chiara MIRABELLA

My research project deals with the synthesis and study of molecular containers assembled via dynamic covalent bonds (DCBs). These containers have a deep polar cavity able to accommodate small polar molecules. We will pursue the application of these containers as carriers for biologically interesting molecules (drugs or metabolites). Cleavage of the DCBs using external stimuli (e.g. light) may then result in a controlled release of the guest molecules.

Hobbies: I like practicing martial arts.

Supervisor: Prof. Pablo Ballester

Daniel Sánchez RESA

My project within **NOAH** is to characterize the containers synthesized within our ITN from the optical point of view. So far, I have studied covalent cages formed by two panels of porphyrins. These kinds of containers are very interesting because of their photophysical properties and the different photodynamic processes that can take place within them. The potential application that we are aiming at is drug delivery.

Hobbies: I like running and yoga.

Supervisor: Dr. Barbara Ventura

Institute for Organic Synthesis and Photoreactivity, National Research Council of Italy (ISOF – CNR)

Quentin BOUVIER

In my individual project, we are trying to improve the chemistry of polyurethanes via a process called microencapsulation, in which small solid particles or liquid droplets are enclosed in a protective shell. Developing such materials would increase our control over coating and adhesive preparations, allowing us to offer state-of-the-art products that suit people's needs.

Supervisor: Dr. Stefanie Eiden

Covestro Deutschland AG

Pedro FERREIRA

My project deals with the design, synthesis and characterisation of hydrogen-bonded capsules with polar interiors and switchable moieties. The incorporation of "photochromic" organic units in the capsules' structure will give us the opportunity to use light to induce a structural change in the capsule. We want to couple this structural change with the disassembly of the capsule and the release of encapsulated Small Organic Molecules .

Hobbies: Practising violin, watching movies and reading

Supervisor: Prof. Pablo Ballester

The Institute of Chemical Research of Catalonia (ICIQ)

1st NOAH Summer School: A week in Tarragona

By Amy Edo-Osagie

The city of Tarragona in northern Spain, is famed for many reasons. Once a roman settlement called “Tarraco”; the city has a number of ancient ruins, including the Tarragona amphitheatre.

But perhaps the feature Tarragona remains most famed for is its “human towers”, where participants come together to create towers of people. Using non-covalent interactions, to create ordered larger structures? An ideal place to meet and celebrate supramolecular chemistry!

Held in ICIQ, the 1st NOAH School brought together all NOAH-ITN members, from PI’s and industrial mentors to ESRs to meet for the first time, and in the case of the ESRs: learn how to become better researchers.

With the given theme focusing on Supramolecular Chemistry and supramolecular X-Ray crystallography, the ESRs were given the chance to learn more about the formation and analysis of crystals, with the opportunity to see an X-Ray diffraction machine in action.

Training in Soft-skills was also given, teaching the ESRs how best to dissect a paper and disseminate their research in minimal time, to varied audiences. This would prove to be valuable advice for the Supramolecular day which would follow, where the ESRs gave oral communications on their work so far.

Lectures were given on the day by Prof. Jonathan Nitschke, Dr. Alessanndro Alipandri, Prof. Jennifer Heemstra and Prof. Michael Schmittel, which highlighted the impact of researchers and the importance of mentorship.

The final day was dedicated to industry, with three of our industrial partners giving talks on R&D in different industrial settings and in relation to the development of photosensitizers for photodynamic therapy. This emphasised what our research can become, ending an enjoyable and informative summer school in Tarragona.

Outreach: NOAH LAB

When so much of everyday life is affected and dictated by chemistry, the importance of spreading science cannot be overstated. As such **NOAH** has developed a mobile outreach program: the **NOAH LAB.** Herein, three of our ESRs report back on their experience carrying out outreach during last year's European Researchers' Night.

European Researchers' Night (Barcelona, Spain)

By Chiara Mirabella & Pedro Ferreira

During this event, we were given the opportunity to share our passion for supramolecular chemistry and **NOAH** with researchers from other fields and the general public, in an informal and friendly environment. We chose to demonstrate supramolecular encapsulation using a practical and "tasty" experiment, where alginate spheres containing juices and tea (orange juice, cola and green tea) inside were produced. After showing the process of encapsulation, the people had the opportunity to produce them by themselves, and eat them to gain a new gastronomic experience.

Thanks to this experience, we realized how difficult is explaining complex chemical processes to the general public in a way that is simple to understand and catches their attention/curiosity. On the other hand, we gained lots of knowledge from other ESRs, who like us, were sharing their scientific knowledge in fields such as biology and engineering, etc.

We also heard an interesting podium discussion on **Bridging STEM to STEAM**. We learnt that there is more than one-way to bring science to the general public, e.g. through performative arts such as music and art, in combination with scientific results and dissemination.

We want to encourage our scientific colleagues to take part in events like this, where they can share their science, **because science is exciting and real but not only inside the lab!**

European Researchers' Night (Bologna, Italy)

By Daniel Sánchez Resa

At the European Researchers' night in Bologna, we had the opportunity to perform several experiments from our outreach program (**NOAH LAB**) in order to spread knowledge about encapsulation and supramolecular chemistry to the general public. Specifically, we played with spheres made of alginate in several media, and the encapsulation and release of food dyes .

It was a great opportunity to see how the general public can connect to basic research, highlighting the importance of the dissemination of the science that we study, and giving everyone an understanding of the importance of research. From my personal point of view, **making your science accessible to both children and adults, helps you to grow as a scientist**!

Women in Science: Mechanically-Activated Nanocapsules: It's all in the grind!

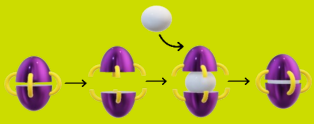
By Amy Edo-Osagie

The 11th of February marked International Women and Girls in Science day, and the 8th of March marked International Women's day. In addition, the month of March is Women's History month in the USA, the UK and Australia. **This is a time for women**, and so, in honour of this, we chose to dedicate this article to women in science.

The RSC's breaking the barriers report recently showed that there is a lack of retention and progression for women in chemistry. An additional RSC report also showed the presence of biases against women at every level in publishing of articles. Given these statistics and barriers, the work of Hanna Jędrzejewska within the group of Prof. Agnieszka Szumna (**NOAH** supervisor at ICHO PAS, Poland), is all the more impressive.

The Szumna group recently published results on the synthesis and study of mechanically activated nanocapsules, able to encapsulate fullerene in response to the stimuli of mechanical grinding.

The peptide–based nanocapsules utilise hydrazone and disulphide bonds as weak points in the capsule's structure. With use of a rigid structure, mechanical energy is able to be transduced to chemical energy, breaking the disulphide and hydrazone bonds, allowing encapsulation of fullerene before reassembly of the capsule by hydrazone and disulphide bonds.



Mechanical grinding as a stimulus in host-guest chemistry is not yet commonly used, and presents key advantages in sustainability due to the lack of solvent , and often reduced energy consumption, potentially opening a path to greener more sustainably produced host-guest structures.

Check *Chem. Eur. J.* **2020**, 26,1558 for more info about this amazing work!

Publications

2019, February, *Chemistry A European Journal*, "Influence of the Insertion Method of Aryl-Extended Calix[4]pyrroles into Liposomal Membranes on Their Properties as Anion Carriers", Luis Martínez-Crespo, Jia Liang Sun-Wang, Pedro Ferreira, Chiara F. M. Mirabella, Gemma Aragay, Pablo Ballester, **ESR1** and **ESR10**

2019, August, *Journal of Porphyrins and Phthalocyanines*, "Photophysical Properties of Porphyrinic Covalent Cages Endowed with Different Flexible Linkers", Daniel Sánchez Resa, Laetitia Schoepff, Ryan Djemili, Stéphanie Duro, Valérie Heitz and Barbara Ventura, **ESR5**

2019, December, *Chemistry A European Journal*, "One Guest or Two? A Crystallographic and Solution Study of Guest Binding in a Cubic Coordination Cage", Christopher G. P. Taylor, Stephen P. Argent, Michael D. Ludden, Jerico R. Piper, Cristina Mozaceanu, Sarah A. Barnett and Michael D. Ward, **ESR4**

2020, January, *Chemistry*, "Catalysis of an Aldol Condensation Using a Coordination Cage", Cristina Mozaceanu, Christopher G. P. Taylor, Jerico R. Piper, Stephen P. Argent and Michael D. Ward, **ESR4**

Conferences

MCAA Conference and General Assembly – Vienna, Austria, February 2019 (Poster), **ESR5**

14th International Symposium on Macrocyclic and Supramolecular Chemistry – Lecce, Italy, June 2019 (Poster), **ESR5**

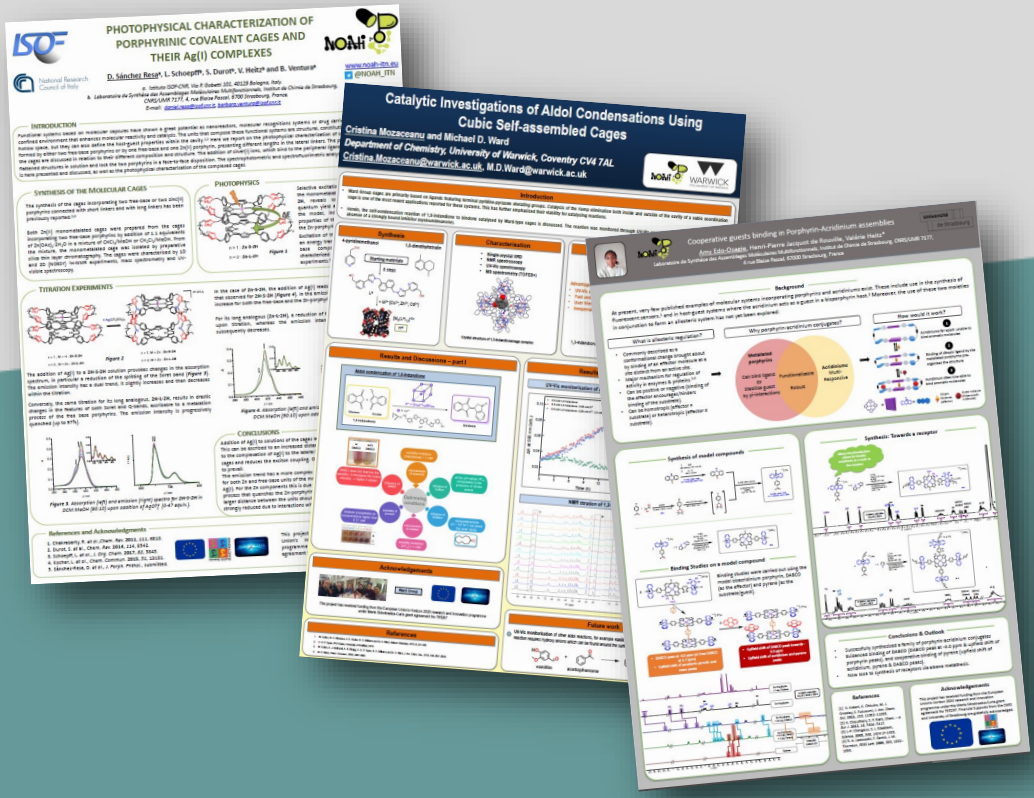
14th Italian Conference on Supramolecular Chemistry – Lecce, Italy, June 2019 (Poster), **ESR5**

UK-IT Joint Meeting on Photochemistry – Lipari, Italy, June 2019 (Oral Presentation), **ESR5**

47th IUPAC World Chemistry Congress – Paris, France, July 2019 (Poster), **ESR7**

Dalton Younger Members Event – Cardiff, UK, September 2019 (Poster), **ESR4**

RSC Macrocyclic and Supramolecular Chemistry Meeting – Canterbury, UK, December 2019 (Poster), **ESR4**



Upcoming events

2nd NOAH School	Bologna, Italy	TBD
15th International Symposium on Macrocyclic and Supramolecular Chemistry	Sydney, Australia	12-16 July 2020
1st Women in Supramolecular Chemistry (WISC) workshop	Cagliari, Italy	7-9 Sept 2020

Contacts

ITN Manager

Dr. Gemma ARAGAY

noah@noah-itn.eu

ITN Coordinator

Prof. Pablo BALLESTER

pballester@iciq.es

Find us here:

@noah.itn @noah_itn noah-itn.eu

Beneficiaries

Freie Universität Berlin

WARWICK THE UNIVERSITY OF WARWICK

ICIQ

covestro

unine UNIVERSITÉ DE NEUCHÂTEL

INSTITUTE OF ORGANIC CHEMISTRY POLISH ACADEMY OF SCIENCES

ISOF CNR

Université de Strasbourg

UNIVERSITAT DE BARCELONA

Partner Organizations

bio LITEC

LEITAT Technological Center

The NOAH project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 765297.