



# Nanoengineering for Mechanobiology “N4M-20”

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It will soon be 3 years since the “Nanoengineering for Mechanobiology” (N4M) young and growing community of mechanobiology enthusiasts last met on the Ligurian coast, in the sunny village of Camogli. It was March 2019, as we gathered for the 5th edition of the symposium, N4M-19 (Ferrari et al. 2019), the yearly rendezvous open to material technology, engineering, exact and life sciences. Back then, we had no idea of the kabbalah reserved to those numbers, which was shortly to be revealed.

Scientific communication has changed and adapted at a global level. The N4M edition of 2020 (*Nanoengineering for Mechanobiology “N4M-20,”* n.d.) took full advantage of the technological switch and transitioned to a virtual venue. The event, to which this issue of European Biophysics Journal is dedicated, had a twofold significance. First, it was attended by a record number of young and established scientists from various fields. More than 210 biologists, medical doctors, physicists, computer scientists, engineers, and chemists were connected from four different continents, confirming the trust and support that the meeting has obtained in this evolving field. At the same time, the N4M-20 represented a vital bridge to a better future. For many of us it really meant ‘see you soon in Camogli’.

For the reporting of scientific evidence, as for any other form of truth, the medium is part of the message (Marshall McLuhan 1964). That is, the channel used to convey a content inevitably impinges on the content itself. The physical distance of online meetings created a space—not necessarily a void—which rendered some aspects of scientific

communication better resolvable. We are used to conversation with our scientific peers, educated to our same research field, knowing all of the important references. We trust that words we say or write (such as ours now) are carefully weighted, their true meaning well discerned by the recipients. Yet, we also experienced that, on a broader scale, the same process can easily fail when the audience is unprepared or cannot decode the wording. The same conventions may not apply in the attempts of communication between science, politics, and the general society over public matters.

From its establishment, the N4M initiative has represented an outstanding opportunity for scientific and technological epistemology. Our original endeavour has been to create a venue where separated disciplines, such as nanoengineering, cell biology, medicine, computer science, and others, could meet and interact. Along the years, the N4M community of mechanobiologists has contributed to the development of a common encoding of the scientific language. Technologists now clearly understand the needs and questions of life sciences, while biologists are far from simple end users, but active propellers of science at the nanoscale. Words were decoded and mechanobiologists were educated to speak an inclusive and broader language.

Every edition of N4M has a different flavour, provided by the collaboration with a guest organiser. For the 2020 edition, the COST action BioBrillouin (Bio-Brillouin Cost Action 2017) contributed by bringing to the attention of the mechanobiology community the potential of Brillouin spectroscopy for the study of biological samples. This technique provides a novel method to probe the mechanical properties of soft materials that does not require the use of a physical probe contacting the sample, enabling high-resolution contactless elastography. This topic was presented during the conference and a perspective review (Caponi et al. 2021) is included in this Special Issue. The physical cues of the 3D microenvironment potentially influence the fate and collective organisation of living cells towards three-dimensional structures, as presented in Tortorella et al. (2021). This evidence is at the core of mechanobiology, and its study requires a pool of experimental approaches that span several orders of

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magnitude, from single molecules up to cells and tissues. Scientists participating in N4M-20 presented state-of-the-art instrumentation for mechanobiology. The paper (Wang et al. 2021) offered a review on dynamic force spectroscopy, and an interesting analysis on the use of fluorescent micropipette aspiration to characterise cell mechanosensation at the single molecule level is presented in Wang et al. (2022). On a different scale, the paper (Zanetti et al. 2021) presented an innovative method to study cell–cell adhesion with enhanced throughput, and Huth et al. (2021) observed how fibroblasts interact with the matrix, and how the produced traction forces are influenced by external shearing. The aim of N4M is to bring together scientists with different backgrounds, with the ambition to discuss and stimulate translation of mechanobiology towards medical and diagnostic applications. The 2020 edition was not an exception, and this special issue includes the contribution by Kourouklis et al. (2021), where a system is presented for conductive skin with a clear path towards the clinics, while the paper by Mejía Morales et al. (2021) discussed a novel high-throughput approach for single cell mechanical phenotyping with the potential to turn into a single cell analysis device.

N4M-20 was organised during a very complicated period, and it would not have been possible without the help of institutions, such as the European Biophysical Societies' Association (EBSA, n.d.), the European Molecular Biology Organisation (EMBO, n.d.), Swiss Federal Laboratories for Materials Science and Technology (EMPA, n.d.), Institute Officina dei Materiali of the National Research Council of Italy (IOM-CNR, n.d.) and the Italian Society of Pure and Applied Biophysics ("SIBPA," n.d.). Moreover, the generous contribution of high technology companies active in the field of mechanobiology, such as CoolLED (CoolLed, n.d.), Cytosurge (Cytosurge, n.d.), Elbitech (Elbitech, n.d.), Impetux (Impetux, n.d.), Nikon (Nikon, n.d.), and Optics11 (Optics11, n.d.), allowed us to organise the conference and keep alive the hope to soon meet again in person. The promise holds, and we will return to Camogli for N4M-22 to celebrate the maturity of an interdisciplinary field that has still much to reveal. How many of those sea waves washing the shore beneath the conference room have we missed? No matter: each of the upcoming ones shall bring all the content of those that were missed before.

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