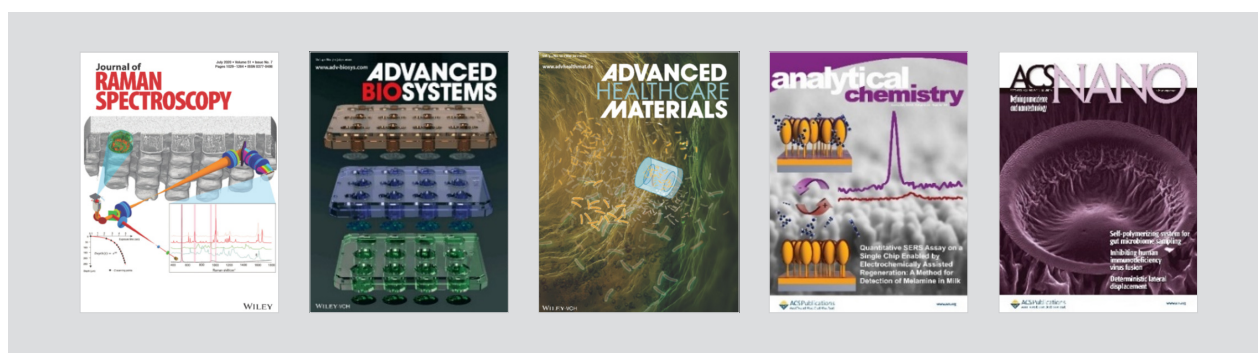


## Annual Highlights

The IDUN research activities in 2020 have resulted in 27 peer reviewed journal articles, 5 journal covers, 5 conference contributions and 10 invited talks. Four of our 2020 papers have impact factors above 10 (Nature Com, ACS Nano and Adv. Drug delivery rev). 41 people were in 2020 working in relation to the IDUN center and together they supervised 24 master students and taught several courses. We successfully ran our PhD summer school program for the fifth time in an online version, with a track on drug delivery and one on micro- and nano-sensors, and hosted an online version of our annual "IDUN Industry Day" for our invited members from industry.

In 2020, Anja Boisen was awarded a faculty grant from the BioInnovation Institute to continue the centers work on sensors within health tech. Associate professor En Te Hwu received support from the LEO foundation for work on rapid and quantitative assessment of skin dysfunction and treatment monitoring. Associate professor Martin Dufva received support from EU for the project entitled "GUT Virus BRain Axis Technology In OrgaNoid Science (GUTVIBRATIONS)".

Three IDUN members received honorary awards in 2020. Anja Boisen was awarded the Order of Dannebrog from Her Majesty the Queen for her contributions to the scientific community. IIDUN PhD student, Nikolaj Kofoed Mandsberg, was presented the prestigious Eliteforsk travel grant from the Danish Agency for Science and Higher Education for talented young researchers and with it, financial contribution for a long-term exchange with a foreign University. Nikolaj was also the recipient of the Kirstine Meyers Memorial Grant, which is awarded to "young promising Danish students or Graduates to promote their education or their research in the Field of Nature Doctrine". Postdoc Tijana Maric was given the honorary citizen award from her birth city Uzice, Serbia



### IDUN Drug

In IDUN Drug we have now for the first time realized oral delivery of insulin (in rats) with the use of self-unfolding foils. Even though the bioavailability is low (less than 1 %) the initial studies suggest that we should focus on designs that will ensure close proximity between the intestinal wall and our delivery device. The initial microcontainer design has, when loaded with antibiotic, been demonstrated to have significantly improved ability to eradicate bacterial biofilms. Moreover, our microcontainers have been 'repurposed' to operate as gut microbiome sampling devices. Finally, we have a microfabrication toolbox ready for realization of devices made of biodegradable/biocompatible materials.

### IDUN Sensor

In IDUN Sensor we have finalized the development of a stackable in-vitro system for analysis of drug transport through several organs. Also, we have published our pioneering work on growing cells (bacteria biofilms as first case) in a centrifugal microfluidic system. These constructs will facilitate the characterization of our drug delivery devices. We have succeeded to use single drug crystals as resonators, hereby demonstrating the possibility of monitoring previously undetected dehydration events in small amounts of drugs. Our work on Surface Enhanced Raman Scattering (SERS) based sensors has had a major breakthrough since we have demonstrated that the SERS substrates can be reused and that specific analytes can be 'drawn' towards the sensing surface.