

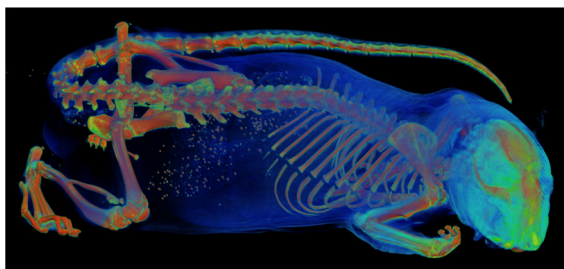
Annual Highlights

The IDUN research activities in 2022 have resulted in 23 peer reviewed journal articles, 2 journal covers, 9 conference contributions and 11 invited talks. Five of our papers have impact factors of around 10 or above (Chemical Engineering Journal, Journal of Controlled Release, ACS Sensors, Advanced Healthcare Materials and Food Hydrocolloids). In 2022 3 PhD students graduated and 4 new PhDs have been hired, one of them with activities at University of Copenhagen. There has also been hired a postdoc to explore the use of Coherent Antistokes Raman Scattering (CARS) in sensing and drug delivery.

Approximately 40 people were working in relation to the IDUN center in 2022 and together, they supervised 13 master and bachelor students and taught several courses. We successfully ran our PhD summer school program for the seventh time and hosted our annual IDUN Industry Day for our invited members from industry. In connection to the IDUN Industry Day we also arranged an alumni event for former students and staff in the IDUN Center of Excellence. To this event, also students and staff from Anja Boisen's earlier research groups, going back as far as to 1999 attended.

We received an ERC advanced grant (PI Anja Boisen) to further explore the self-unfolding drug delivery devices initiated in IDUN. Later in 2022, we were awarded a Novo Nordisk Foundation (NNF) Challenge grant on energy materials. Here we will, in collaboration with University of Glasgow develop new materials/solutions for energy harvesting/transformation in the gut. This effort will eventually allow us to truly combine sensing and drug delivery activities - targeting e.g. self-powered devices for sensing & delivery. Our IDUN faculty members associate professors Line Hagner Nielsen and En Te Hwu have both been promoted to group leaders and have also both secured external funding (e.g. Horizon 2020 and NNF). Additionally, we have received several grants for supporting our start-up activities, including two NNF Pioneer Innovator grants (Oleksii Ilchenko and En Te Hwu) and a Spin-out Denmark grant.

We are proud to share that our postdoc Rolf Bech Kjeldsen, won the first prize in the D NRF photo competition and the winner photo can be seen below. Anja Boisen was awarded the Electro Chemical Societies Sensor divisions outstanding achievement award in Atlanta, USA and she was giving a WIN distinguished lecture at University of Waterloo, Canada. IDUN continues to be deeply engaged in outreach and we have among other things participated in podcasts on biotech, hacking technology and nanotechnology.



IDUN Drug. In IDUN Drug we have for the first time been able to image discrete 3D printed microdevices *in vivo* using Computed Tomography (CT). We have mixed contrast agents into polymers that we use in our high-resolution homemade 3D printer. The 3D printer is used for realizing advanced drug carrier geometries. Thereby we can study which geometries perform best in terms of mucus adhesion and mucus embedment. Additionally, we have explored more advanced geometries and materials for dual-release devices. We have made our first publication on micromotors for drug delivery. These micromotors can be loaded into some of our own larger drug delivery devices.

IDUN Sensor is mainly focusing on our Surface Enhanced Raman Scattering (SERS) based sensors for applications in therapeutic drug monitoring (TDM) and centrifugal microfluidics for cell growth. We have published our first work on combination of electrochemistry and SERS in detection of anti-cancer drugs. Here, we also disclosed the first prototype of an instrument to perform TDM. Moreover, in close collaboration with IDUN Drug, we have developed a sensitive force analyzer system that can monitor adhesive forces in relation to one single μm sized drug delivery device.