Fysikermøtet 2025 NTNU Trondheim

Report of Contributions

https://indico.global/e/10187

Contribution ID: **99** Type: **Oral presentation**

The Euclid space mission and the accelerating expansion of the Universe

Wednesday 18 June 2025 13:00 (40 minutes)

In our daily life, gravity is always an attractive force. After Hubble discovered the expansion of the Universe in 1929, it has been usual to think that the expansion of the Universe must be decelerating, although there have also been other ideas. In fact, Einstein first in 1917 inserted the "cosmological constant"in his equations, as a kind of universal repelling force, to allow a static universe, something he later called his greatest blunder. This cosmological constant has come back. In 1998 it was clear from observations of exploding stars, awarded with the Nobel Prize, that the Universe in fact is accelerating and not decelerating, and that the data fits well with Einstein's cosmological constant. However, the existence of a cosmological constant is perhaps the greatest mystery of current theoretical physics, as theory would predict a cosmological constant more than 60 magnitudes larger than given by the data. Is it really Einstein's cosmological constant we are seeing, or some kind of dynamic field, dubbed "dark energy", or is something wrong with general relativity? To get a handle on this, the European Space Agency in 2011 selected Euclid as a future mission. Euclid was launched on the 1st of July 2023 and is now surveying the sky to get a detailed picture of the expansion history of the Universe, to try to give a better explanation of what is causing the expansion of the Universe to accelerate. In this talk, I will describe the Euclid mission and its background.

Presenter: Prof. LILJE, Per Barth (UiO)

Session Classification: Plenary talk

Contribution ID: **106** Type: **Oral presentation**

Quantum technology and WACQT

We are in the middle of what has been called the second quantum revolution, where precise control over systems that obey the laws of quantum physics enable progress in many technologies, e.g., computers, sensors, and communication devices. In this presentation, I will explain what quantum technology is based on and what it can be used for. I will also give an overview of the Swedish efforts in quantum technology through WACQT —the Wallenberg Centre for Quantum Technology. In particular, I will show how we build a Swedish quantum computer based on superconducting circuits in the core project of WACQT at Chalmers University of Technology.

Presenter: Dr KOCKUM, Anton Frisk (Chalmers University of Technology)

Session Classification: Plenary talk

Contribution ID: **107** Type: **Oral presentation**

Interacting with superconductors

Five Nobel prizes have highlighted advances in understanding the fundamental physics of how some materials –superconductors –can transport currents without heat loss. Despite this, there is still so much we don't understand about how these materials interact with other states of matter, or external impulses. Here we'll explore some of these fundamentals, and how certain interactions can let us harness their properties for pioneering quantum technologies.

Presenter: Dr JACOBSEN, Sol H. (NTNU)

Session Classification: Plenary talk

Contribution ID: **108** Type: **Oral presentation**

Kvantevitenskap: Fra fascinerende naturfenomen til morgendagens teknologi

Da kvantefysikken vokste fram for drøyt hundre år siden, utgjorde den et paradigmeskifte i vår forståelse av naturen, og spesielt av naturens minste bestanddeler. Den har i lang tid fascinert folk også langt utenfor fysikernes rekker og nærmest vært litt myteomspunnen. Etter hvert har kvantefysikken også fått uvurderlig betydning for den teknologiske utviklingen. Kvanteteknologi, med uante muligheter for databeregninger, sensorteknologi og kommunikasjon, er nå et stort satsningsområde i hele verden. I dette foredraget vil Susanne Viefers gi en gjennomgang av noen av kvantefysikkens hovedtrekk og fascinerende egenskaper, og hvordan disse nå utnyttes til å utvikle helt nye typer teknologi. Videre vil hun diskutere kvanteteknologiens status og potensiale, illustrert med eksempler.

Presenter: Prof. VIEFERS, Susanne (UiO)

Session Classification: Plenary talk

Contribution ID: **109** Type: **Oral presentation**

A Decade in 4D Live Microscopy: Looking Under the Hood

I want to take you on a journey through the last ten years of my field of research - 4D live microscopy. Live microscopy allows us to observe living cells in real-time and capture dynamic processes as they unfold and evolve in 3D space. This capability provides invaluable insights into the complex and dynamic nature of biological systems, as well as stunning imagery. I'll be focusing on technical innovations while ensuring that the methods are contextualized within their respective applications in dementia research, regenerative medicine, and developmental biology.

Our journey begins at Cambridge University, where I completed my PhD and served as Head of Imaging at the Dementia Research Institute. Here, I worked on super-resolution, a technique that allows us to surpass the diffraction limit of conventional optical microscopy. Together with medical scientists, we used these methods to study phase transitions of molecules thought to be involved in amyotrophic lateral sclerosis (ALS).

Following my time in Cambridge, I started my own group at the Arctic University in Tromsø. Driven by application needs, my focus shifted to the development of ultra-fast confocal microscopy methods tailored to tissue imaging in the context of regenerative medicine. Specifically, we developed a confocal microscope that can record an entire volume in a single camera exposure. With this machine, we managed to capture tiniest cellular organelles in engineered human heart tissue - an achievement I believe will have wide-ranging implications for therapeutic strategies in heart repair.

The final leg of my talk covers my time at the European Molecular Biology Laboratory in Heidelberg, Germany, where I concentrated on the development of light-sheet microscopy. This technique has revolutionized our ability to study the developmental biology of maritime specimens, providing detailed insights into how entire living organisms develop on a cellular level. Recently, we finalized a similar method in Tromsø, which will allow us to study the immune system of farmed fish, with the hope of improving the conditions in which these animals are raised.

Reflecting on this decade, I must conclude that live microscopy is truly at the crossroads of biomedicine, engineering, and physics.

Presenter: Prof. STRÖHL, Florian (UiT)

Session Classification: Plenary talk

Contribution ID: **110** Type: **Oral presentation**

Fysikklæring på hjernens premisser

Presenter: Dr GJERDE, Vegard (UiB)

Session Classification: Plenary talk

Contribution ID: **111** Type: **Oral presentation**

Discrete conformal symmetry and integrable spin chains

Monday 16 June 2025 16:15 (15 minutes)

It has been a long-standing problem in quantum integrability whether Reshetikhin's condition, which provides a three-local conserved charge, implies the existence of sufficient many mutually commuting local charges that guarantee integrability. In an attempt to answer this question, I reveal the discrete conformal algebra hidden in Yang-Baxter integrable 1D systems, and propose a practical method to iteratively identify new integrable models and construct the corresponding R-matrices for their classical statistical mechanical counterparts.

Author: ZHANG, Zhao (University of Oslo)

Presenter: ZHANG, Zhao (University of Oslo)

Session Classification: Parallell B1

Contribution ID: **112** Type: **Oral presentation**

Nuclear excitation functions for natZr(d,x) reactions with focus on the PET/theranostic candidate 86Y

Monday 16 June 2025 16:45 (15 minutes)

Radionuclides are important both for diagnostic and treatment of cancer. 86Y is a candidate for positron emission tomography (PET) and, when employed together with 90Y, is amenable for thernostics. Theranostics can be done using either a self-theranostic nuclide, where the same radionuclide is used in both diagnosis and treatment, or by using two different radionuclides (a theranostic pair), such as 86Y and 90Y, with the same chemical properties, attached to the same searching molecule. In this work, nuclear excitation functions for natZr(d,x) reactions have been measured to investigate if this is a viable pathway to produce the medically relevant 86Y radionuclide. The stacked target activation method1 has been used to analyze two stacked target experiments where natural zirconium foils were irradiated with deuteron beams with incident energies of 30 MeV and 50 MeV. These experiments were conducted at the Lawrence Berkeley National Laboratory (LBNL), and gamma-ray spectroscopy was used to measure the activity of each observed radionuclide in the zirconium foils. The monitor reactions of natFe(d,x)56Co, natNi(d,x)56Co, natNi(d,x)58Co, natNi(d,x)61Cu, natTi(d,x)46Sc amd natTi(d,x)48V have well characterized cross sections and were used to determine the deuteron beam current in each foil, which was required for the cross-section calculations. In this talk I will present the final cross sections and compare them with results from the reaction modelling codes TALYS2, ALICE3, CoH4, EMPIRE5 and TENDL6.

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Author: MARTINSEN, Elise Malmer (Univeristy of Oslo)

Co-authors: VOYLES, Andrew; Mrs EKEBERG, Hannah (University of Oslo); LI, Kevin Ching Wei (University of Oslo); BERNSTEIN, Lee; SIEM, Sunniva (University of Oslo); ET AL., x

Presenter: MARTINSEN, Elise Malmer (Univeristy of Oslo)

Session Classification: Parallell A1

Contribution ID: **113** Type: **Oral presentation**

Investigating cannibalistic millisecond pulsar binaries using: New constraints from pulsar spin and mass evolution

Tuesday 17 June 2025 13:30 (15 minutes)

Millisecond pulsars (MSPs) are rapidly spinning neutron stars often found in close binary systems with a companion star. Some of these systems, known as spiders, experience a process where the pulsar's intense radiation gradually strips away material from its companion. These systems are classified into two types: redbacks (RBs), where the companion has a mass between 0.1 and 0.5 times the mass of the Sun ($M_\odot$), and black widows (BWs), where the companion is much lighter, typically less than 0.1 $M_\odot$. We modeled how these binaries evolve, focusing on how mass is transferred from the companion to the neutron star and how the pulsar's radiation affects the system. Our results show that for efficient mass transfer, at least 70% of the material stripped from the companion is accreted by the neutron star. This process can significantly increase the neutron star's mass, with some MSPs in spider systems reaching more than 2.0 $M_\odot$, making them among the most massive neutron stars ever observed. But if a neutron star gains too much mass, it may collapse into a black hole before reaching sub-millisecond spin periods. We also explain why some BWs appear to lack hydrogen in their spectra and show that RBs naturally evolve into BWs over time. Overall, our findings help clarify how MSP binaries evolve and highlight the delicate balance between mass accretion and pulsar radiation in shaping their final states.

Author: MISRA, Devina (Norwegia Institute of Science and Technology)

Co-authors: Prof. LINARES ALEGRET, Manuel (Norwegian Insititute of Science and Technology); Dr YE, Claire (Canadian Institute for Theoretical Astrophysics)

Presenter: MISRA, Devina (Norwegia Institute of Science and Technology)

Session Classification: Parallell A3

Contribution ID: **114** Type: **Poster presentation**

The slowest spinning Galactic-field spider PSR J1932+2121: A history of inefficient mass transfer

The Five-hundred-meter Aperture Spherical Telescope (FAST) has recently discovered hundreds of new pulsars, including an unusual millisecond pulsar (PSR J1932+2121) in a close binary system. Unlike most rapidly spinning millisecond pulsars in compact orbits, this one rotates every 14.2 milliseconds, making it at least two times slower than typical pulsars of its kind in the Galactic field. It orbits its companion every 0.08 days (about 2 hours), and its minimum companion mass is estimated to be 0.12 times the mass of the Sun ($M_\odot$). Based on these properties, it is classified as a redback, a type of pulsar that gradually strips material from its companion through intense radiation.

To understand its unusual properties, we modeled its evolution, including phases of mass transfer and pulsar activity. Our results suggest that PSR J1932+2121 underwent an inefficient mass-transfer phase, meaning it accreted only 30–50% of the material from its companion. This lower accretion efficiency likely explains why it spins more slowly than other redbacks. We also find that its initial orbital period was between 2.0 and 2.6 days, shrinking to its current short orbit over time.

However, one major puzzle remains: its strong surface magnetic field (2×10^9 G) is difficult to explain using current models of how pulsar magnetic fields evolve. This makes PSR J1932+2121 a unique system to study the complex relationship between mass transfer, spin-up processes, and magnetic field evolution in pulsars.

Author: MISRA, Devina (Norwegia Institute of Science and Technology)

Co-authors: Dr KOLJONEN, Karri I. I. (Norwegian Institute of Science and Technology); LINARES ALEGRET, Manuel (Norwegian Insititute of Science and Technology)

Presenter: MISRA, Devina (Norwegia Institute of Science and Technology)

Contribution ID: **115** Type: **Oral presentation**

Ultra-high-energy cosmic rays from ultra-fast outflows of active galactic nuclei

Tuesday 17 June 2025 13:15 (15 minutes)

Ultra-fast outflows (UFOs) of plasma from actively accreting galactic nuclei (AGN) are large-scale, mildly relativistic flows of highly ionised material. The interaction of these outflows with the interstellar medium can lead to the formation of collisionless shocks that are potential sites for the acceleration of elementary particles to ultra-high energies (”cosmic rays”). We study the cosmic-ray spectrum and maximum energy achievable in these UFOs via semi-analytical modelling and three-dimensional numerical simulations. We apply this approach to a sample of 86 observed UFOs and find that heavy nuclei, e.g. iron, can be accelerated up to 100 EeV at the wind-termination shock in some UFOs – corresponding to the highest observed energies of cosmic rays at Earth. However, the escaping flux is attenuated strongly due to photonuclear interactions with the intense photon fields of the nearby AGN unless the cosmic rays are predominantly protons. We show that UFOs can provide an important contribution to the observed flux of ultra-high-energy cosmic rays. In addition, we predict a substantial flux of high-energy neutrinos from interactions of the accelerated cosmic rays in the UFOs.

Author: EHLERT, Domenik (Norwegian University of Science and Technology)

Co-authors: PERETTI, Enrico (Université Paris Cité, CNRS, Astroparticule et Cosmologie); Prof. OIKONOMOU, Foteini (NTNU)

Presenter: EHLERT, Domenik (Norwegian University of Science and Technology)

Session Classification: Parallell A3

Contribution ID: **116** Type: **Oral presentation**

Modeling Optical Light Curves and Radial Velocity Curves from Compact Binary Millisecond Pulsar Systems

Tuesday 17 June 2025 13:45 (15 minutes)

Compact binary millisecond pulsar systems contain a rapidly rotating neutron star, or pulsar, and a companion star. The pulsar wind contains high energy particles that can heat, or irradiate, the companion, and we can observe the effects of this in optical data of the companion. These systems can host the most massive pulsars and to accurately calculate their masses, we model the optical light curves emitted from the companions in these systems, along with their radial velocity curves and emitted spectra, to find the binary parameters of the systems. We use the binary modeling software ICARUS to model systems exhibiting a range of irradiation strengths. We implement a new Markov Chain Monte Carlo sampling algorithm that links multiple datasets for the same source to find changes in the system over multiple years. In one system, PSR J1622-0315, we find evidence for a supermassive neutron star of mass $2.3 \pm 0.4\,\mathrm{M}_\odot$ and a companion with low, but significant irradiation, and variable asymmetric heating from star spots.

We also systematically compare models of radial velocities with different weights for systems showing moderate and high amounts of irradiation. We use Balmer and MgI absorption lines to trace radial velocities from different regions of the companion to precisely bracket the center of mass radial velocity of each system. We perform simultaneous fits of the light curves and radial velocity curves of multiple systems to find more precise estimates of the their binary parameters.

Author: SEN, Bidisha (Norwegian Insititute of Science and Technology)

Co-authors: MISRA, Devina (Norwegia Institute of Science and Technology); LINARES ALEGRET, Manuel (Norwegian Insititute of Science and Technology)

Presenter: SEN, Bidisha (Norwegian Insititute of Science and Technology)

Session Classification: Parallell A3

Contribution ID: **117** Type: **Oral presentation**

Multi-MOX: Facilitating plutonium multi-recycling in the French PWR fleet

Wednesday 18 June 2025 11:00 (15 minutes)

This study examines the Multi-MOX (MMOX) strategy for plutonium multi-recycling in PWRs using the CLASS fuel cycle simulation tool. MMOX involves blending reprocessed plutonium from various sources to produce viable fresh nuclear fuel. While MMOX significantly curtails the growth of the plutonium inventory, it does not stabilize it entirely in the long term. Although lower burnup reduces plutonium buildup, it increases the production of minor actinides. Comparing MMOX to non-recycling and mono-recycling scenarios, we find that it reduces plutonium inventory by 35% and 19%, respectively. Despite higher minor actinide production, MMOX decreases overall transuranic element production. Additionally, MMOX reduces the need for interim spent fuel storage by a factor of ten compared to non-recycling and by two-thirds compared to mono-recycling, while substantially lowering the age of stockpiled used nuclear fuel.

Author: TORVUND, Gulla (University of Oslo)

Co-author: ERNOULT, Marc

Presenter: TORVUND, Gulla (University of Oslo)

Session Classification: Parallell B4

Contribution ID: **118** Type: **Oral presentation**

Evolution of the Pygmy Dipole Resonance in the Sn mass region studied with the Oslo method

Tuesday 17 June 2025 11:00 (15 minutes)

The pygmy dipole resonance (PDR) is commonly associated with an excess $E1$ strength on top of the low-energy tail of the giant dipole resonance (GDR) close to the neutron-separation energy in stable and unstable heavy nuclei. While its detailed structure, properties, and origin remain a matter of ongoing debates and research, the neutron-skin oscillation picture of this feature still prevails and suggests some dependence of the PDR strength on neutron excess. This might have further consequences for neutron-capture rates relevant for heavy-element nucleosynthesis [1], making a systematic investigation of the PDR and the low-lying $E1$ strength in general in different isotopic chains particularly interesting from the nuclear structure and astrophysical perspectives.

This work presents the most recent update on a consistent systematic study of the low-lying electric dipole strength and the potential PDR in stable and unstable Pd, Cd, In, Sn, and Sb isotopes with the Oslo method [2].The analysis focuses on dipole γ-ray strength functions (GSF) below the neutron threshold extracted from particle-γ coincidence data from light-ion induced reactions studied at the Oslo Cyclotron Laboratory (OCL). The most recent $(p, p'\gamma)$ and $(\alpha, p\gamma)$ experiments have been performed with a new array of 30 LaBr3(Ce) scintillator detectors (OSCAR) with an improved energy resolution and timing properties for the selection of particle-γ events as compared to the earlier experiments done with the NaI(Tl) detector array CACTUS. All previously published GSFs of ^{105,107,111,112}Cd [3] and $^{105-108}$Pd [4] isotopes have been re-analysed to provide a more consistent analysis of the strengths in the Sn mass region.

With a wide span of isotopes (from unstable, neutron-deficient $^{1}09$In to unstable, neutron-rich ^{127}Sb), these dipole strengths provide an excellent case for investigation of the PDR evolution with increasing proton-neutron asymmetry, comparing it with different theoretical approaches, and revealing a possible impact of this feature on the astrophysical radiative neutron-capture processes. Combining these data with available (γ, n) cross sections and the $E1$ and $M1$ strengths from relativistic Coulomb excitation experiments allows us to extract the low-lying $E1$ component from the total dipole strength in each case. It was found to exhaust $\approx 1-3\%$ of the classical Thomas-Reiche-Kuhn (TRK) sum rule, being nearly constant throughout the whole chain of Sn isotopes and weakly increasing with neutron number in Cd and Pd isotopes. This finding is in contradiction with the majority of theoretical approaches, such as, e.g., relativistic quasi-particle random-phase and time-blocking approximations, predicting a strong, steady increase in the low-lying $E1$ strength with neutron number. Moreover, a presumably isovector component of the PDR was extracted for $^{118-122,124}$Sn. The most neutron-deficient case ^{109}In studied recently at the OCL, on the contrary, exhibits little to no excess $E1$ strength below the neutron threshold, thus standing out among the neighbouring Cd and Sn isotopes.

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Co-author: LARSEN, Ann-Cecilie (University of Oslo (NO))

Presenter: MARKOVA, Maria (University of Oslo)

Session Classification: Parallell A2

Contribution ID: **119** Type: **Oral presentation**

Investigation of pore scale phenomena in CCS applications using X-ray Micro Computed Tomography

Monday 16 June 2025 15:45 (15 minutes)

The effects of climate change make atmospheric CO2 reductions a necessity. This effort is mostly represented by Carbon Capture and Storage (CCS): the removal of CO2 from the atmosphere and its transport to safe and permanent storage. Injecting, trapping and storing CO2 within the subsurface requires a deep understanding of the geological and geophysical processes that are involved. At the pore scale, X-ray micro-Computed Tomography (CT) has emerged as a powerful method for in-situ studies due to a spatial resolution of the order of μm for home-laboratory based CT and nm for synchrotron facilities. Its non-invasive nature makes CT highly suitable for in-situ CO2 experiments. We showcase state-of-the-art studies from the X-ray Physics Group at NTNU relating to challenges in CCS. In-situ CO2 injection experiments can be performed and monitored using CT to observe salt precipitation in saline aquifers as well as corrosion of steel pipelines and casings in contact with cement. The former can restrict storage capacity and injection rates while the latter can lead to well leakage. Low concentration impurities in CO2 can compromise the efficacy of plugs and caprock seals over time. To study the mechanical degradation of the rocks, millimeter scale triaxial cells, with continuous X-ray monitoring, are utilized to carry out mechanical stress tests. In summary, our CT-based experiments cover a wide range of processes relating to CCS. In addition, we will share insights into how we perceive the path forwards in terms of improved instrumentation, complementary methods, and algorithms.

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Co-authors: Ms ZEMAN, Jessica (NTNU); Mr JAISWAL, Mukul (NTNU); Ms MATHEW, Arshitha (NTNU); Ms PALLIPOTTA, Soumya (NTNU); Dr TEKSETH, Kim Robert (NTNU); Dr CHATTOPADHYAY, Basab (NTNU); Dr KRISTOFFERSEN, Anders (Equinor ASA); Prof. BREIBY, Dag Werner (NTNU)

Presenter: LUANI, Giacomo (NTNU)

Session Classification: Parallell A1

Track Classification: 7. Subatomic physics and astrophysics: Subatomic physics

Contribution ID: **120** Type: **Oral presentation**

Discovery of gamma-ray orbital modulation in three spider pulsars

Tuesday 17 June 2025 14:15 (15 minutes)

Compact binary millisecond pulsars (spiders) are short-period binary systems consisting of a millisecond pulsar and a low-mass companion. These systems emit across the entire electromagnetic spectrum and are particularly bright in gamma-rays. Pulsed gamma-ray emission has been observed in many of these systems and is believed to originate from the neutron star's current sheet. Some spiders also exhibit orbital modulation of the gamma-ray and X-ray luminosities.

The X-ray modulation can be explained by an intrabinary shock emission model, where pulsar wind particles are re-accelerated and Doppler boosted along the shock tangent, producing orbitally modulated photons via synchrotron radiation. This shock typically wraps around the pulsar, causing modulation to peak at the pulsar's inferior conjunction.

If similar processes were responsible for the gamma-ray modulation, its peak should align with X-ray modulation. However, in three previously studied systems, the X-ray and gamma-ray modulation peaks occur at opposite orbital phases, suggesting different underlying mechanisms, such as inverse Compton scattering of companion star photons by pulsar wind particles or synchrotron emission from wind particles interacting with the companion's magnetosphere.

Using data from the recently published Third Fermi Large Area Telescope Catalog of Gamma-Ray Pulsars (3PC), we searched for gamma-ray orbital modulation in 40 redback and black widow pulsars. We detected significant modulation in seven systems, including three newly identified ones. In this presentation, I will discuss these findings, focusing on the measured modulated fractions and their relation to system properties such as gamma-ray flux, luminosity, binary inclination and X-ray light curves.

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Presenter: Mr SATYBALDIEV, Maksat (Norwegian University of Science and Technology)

Session Classification: Parallell A3

Contribution ID: **121** Type: **Oral presentation**

Investigating Pore-scale air-water interfacial fluctuations in multiphase flow via time-resolved X-ray computed tomography

Monday 16 June 2025 16:30 (15 minutes)

Multiphase flow in a porous media is a widespread phenomenon with significance spanning from daily life to cutting-edge scientific fields and has hence been studied for centuries. Notable examples in geophysics include environmental cleanup, CO2 sequestration, and water purification. When one fluid phase displaces another inside a porous medium, intricate dynamics plays out across diverse spatial and temporal scales. In the case of multiphase flow, properties like relative permeability are estimated at the macroscopic "Darcy"level without accounting for the millisecond time-scale pore events. Despite progress, real-time imaging of fast (millisecond) events happening at the pore scale in 3D has historically been difficult. In this study, we showcase a method to consistently replicate and visualize pore-scale dynamics during drainage and imbibition. Using advanced X-ray computed tomography (CT), we achieve 4D imaging at the natural timescale of these events. Our approach relies on hydraulic pumping and a high-speed X-ray imaging system, recording 2,000 frames per second to deliver a temporal resolution of 0.5 milliseconds. This technique has enabled us to track the real-time movement of fluid interfaces. For example, we obtain a precise, quantitative visualization of rapid pore-filling events known as Haines jumps, rather than just snapshots taken before and after the events. We will also discuss how fast pore-scale processes are influenced by varying flow rates and capillary numbers during drainage. These findings illuminate the underlying physics of multiphase flow and demonstrate the promise of our imaging technique for future investigations in areas such as geoscience, biomedical engineering, and beyond.

Author: JAISWAL, Mukul (Norwegian University of Science and Technology)

Co-authors: Dr TEKSETH, Kim Robert (Norwegian University of Science and Technology); LUANI, Giacomo (Norwegian University of Science and Technology); ZEMAN, Jessica (Norwegian University of Science and Technology); MIRZAEI, Fazel (Norwegian University of Science and Technology); YOUNAS, Daniyal (Norwegian University of Science and Technology); Dr LUKIC, Bratislav (European Synchrotron Radiation Facility); Dr CHATTOPADHYAY, Basab (Norwegian University of Science and Technology); Prof. BREIBY, Dag Werner (Norwegian University of Science and Technology)

Presenter: JAISWAL, Mukul (Norwegian University of Science and Technology)

Session Classification: Parallell B1

Contribution ID: **122** Type: **Oral presentation**

Investigating shape transitions in neutron rich ruthenium

Tuesday 17 June 2025 11:15 (15 minutes)

The changes of nuclear deformation across the nuclear chart are among the fundamental questions in nuclear structure. The neutron rich region around mass 100 is particularly interesting for its rapid shape transitions, which make it a good testing ground for various theoretical models. The ruthenium chain is believed to contain one of the strongest cases for highly deformed triaxial shape close to the ground state, but experimental transition probabilities in the γ band are needed to verify this. Through lifetime measurements with the recoil distance Doppler-shift method, conducted at GANIL in 2017, we have obtained new transition probabilities in the γ bands of ¹¹⁰Ru and ¹¹²Ru. We compare these with microscopic beyond-mean-field calculations and use the generalized triaxial rotor model to gain insight into the angular momenta.

Author: HEINES, Johannes Sørby (Nuclear Physics Group, University of Oslo)

Co-authors: GÖRGEN, Andreas (University of Oslo); MODAMIO, Victor (University of Oslo)

Presenter: HEINES, Johannes Sørby (Nuclear Physics Group, University of Oslo)

Session Classification: Parallell A2

Contribution ID: **123** Type: **Oral presentation**

The power of the dark side: hunting spiders to find massive neutron stars

Tuesday 17 June 2025 14:30 (15 minutes)

What is the maximum mass of a neutron star, above which it collapses into a black hole? The answer to this seemingly simple question has far-reaching implications for nuclear physics, astrophysics, and the emerging field of gravitational wave astronomy. Despite its importance - particularly in determining the equation of state of ultra-dense matter - this crucial quantity is still poorly constrained.

Compact binary millisecond pulsars - nicknamed 'spiders' - consist of a rapidly-rotating neutron star in a tight orbit with a low-mass main-sequence companion. Thanks to the sustained accretion phase that spins up their pulsars, these systems provide a promising avenue for finding the most massive neutron stars. Unfortunately, weighing these systems is far from simple. Many spiders exhibit intense irradiation effects due to ablation of the companion by the pulsar's wind. This drastically alters the light from these systems, making obtaining robust masses challenging.

The dark side of the companion holds the key to accurate mass measurements in spiders. Using spectroscopic observations from the world's largest optical telescopes, we can resolve spectral features associated with different stellar temperatures - and thus different locations on the companion's surface - to both correct for, and leverage the effects of irradiation, to precisely trace the companion throughout its orbit.

In this talk, I will summarise the results of these deep spectroscopic studies from our group at NTNU. I will highlight some of our unique discoveries, while also showing how we use these results to constrain our models, and thus continue the hunt for the most massive neutron stars.

Author: SIMPSON, Jordan (NTNU)

Co-authors: LINARES ALEGRET, Manuel (NTNU); SEN, Bidisha (NTNU); Mr TURCHETTA, Marco (NTNU); Dr CASARES, Jorge (IAC); Dr SHAHBAZ, Tariq (IAC)

Presenter: SIMPSON, Jordan (NTNU)

Session Classification: Parallell A3

Contribution ID: **124** Type: **Oral presentation**

Potential 2-year master's programme in acoustics at NTNU

Tuesday 17 June 2025 14:15 (15 minutes)

While acoustics is a well established discipline in academia with a broad range of applications, it easily suffers from a lack of visibility in higher education, especially for students at the start of their university studies. Moreover, the transverse nature of acoustics makes it difficult to find a suitable place for the discipline at a university. This may explain why NTNU has been educating so few acousticians while it has been offering a broad portfolio of courses in acoustics. This communication presents first the current situation of education in acoustics at NTNU. Second it provides an assessment of the demand for acousticians in Norway. Third, this communication outlines the structure of and the principles behind a tentative 2-year international master's programme in sound and vibrations. In short this programme would (1) recruit students with a bachelor's degree in various disciplines, (2) provide general courses in acoustics in the first year and (3) offer a number of specializations during the second year.

Author: DUTILLEUX, Guillaume (NTNU/IE/IES/Akustikk)

Co-authors: MARTIN, Sara R (NTNU); Prof. SVENSSON, U. Peter (NTNU/IE/IES/Akustikk)

Presenter: DUTILLEUX, Guillaume (NTNU/IE/IES/Akustikk)

Session Classification: Parallell B3

Contribution ID: **125** Type: **Oral presentation**

Self-Calibrated Optical Power Measurements Using the PQED and Integrated Photonic Chips

Tuesday 17 June 2025 11:00 (15 minutes)

The Predictable Quantum Efficient Detector (PQED) is an internationally recognized primary standard for optical power measurements, with its core technology developed entirely in Norway. Led by Justervesenet, the Chip S·CALe project focused on producing practically loss-free photodiodes, along with three independent methods to quantify residual losses—shown to be below 10 ppm. These methods include fitting a simulation model to either charge carrier lifetime or photocurrent measurements, as well as a purely experimental approach known as the dual-mode method, which combines photocurrent and electrical substitution on a single photodiode chip.

We present approaches for achieving self-calibration in optical power measurements, demonstrating record-low uncertainties on the order of 150 ppm. Self-calibrating photodiodes enable integration of primary standards directly into instruments, eliminating the need to return equipment to the laboratory for calibration. This is particularly valuable for measurements in inaccessible or remote environments. A practical example is provided, showing how PQEDs and integrated photonic chips are used to ensure traceability in the calibration of detectors operating in the low-photon regime. This work reflects a broader development trend towards photonic integrated circuits for compact and scalable photonic measurement systems.

Author: HEITMANN SOLHEIM, Johanne (Justervesenet)

Co-authors: BARDALEN, Eivind (Universitetet i Sørøst- Norge); GRAN, Jarle (Justervesenet); SKAAR, Lars Kristian (Justervesenet); TRAN, Trinh (Justervesenet)

Presenter: HEITMANN SOLHEIM, Johanne (Justervesenet)

Session Classification: Parallell B2

Contribution ID: **126** Type: **Oral presentation**

The Role of Analytical Methods in Electrical Loss Calculations for High-Voltage Armored Three-Core Power Cables

Wednesday 18 June 2025 11:15 (15 minutes)

For large high-voltage power cables, such as the export cables connecting offshore windfarms to shore, a key design challenge is calculating the cable's current-carrying capacity: the maximum current it can carry without exceeding a specified temperature limit. For complex cable designs, such as three-core cables with metallic screens and steel-wire armor, commercial Finite Element Method (FEM) software has become a widely used tool for calculating electrical losses. While FEM through commercial software is powerful and general, it also comes with some drawbacks: it's time-consuming, expensive, and requires specialized user expertise. Is it possible that "old-school"analytical methods still have a role to play?

This presentation will cover the design and a typical use case of modern armored three-core power cables, the physical principles behind losses occurring in such cables, and briefly touch on a specific method for calculating armor losses.

Author: HOVDE, Martin (Nexans Norway AS)

Presenter: HOVDE, Martin (Nexans Norway AS)

Session Classification: Parallell B4

Contribution ID: **127** Type: **Oral presentation**

Why is energetic particle precipitation important for climate research and seasonal forecasting?

Monday 16 June 2025 16:00 (15 minutes)

Over the past decades, numerous observations and model studies have provided substantial evidence that energetic particle precipitation (EPP) affects the chemistry and dynamics of the stratosphere. Concurrently, the significance of stratospheric dynamics, particularly in winter short-range and seasonal forecasts, has been highlighted. However, there has been little effort to integrate the knowledge from these two research fields.
This review aims to bridge the gap between the Space Physics and Climate research communities. It will elucidate current knowledge on EPP and its impact on the chemistry and dynamics of the mesosphere and stratosphere, highlighting recent research. Additionally, it will present scientific findings demonstrating that EPP induced changes in the mesosphere and stratosphere can migrate downwards into the troposphere and reach the surface. Particularly during the eastward phase of the Quasi-Biennial Oscillation and/or close to a Sudden Stratospheric Warming (SSW), EPP can significantly impact stratospheric dynamics projected onto the North Atlantic Oscillation or Northern Annular Mode. The review highlights EPP as a potential moderator of SSWs in terms of their occurrence, timing, and strength, which are all crucial parameters for short-range and seasonal forecasts for the Northern Hemispheric winter. Moreover, it presents research demonstrating that the EPP chemical-dynamical coupling is becoming stronger in an atmosphere influenced by climate change. Bridging the gap between space physics and climate research is essential, as the natural variability of the atmosphere underpins the climate signal. Better prediction of SSWs and their effects on the northern winter weather is crucial in preparing for extreme weather events and supporting economic activities. This interdisciplinary approach can enhance our overall understanding of the Earth's atmosphere and its complex processes.

Author: NESSE, Hilde (University of Bergen, Norway)

Presenter: NESSE, Hilde (University of Bergen, Norway)

Session Classification: Parallell A1

Contribution ID: **128** Type: **Oral presentation**

The Mesospheric Magnetometry project: Remotely measuring the magnetic field with a laser.

Monday 16 June 2025 16:15 (15 minutes)

By means of laser optical pumping and Larmor-resonance detection, it is possible to use the naturally occurring sodium layer in the mesosphere to measure Earth's magnetic field magnitude at 90 km above ground. This is an altitude otherwise only accessible by rockets, which only will provide point measurements of very short time scales.

In December 2019, for the first time, we were able to remotely measure the magnetic field in the mesospheric sodium layer, in the auroral zone.
During the winter of 2019-2020 we applied a CW sum-frequency FASOR/laser for probing the sodium-atom Larmor resonance at the Artic Lidar Observatory for Mesospheric Research (ALOMAR) at Andøya in northern Norway in order to measure and monitor the magnetic field in situ in the high latitude mesosphere over longer time scales.

The technique, which has been proved earlier at mid-latitudes, has now been confirmed and applied to high latitudes in the auroral zone during disturbed auroral and geomagnetic conditions. The magnetic field in the auroral zone is close to vertical making our measurements a notable achievement since the beam is closer to parallel with the magnetic field, contrary to earlier measurements being closer to perpendicular as shown as best by theory.

Author: GULBRANDSEN, Njål (UiT - Norges Arktiske Universitet)

Co-authors: Dr DENMAN, Craig; Dr MATZKA, Jürgen (GFZ German Research Centre for Geosciences, Niemegk, Germany); JOHNSEN, Magnar (UiT - Norges Arktiske Universitet); Dr HILLMAN, Paul; Dr HOPPE, Ulf-Peter (FFI); Dr SCHULTZE, Volkmar (Leibniz Institute of Photonic Technology, Jena, Germany)

Presenter: GULBRANDSEN, Njål (UiT - Norges Arktiske Universitet)

Session Classification: Parallell A1

Contribution ID: **129** Type: **Poster presentation**

In Vitro Exploration of Proton-Based Therapies for the Treatment of Glioblastoma Multiforme

Glioblastoma multiforme (GBM) is an aggressive brain tumor with an average survival of 15 months due to tumor recurrence or invasion. It accounts for roughly 50% of primary brain tumors. The World Health Organization (WHO) classifies Glioblastoma as a tumor of the Central Nervous System (CNS) of grade 4, the most malignant in the classification scale.

Currently, the standard treatment for patients diagnosed with GBM is surgical removal of the tumor mass, followed by radio and chemotherapy. However, this standard of care is not able to cope with the insidious nature of this tumor.

In this context, this PhD project aims to explore and optimize advanced proton-based therapies that could improve patient outcomes. The study focuses on three main modalities: conventional proton therapy (PT), proton dynamic therapy (ProDT), and proton boron capture therapy (PBCT), with a comparison to photon dynamic therapy (PDT). These approaches leverage the physical advantages of protons for better tumor targeting and normal tissue sparing. In ProDT, protons activate photosensitizers to induce tumor cell death, while PBCT utilizes boron-containing compounds to trigger high-LET alpha particle emissions within tumors, enhancing biological effectiveness.

The project will initially involve in vitro experiments on GBM cell lines to identify optimal irradiation conditions and promising photosensitizers. A potential second phase may include in vivo validation, depending on preliminary results. Ultimately, this research aims to contribute to the development of more effective and less toxic GBM treatments, potentially improving survival rates and patient quality of life.

Author: CANONACO, Marianna (UiO)

Presenter: CANONACO, Marianna (UiO)

Contribution ID: **131** Type: **Oral presentation**

Geometrical and Topological Ideas in Condensed Matter Physics

Monday 16 June 2025 16:45 (15 minutes)

Topological ideas have come to the forefront of condensed matter physics in recent decades, since the discovery and subsequent explanation of the integer quantum Hall effect. Today, these ideas are showing up in various subfields, and play important roles in guiding future theoretical and experimental research.

A more recent direction in this field is to couple topological ideas with geometrical ideas, where the geometry of quantum states (distance in Hilbert space) is constrained by the underlying topological structure.

This talk aims at giving an introduction to both topological and geometrical ideas in free-fermion condensed matter systems, and subsequently show the interplay of geometry and topology, and how it can lead to new and interesting physical responses in real materials.

Author: LANGE, Gunnar Felix (University of Oslo)

Presenter: LANGE, Gunnar Felix (University of Oslo)

Session Classification: Parallell B1

Contribution ID: **132** Type: **Oral presentation**

Role of Thickness in Magnon Propagation Across Antiferromagnetic Insulators

Monday 16 June 2025 17:00 (15 minutes)

The diffusion of spin-waves or magnons in magnetic insulators is a promising candidate for sending signals in spintronic-based logical units that can outperform classical electronic current-based devices.
We present numerical simulations of magnon transport at finite temperature and its dependence on the material thickness in antiferromagnetic (AFM) insulators with material parameters from hematite. We consider magnon transport in both magnetic phases of hematite: i. easy-axis phase and ii. easy-plane phase.
Magnons are injected and detected electrically through the Spin Hall effect and the inverse Spin Hall effect, respectively.
We observe a distinct transition from effective 2D to 3D transport, occurring at a thickness comparable to the system's domain-wall length scale. The results indicate that ultrathin materials support better spin transport and thus could be the better candidate for implementation in spintronic devices.

Authors: Prof. QAIUMZADEH, Alireza (NTNU); MYHRE, Mathias (NTNU); Dr BREHM, Verena Johanna (NTNU)

Presenter: MYHRE, Mathias (NTNU)

Session Classification: Parallell B1

Contribution ID: **133** Type: **Oral presentation**

Extracting the nuclear level density and γ-ray strength function of ^{90}Zr

Tuesday 17 June 2025 11:30 (15 minutes)

The nuclear physics group at the University of Oslo (UiO) and the Oslo Cyclotron Laboratory (OCL) have developed a method, known as the Oslo method, to extract the nuclear level density(NLD) and Gamma-ray strength function (GSF). These quantities are important because they are inputs that are used in the Hauser-Fesbach statistical model calculations. These calculations are used to predict reaction cross-sections. The experimentally measured quantities can be used as inputs in codes, such as TALYS, to calculate/constrain the (n, γ) cross-sections.

An experiment was performed at the OCL using the CATCUS detector array and the $^{90}Zr(p, p'\gamma)^{90}Zr$ reaction was studied. In neighbouring zirconium isotopes ($^{91,92,94}Zr$) an M1 resonance was found at 9 MeV, and thus the aim of this experiment was to investigate whether this resonance is seen in ^{90}Zr. Therefore, using the Oslo method, the NLD and GSF for this reaction was extracted below the neutron separation energy.

The results from this analysis are presented here. As ^{90}Zr does not have any neutron resonance spacing data available, one can use systematics to estimate the neutron resonance spacing or use the shape method to obtain the slope of the GSF and thus the NLD when using the Oslo method. In this work, the systematics have been used for the normalization and are compared with the Shape method results. Furthermore, the NLD and GSF from this work have been used to calculate the $^{89}Zr(n, \gamma)^{90}Zr$ cross-section using TALYS.

Author: BELL, Lauren (University of Oslo)

Co-authors: LARSEN, Ann-Cecilie (University of Oslo (NO)); SIEM, Sunniva (University of Oslo)

Presenter: BELL, Lauren (University of Oslo)

Session Classification: Parallell A2

Contribution ID: **134** Type: **Oral presentation**

Extracting isomeric yield ratios in fission fragments

Tuesday 17 June 2025 11:45 (15 minutes)

In nuclear fission, a heavy nucleus typically divides into two fission fragments. The fragments are observed to have an angular momentum of 6-7 $\hbar$ on average, the mechanism behind this generation of angular momentum is still not fully understood. One approach to investigate the angular momentum of the fragments is to measure the isomeric yield ratio (IYR) i.e. the population fraction of an isomeric state. The IYR is known to be sensitive to the angular momentum distribution in the fragments. Consequently, measuring the IYR can provide insights into the initial state of the fission fragments.

This study employs a technique to access short-lived isomeric states for which the IYR have not been previously measured. Using this method, we have extracted the IYR of ^{94}Rb, ^{130}Sn, ^{135}Te and ^{137}Xe, from data taken in the ν-ball campaign at the ALTO facility at IJC Laboratory, Orsay. We use the nuclear decay code TALYS in combination with the fission code FREYA and GEF to calculate the primary angular momentum of the fragment derived from the measured IYR values. These results can be used to constrain the fission models.

Author: HAUG, Henrik

Co-authors: GJESTVANG, Dorthea (University of Oslo); SIEM, Sunniva (University of Oslo)

Presenter: HAUG, Henrik

Session Classification: Parallell A2

Contribution ID: **135** Type: **Oral presentation**

Script-based automatic Volumetric Modulated Arc-Therapy (VMAT) planning for Whole Brain RadioTherapy (WBRT) with and without hippocampal avoidance (HA)

Tuesday 17 June 2025 11:45 (15 minutes)

Since 2018, physicists at the radiotherapy department at St. Olavs Hospital, Trondheim, have developed Python scripts for automating VMAT treatment planning in RayStation for several tumor localizations [1,2]. VMAT delivers conform radiation doses to tumor volumes while sparing the nearby organs at risk (OARs). Automation reduces the time spent on planning while keeping, or improving, treatment quality.

WBRT is a palliative treatment for patients with multiple brain metastases, mainly aiming to reduce symptoms and extend the patient's lifespan [3]. Our script automatically produces WBRT plans with a homogeneous and conform dose to the target volume while minimizing the dose to the OARs. The script improves treatment consistency and is now in clinical use.

A major drawback of WBRT is the risk of cognitive decline [4]. Several studies indicate that a reduced hippocampal dose may lower the risk of cognitive decline and thus increase the quality of life of the patients [5]. Nevertheless, WBRT with hippocampal avoidance (HA-WBRT) is not routinely used in Scandinavia and remains debated internationally. A key challenge of HA-WBRT is its resource-intensive planning and delivery process. We developed our WBRT script into a HA-WBRT script using a modified version of Yuen's field set-up [6]. Compared to WBRT, the automatic HA-WBRT script reduces the dose to the hippocampi by more than 50% at the expence of a slightly less homogenous dose to the target volume. The basics of script-based planning can be used for other tumor locations in order to reduce time and effort spent by the treatment planner and increase overall plan quality and consistency.

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Author: GJØSTEEN FLATMARK, Kari Margrethe (Department of physics, NTNU, Trondheim)

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SOLHEIM, Tora (Department of Radiotherapy, St. Olavs Hospital, Trondheim); LARSEN LIE, Jacob (Department of Radiotherapy, St. Olavs Hospital, Trondheim); LANGELAND MARTHINSEN, Anne Beate (Department of Radiotherapy, St. Olavs Hospital, Trondheim)

Presenter: GJØSTEEN FLATMARK, Kari Margrethe (Department of physics, NTNU, Trondheim)

Session Classification: Parallell B2

Contribution ID: **136** Type: **Oral presentation**

Extraction of level density and gamma-ray strength function of 28Si using the Oslo method

Tuesday 17 June 2025 12:00 (15 minutes)

The Oslo Cyclotron Laboratory (OCL) have developed a method, known as the Oslo method, to extract the nuclear level density (NLD) and γ-ray strength function (GSF) simultaneously from particle-γ coincidence measurements. So far, the method has been tested and found successful for (more exotic) deformed rare-earth nuclei and for weakly deformed 148,149Sm nuclei. For lighter nuclei, where the statistical properties are less favorable, the foundation of the method is more uncertain. An attempt was made in 2003 to use the Oslo method to extract the NLD and GSF of 27,28Si. However, due to the limited technology and detection methods at the time, the efficiency and the resolution was too poor. Hence, in order to fully assess the Oslo method's applicability to lighter nuclei, further testing is necessary. As part of my thesis the Oslo method has been applied to 28Si, using the (p,p'γ) inelastic scattering reaction. I successfully extracted the NLD up to 11 MeV for both NaI(Tl) and LaBr3(Ce) detectors, though some differences were observed. For instance, a 4.6 MeV peak with 4+ spin is clearly visible in the LaBr3(Ce) data, but absent in the NaI(Tl) data. The GSF proved to be challenging, due to the statistical limitations of the dataset. However, by employing an alternative approach, the GSF was successfully extracted. The significance of these findings lies not only in demonstrating that the NLD of lighter nuclei can be reliably extracted using this method, but also in providing direct evidence of the important role that energy resolution plays in nuclear structure research.

Author: GRANHEIM, Lise Anette (University of Oslo)

Presenter: GRANHEIM, Lise Anette (University of Oslo)

Session Classification: Parallell A2

Contribution ID: **138** Type: **Oral presentation**

Engaging physics students in society through a Bildung-oriented physics education

Tuesday 17 June 2025 14:00 (15 minutes)

Based on the combined results of five different papers examining the relationship between physics education and Bildung, i.e. how we create physics students that engage themselves in society, this presentation presents several datasets from physics students. The presentation will also make suggestions on how we can build this engagement.

Physics students show a strong commitment to the epistemic values of science, and are open to using these also in other areas than physics. They have a strong motivation based on intrinsic interest in the subject they study, and to understand how the world works. In this they differ from e.g. engineering students who to comparison have a strong motivation toward their future profession. The distinct differences between student groups within STEM (science, technology, engineering, mathemathics), creates an argument for tailoring the teaching of Bildung-oriented or STS (science, technologi, society) aspects of the education, to the individual student groups, rather than lumping these topics together in large general courses.

This presentation will discuss how this can be done for physics students.

Author: Mr KJELSBERG, Ronny (Institutt for Fysikk, NTNU)

Session Classification: Parallell B3

Contribution ID: **139** Type: **Oral presentation**

Large tunable thermoelectric effects in superconducting spin valves

Monday 16 June 2025 15:45 (15 minutes)

A tunable cryogenic thermoelectric generator needs a high conversion factor between electricity and heat and a large change in the thermoelectric output when switching the magnetic state of the device. Recent studies have revealed magnetically controllable thermoelectric effects in superconductor/ferromagnet (S/F) structures. However, the reported modifications in thermoelectric power are either minimal, involve superconductors with relatively low critical temperatures (below 1K), or do not utilize commercially available spintronic materials.

Here, I will present a joint theoretical and experimental work, where I have done the theoretical calculations and our collaborators have performed the experiment. We demonstrate large tunable thermoelectric effects in superconducting spin valves with commercially available materials. These findings pave the way for the development of efficient and versatile cryogenic thermoelectric heat engines.

Authors: SANCHEZ, Carlos; GONZALEZ-RUANO, César; G. ALIEV, Farkhad; LINDER, Jacob; BRATLAND TJERNSHAUGEN, Johanne (NTNU); TUERO, Pablo; LU, Yuan

Session Classification: Parallell B1

Contribution ID: **140** Type: **Oral presentation**

Databases of statistical nuclear properties

Tuesday 17 June 2025 10:45 (15 minutes)

Nuclear data is the foundation for all applications involving nuclei. This includes everything from applied fields such as reactor simulations, weapons development, radiation safety, nuclear medicine to more fundamental applications such as cosmic-ray physics, nuclear astrophysics and nucleosynthesis.

To address the nuclear data needs a number of evaluated or compiled data libraries has been created, such as ENDF, JEFF, JENDL, TENDL, and many more. These libraries will typically follow experimental data when available and rely on theoretical predictions otherwise. Theoretical reaction cross sections relies on nuclear structure data such as the nuclear level density (NLD) and γ-ray strength function (γSF). These properties have been a core research theme for the nuclear physics group at the University of Oslo. This has lead to the development of the Oslo method of measuring NLD and γSFs. This technique is unique in that it is the only method that allows for simultaneous measurements of these properties. Over the last ~ 25 years the nuclear physics group have accumulated an impressive library of NLDs and γSFs, with more than 100 different nuclei being measured.

In response to the new wealth of experimental data on both NLDs and γSFs, the Nuclear Data Section at IAEA initiated a Coordinated Research Project (CRP) to create a γSF database, and more recently a CRP to update NLD databases to include Oslo-method data. The Norwegian Nuclear Research Centre (NNRC) are involved in both project, providing the entire library of experimentally measured NLDs and γSFs with the Oslo method.

Author: INGEBERG, Vetle Wegner (University of Oslo (NO))

Session Classification: Parallell A2

Contribution ID: **141** Type: **Oral presentation**

Quantum criticality of altermagnetism

Wednesday 18 June 2025 11:00 (15 minutes)

The term *altermagnetism* has recently been introduced to describe the Néel order of a class of materials whose magnetic sublattices are neither related by translation nor inversion. These materials have so far mostly been studied using non-interacting electron models. While technically appealing, this approach fails to capture the inherently correlated nature of the magnetic order as well as its relation to proximate phases in the phase diagram. Employing a recently proposed minimal microscopic model for altermagnetism, we explicitly derive a nonlinear sigma model describing the long-wavelength fluctuations of the staggered magnetization. Including fermionic excitations, we expose a tractable interacting low-energy theory of a metallic altermagnet. In this talk, I will explain the rationale for this theory and argue how the altermagnetic symmetries modify the quantum critical scaling of antiferromagnets.

Author: LUNDEMO, Sondre Duna (Norwegian University of Science and Technology)

Co-authors: Prof. SUDBØ, Asle (Norwegian University of Science and Technology); Dr NOGUEIRA, Flavio (Institute for Theoretical Solid State Physics, IFW Dresden)

Session Classification: Parallell A4

Contribution ID: **142** Type: **Oral presentation**

Investigating the physical properties of tidal disruption events

Tuesday 17 June 2025 14:00 (15 minutes)

Tidal disruption events are extremely energetic astrophysical transients. They emit radiation in a multitude of wavelength ranges except gamma-rays. The tidal disruption event AT2019azh is a very interesting one as it is one of the closest ones we have observed, and it is also one of the brightest ones. In this talk, I will present what we can learn about the physical properties of AT2019azh from upper limits from Fermi-LAT and numerical simulations.

Authors: Prof. OIKONOMOU, Foteini (NTNU); SANNÆS, Ingrid Helgeland

Presenter: SANNÆS, Ingrid Helgeland

Session Classification: Parallell A3

Contribution ID: **143** Type: **Oral presentation**

Confined colloidal droplets dry to form circular mazes

Monday 16 June 2025 16:00 (15 minutes)

Pattern recognition is fundamental to human nature that has allowed humanity to evolve and thrive. As a result, we have a natural affinity for patterns that exist all around us in the natural world, from honeycomb to constellations. Here, we present the pattern formation of colloidal droplets allowed to dry slowly in a vertical confinement. The pattern left behind is a unique labyrinth of colloidal fingers, showing multiple length scales. While some similar patterns have been observed before, the driving forces behind this process are distinctly different to, for example, frictional finger formation observed in granular systems.

Author: BEECHEY-NEWMAN, Ilaria (Norwegian University of Science and Technology)

Co-authors: Mr HENNIG, Andreas Andersen (Norwegian University of Science and Technology); Mr FLEKKØY, Eirik Grude (University of Oslo); Ms EISER, Erika (Norwegian University of Science and Technology); Ms KIZILOVA, Natalya (Warsaw University of Technology)

Session Classification: Parallell B1

Contribution ID: **144** Type: **Oral presentation**

Phonon-mediated spin-polarized superconductivity in altermagnets

Wednesday 18 June 2025 11:15 (15 minutes)

We have considered the possibility of phonon-mediated unconventional superconductivity in a recently discovered new class of antiferromagnets, dubbed altermagnets. Within a weak-coupling approach, and using a minimal band model for altermagnets [1], we have found a dominant superconducting instability odd in momentum and even in spin with fully spin-polarized Cooper pair [2]. We discuss the origin of this unusual result in terms of the spin-structure of the altermagnetic Fermi surface, in combination with the momentum-space structure of the effective phonon-mediated electron-electron interactions on the Fermi surface. [1] B. Brekke, A. Brataas, and A. Sudbø, PRB 108, 224421 (2023). [2] K. Leraand, K. Mæland, and A. Sudbø. Work supported by Norwegian Research Council, through Grant No. 262633, "Center of Excellence on Quantum Spintronics", as well as Grant No. 323766.

Author: LERAAND, Kristoffer (NTNU)

Co-authors: Prof. SUDBØ, Asle (Norwegian University of Science and Technology); Dr MÆLAND, Kristian (University of Wurzburg)

Session Classification: Parallell A4

Contribution ID: **145** Type: **Oral presentation**

A saga on the γ-decay branching ratio of the Hoyle State

Monday 16 June 2025 16:30 (15 minutes)

The triple-alpha process is one of the most fundamental processes in stellar nucleosynthesis, particularly the production of ^{12}C. This process entails the fusion of three helium nuclei to form an intermediate state in ^{12}C. This intermediate state can decay back into its three constituent alpha particles or radiatively decay to form stable ^{12}C. At temperatures between 0.1 - 2 GK, the triple-alpha reaction is almost exclusively mediated by the Hoyle state in ^{12}C. Understanding the properties of the Hoyle state is therefore important for the modeling of the subsequent stellar evolution.

The creation of stable carbon through this process happens mainly through two available decay branches, leaving the ^{12}C in its ground state. The radiative decay of the Hoyle state to form stable ^{12}C proceeds mainly through gamma decay and pair production. The radiative width of the gamma-branch has been measured several times between the period 1961 to 1976 [1-7]. Most of the measurements performed up until 1976 have yielded results which are in agreement with one another. However, a recent measurement published in 2020 by Kibédi *et al.* [8] resulted in a significantly larger radiative branching ratio (Γ_{rad}/Γ) compared to all previous measurements. Recently several measurements have been published as a direct result of this discrepancy [9-12].

Given the astrophysical significance of the Hoyle state, resolving this conflict is crucial. Therefore, new measurements have been performed to reinvestigate the gamma-decay branching ratio of the Hoyle state, with a complete reanalysis of the data published by Kibédi *et al.* [8]. The experiments have been performed at the Oslo Cyclotron Laboratory through the ^{12}C(p, p'$\gamma\gamma$)-reaction. In these experiments, the SiRi particle telescope [13] was employed to detect proton ejectiles and the OSCAR [14] LaBr3 array was used to detect the coincident gamma-ray decays. Results from the new measurement and the reanalysis of the data published by Kibédi *et al.* [8] will be presented.

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Session Classification: Parallell A1

Contribution ID: **146** Type: **Oral presentation**

Antiferromagnetic thin films grown via MBE

Wednesday 18 June 2025 11:30 (15 minutes)

I will present our recent results on the growth of the Kagome metals Mn_3Sn and FeSn. We have successfully developed the thin film growth via molecular beam epitaxy for both materials.
Both FeSn and Mn_3Sn are antiferromagnets with a non-collinear spin structure arranging in the Kagome lattice. Kagome materials are of particular interest due to their frustrated spin texture and unconventional topological band structures. They are therefore candidate materials for Weyl nodes and host Dirac states. While the magnetic properties support skyrmions up to elevated temperatures.
I will present our film growth and show that we have achieved single crystalline layers of both materials.
In addition to the Kagome materials we have also recently successfully synthesized single crystalline layers of the antiferromagnetic semiconductor $CuFeS_2$.From theoretical calculations it has been shown, that $CuFeS_2$ should support altermagnetism. I will show our current status for the the molecular beam epitaxy growth of this material.

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Session Classification: Parallell A4

Contribution ID: **147** Type: **Oral presentation**

Assessment of B_0 shimming routines for cervical spinal cord MRI at 7 Tesla

Tuesday 17 June 2025 11:30 (15 minutes)

7T MRI shows great potential for precise imaging of the spinal cord, offering higher resolution and signal-to-noise ratio compared to conventional clinical MR systems. However, increased field strength amplifies field inhomogeneities from magnetic susceptibility differences, potentially degrading diagnostic quality of the images. Shimming is a method to homogenize the magnetic field by sending variable currents through integrated shim coils. Different methods exist to calculate these currents, influenced by parameters such as volume of interest (shim volume). The optimal shimming routine for 7T MRI of the cervical spinal cord is however unclear.

Imaging of the cervical spinal cord was performed on five healthy volunteers on a 7T Terra System (Siemens Healthineers), with a 1Tx, 24Rx cervical coil. Shimming was performed with vendor-provided algorithms. The effect of shim volume, method of shimming, and number of shim iterations was quantitatively assessed on sagittal B0 field maps covering the full cervical spine, alongside axial multi-echo gradient echo and echo-planar imaging acquisitions centered on C3 and C6.

The vendor-provided Siemens Brain with shim volume enclosing the cervical spinal cord was used as a reference routine for comparison. This narrow shim volume yielded better shim quality than a shim volume covering the entire neck. A reduced shim volume targeting regions around C3/C6 yielded minimal improvements within the volume, while exacerbating field distortion outside. One shim iteration yielded equally good shim quality as three iterations. More advanced shimming methods yielded no further improvement. In conclusion, one iteration of the reference routine provided the most optimal shim.

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Session Classification: Parallell B2

Contribution ID: **148** Type: **Oral presentation**

Charmonium production in heavy-ion collisions with ALICE

Monday 16 June 2025 17:00 (15 minutes)

Charmonium production has long been recognized as a key probe for studying the properties of the quark–gluon plasma (QGP). The early formation of heavy-quark pairs, such as $c\bar{c}$ and $b\bar{b}$, makes charmonia ideal tools for investigating the evolution of the hot and dense medium created in ultra-relativistic heavy-ion collisions. At LHC energies, the recombination of uncorrelated charm-quark pairs, referred to as (re)generation, has been shown to significantly affect charmonium yields, counterbalancing the suppression effects traditionally associated with QGP formation. As a result, measurements of J/ψ production in both pp and Pb–Pb collisions are essential to distinguish between different theoretical models. Furthermore, the separation of non-prompt charmonia, originating from beauty hadron decays, provides valuable insight into the energy loss mechanisms experienced by beauty quarks as they traverse the QGP. An additional area of growing interest is the study of J/ψ production within jets, which offers a novel perspective on the hadronization dynamics of the $c\bar{c}$ pair into a bound charmonium state. In this contribution, we therefore also present measurements of the prompt and non-prompt J/ψ fragmentation functions in charged jets at midrapidity, along with comparisons to theoretical predictions.

Author: MIKALSEN, Andreas Ulveseth (University of Bergen (NO))

Session Classification: Parallell A1

Contribution ID: **149** Type: **Oral presentation**

Magnon and photon blockade magnetic cavities

Wednesday 18 June 2025 11:45 (15 minutes)

Insulating magnets hold great promise for quantum technology due to the long lifetime of magnetic excitations and easy interoperability with other systems. Due to the large number of spins in a magnet, they couple strongly to photons confined in a cavity, making magnetic cavities a useful tool to study the quantum behavior of magnets. Among these is the generation of single magnons or photons, offering control at the single quantum level of principal importance for quantum information technology. High-quality single photons from other sources have already been used as a platform for quantum computation.
In this talk I will present our recent theoretical works on magnon and photon blockades in magnetic cavities, including both ferromagnets and antiferromagnets. In the first work [1] we consider photon blockade in cavities with ultra-strong magnon-photon coupling, which we connect to photon quadrature squeezing that reduce the uncertainty when pumping along specific directions. In the second work [2] we instead consider a nanosized antiferromagnet supporting degenerate magnon-modes. The antiferromagnetic ground-state is known to exhibit strong two-mode squeezing, an attractive quality for quantum information technology. The squeezing also causes a highly non-uniform level spacing that can suppress the excitation of multiple bosons leading to both magnon and photon blockade.
[1] V. Falch, A. Brataas, A. Qaiumzadeh, Phys. Rev. B 111, 104425 (2025)
[2] V. Falch, A. Brataas, A. Qaiumzadeh, arXiv:2504.08562

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Session Classification: Parallell A4

Contribution ID: **150** Type: **Oral presentation**

Reducing the lateral dose penumbra of therapeutic proton beams using magnetic fields

Tuesday 17 June 2025 12:00 (15 minutes)

Background: Proton beam therapy is a treatment used against cancer. Compared to conventional photon beam treatment it has a superior dose distribution, resulting in the potential to reduce the damage to surrounding healthy tissue while achieving tumor control. While proton beams have steep distal dose falloffs, the lateral dose fall-off broadens at the end of the proton range, due to multiple Coulomb scattering (MCS). Moreover, protons have a higher biological effectiveness on tissue compared to photons. A constant relative biological effectiveness (RBE) factor of 1.1 is commonly assumed for clinical use, despite it being known that the RBE varies throughout the track of the proton beam.

Methods: In the first part, Monte Carlo simulations of proton beams were performed on a virtual water phantom with the FLUKA simulation package. We investigated the effects on the proton dose distribution when applying magnetic fields to reduce the diverging effect of MCS. The conventional pencil beam scanning technique that is clinically used was implemented as a reference. Different conditions in the water phantom were perturbed to also allow evaluation of potential effects on the RBE-weighted dose when the beam is modified by magnetic fields. The last part of the project will evaluate both beam delivery techniques on clinical cases of head and neck cancer patiens.

Results: The FLUKA setups for both the pencil beam scanning technique and the modified approach with magnetic fields have been successfully implemented, allowing investigations in the virtual water phantom. Preliminary results from the water phantom show that the proton beams in the magnetic fields have steeper lateral dose falloffs, and a higher peak dose delivered at the center of the longitudinal beam axis. This indicates that the modified approach with magnetic fields can reduce the diverging effect of MCS and further optimize the proton dose distribution as intended. This is an ongoing master project, where more results will be generated during the spring and presented at the meeting.

Conclusions: Although proton beam therapy is a very promising high-precision treatment modality of cancer patients, more detailed knowledge of the physical properties of proton delivery, may lead to further optimization of the treatment in the future. We demonstrate a new method of shaping the beam with magnetic fields to achieve steeper lateral dose penumbra resulting in more precise delivery of the proton dose. The initial results in this project are interesting and has generated ideas for further investigations.

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Session Classification: Parallell B2

Contribution ID: **151** Type: **Poster presentation**

Investigating the Connection Between Surface Topography, Cell Membrane and Nucleus Deformation and its Impact on Chromatin Organization and Gene Expression

The field of mechanobiology explores how physical forces and mechanical properties of cells and tissues impact cell development and cell differentiation in health and disease. Physical forces acting on the cell can lead to perturbation of the cell membrane, causing remodeling of the cytoskeleton which can result in reorganization of the nuclear morphology. This is often associated with chromatin reorganization and changes in gene expression. Unraveling the mechanism of mechanical signaling is challenging because it is difficult to study in a controlled manner. Nanofabrication methods enable the generation of precisely engineered surfaces. When combined with advanced microscopy techniques, they can facilitate controlled and systematic studies of the relationships between mechanical forces, nuclear deformation, and chromatin organization. To achieve this we fabricate nanopillar arrays on glass cover slips using electron beam lithography. Through our design we can test three variations of the same parameter within a single experiment, alongside a flat control region for comparison. By seeding cells onto the substrate and allowing them to adhere, we can observe how their interaction with the nanopillars alters nuclear morphology and chromatin organization through advanced microscopy techniques. We will assess the changes in nuclear morphology and look at changes in HP1-α aggregates in the nucleus, which are proteins that are involved in compaction of the chromatin. For future work we aim to include alternative fabrication techniques, which may enable fabrication of more complex surface topography.

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Contribution ID: **152** Type: **Oral presentation**

Coherent X-ray Diffraction Imaging to Investigate morphology of Calcium Carbonate Microparticles

Tuesday 17 June 2025 10:45 (15 minutes)

Coherent X-ray diffraction imaging (CXDI) is a phase retrieval technique that reconstructs a real-space image from the corresponding Fraunhofer (far-field) diffraction patterns that must be over-sampled in the reciprocal space. The measured diffraction patterns of an object are directly related to the Fourier transform of the electron density of the sample. CXDI is a lensless imaging technique that retrieves the sample's structural information using the observed Fourier space amplitude and iteratively recovered phase. The phase recovery algorithm alternates a guess of the phase between real and Fourier spaces using known constraints –positivity of the electron density and a support constraint that defines the region within which the electron density is non-zero. The method, therefore, requires the particles to be isolated and have a size that falls within the size of the beam to ensure the oversampling condition is met. CXDI requires advanced coherent X-ray sources like synchrotrons combined with state-of-the-art detectors and iterative phase retrieval algorithms.

As part of our ongoing research on understanding nucleation and growth, we utilised CXDI to investigate the morphological development of calcium carbonate ($CaCO_3$), an important constituent in shells and other exoskeletal structures. We can control the developing morphology of $CaCO_3$ through additives, concentrations, and the confinement of precursors.

In this presentation, we will present an in-depth review of the CXDI methodology and demonstrate its use within the study of the 3D internal and external morphologies of a range of $CaCO_3$ particles with voxel sizes as high as 11 nm.

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Session Classification: Parallell B2

Contribution ID: **153** Type: **Oral presentation**

Micro:bit og programmering til datainnsamling i fysikkundervisning

Tuesday 17 June 2025 13:30 (15 minutes)

Da programmering ble innført som del av diverse skolefag i 2020 var det med et utrykt ønske om at programmering skulle brukes til å jobbe med videre forståelse av faget og fungere som et verktøy i undervisningen. Dette går bra i mange settinger, men på lavere trinn i naturfag blir programmering ofte bare brukt i teknologiprosjekt. Det er ofte også eksterne aktører som kommer inn med programmeringsundervisning, så det blir ikke en integrert del av faget. Dette har også til dels preget lærerutdanningene. Ved lærerutdanninga på NTNU har vi prøvd å komme opp med undervisningsopplegg som integrerer programmering og fag. Vi har hatt hovedfokus på datainnhenting og bruk av sensorer, og har bruker micro:bit for de fleste skoler i Norge har tilgang til den.

I dette foredraget vil jeg kort presentere noen funn om hva som skal til for at lærerstudenter tar med seg programmering ut i skolen, og så vise fram hvordan vi bruker micro:bit i fysikkdelen av naturfagsundervisningen for grunnskolelærerstudenter. En micro:bit har flere interne sensorer, og da de fleste skolene i Norge har tilgang på den krever det ikke investeringer i utstyr. Av interne sensorer har vi hovedsaklig målt temperatur og magnetfelt, men også programmert micro:biten så den kan brukes i fallforsøk. Vi har også jobbet med å utvikle egne sensorer. Dette arbeidet har vært gjort sammen med Nils Kristian Rossing fra skolelaboratoriet på NTNU, og vi har nå en programmerbar kraftmåler som fungerer som en ekstern sensor for micro:bit.

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Session Classification: Parallell B3

Contribution ID: **154** Type: **Oral presentation**

The effect of ultrasound irradiation in nanoparticle diffusion in hydrogels

Tuesday 17 June 2025 11:15 (15 minutes)

A major challenge in cancer chemotherapy is the targeted delivery of drugs to tumor cells. Enhanced delivery to tumor tissue can be achieved by loading drugs into nanoparticles (NPs), leveraging the enhanced permeability and retention effect, which promotes NP extravasation into the tumor. However, NPs often accumulate near blood vessels instead of spreading throughout the tissue due to diffusion limitations imposed by the extracellular matrix. Focused ultrasound, especially in combination with microbubbles, has been shown to improve drug and NP delivery to tumors [1]. Despite promising clinical results, molecular-level insights into how ultrasound affects NP transport through the extracellular matrix remain limited.
Recent in-vitro experiments tracking NP transport in agarose hydrogels showed that ultrasound irradiation moderately increases the diffusion coefficient of the NPs [2]. To bridge these experimental observations with molecular mechanisms, we designed a coarse-grained model of NP diffusing in an agarose hydrogel, mimicking the in-vitro setup. The model incorporates excluded volume, NP-hydrogel attractive interactions and an effective US-like oscillatory external force, simulating the hindered diffusion of NPs through the hydrogel. Using this model, we investigate under which conditions US can lead to an enhancement of the NP transport through the hydrogel, thereby explaining the macroscopic experimental measurements.
[1] Snipstad, S. et al. Adv. Drug Deliv. Rev. (2021), 177, 113846.
[2] Ma, D. et al. JASA (2018), 144(6), 3496-3502.

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Presenter: BLANCO, Pablo M. (Norwegian University of Science and Technology)

Session Classification: Parallell B2

Contribution ID: **155** Type: **Oral presentation**

Clustering in nuclei and its effects on the stellar nucleosynthesis

Wednesday 18 June 2025 11:30 (15 minutes)

Clustering in nuclei is an emergent phenomenon, whereby nuclei tend to aggregate (or cluster) into various components. In light nuclei, this phenomenon is postulated to manifest notable properties such as dilute density structures and even Bose Einstein condensates. Cluster states can also have significant effects on scattering cross sections, particularly at low energies. Modelling clustering is therefore not only a pivotal test of ab initio theoretical models, but also crucial for accurate reaction rates for stellar nucleosynthesis. This talk presents some notable examples of clustering in nuclear astrophysics that are being tackled at UiO.

Author: LI, Kevin Ching Wei (University of Oslo)

Session Classification: Parallell B4

Contribution ID: **156** Type: **Oral presentation**

Physics on Children's Terms - A Tool for Playful and Inclusive Exploration in Early Childhood Education

Tuesday 17 June 2025 13:15 (15 minutes)

Despite growing international recognition of the value of introducing physics-related phenomena in early childhood education (ECE) to support children's curiosity and long-term learning (Worth, 2010; Bucher & Hernández, 2016; Karplus, 1964), the presence of physics in Norwegian kindergartens remains fragmented. The national framework (Rammeplanen, Norwegian Ministry of Education and Research, 2017) references physics concepts under both Number, space and shape and Nature, environment and technology, but without a clear thematic structure. As a result, the implementation of physics-related content is largely dependent on individual teacher competence and interest.

This study presents the development and pilot testing of a set of reflection cards designed for use in Early Childhood Teacher Education (ECTE) and kindergarten practice. Each card addresses a specific physics topic and suggests hands-on, child-centered activities using simple materials. The cards aim to support the planning and facilitation of physics exploration in an inclusive and accessible way.

The material was tested by a group of ECTE students and six kindergarten teachers who will begin using it from August. The study outlines the development process and analyses feedback gathered through written and oral responses. A thematic analysis (Braun & Clarke, 2006) was used to identify key patterns in how the cards were perceived and what pedagogical needs they may address. A follow-up study based on observations of the cards in use is planned.

Author: GRANONE, Francesca (University of Stavanger)

Session Classification: Parallell B3

Contribution ID: **157** Type: **Oral presentation**

Studying the astrophysically crucial 12C(α, γ)16O reaction at high temperatures

Wednesday 18 June 2025 11:45 (15 minutes)

One of the major processes in stars is helium burning, which consists of two main parts that produce $^{12}\mathrm{C}$ and $^{16}\mathrm{O}$. Helium burning is the primary source of $^{12}\mathrm{C}$ and $^{16}\mathrm{O}$, the two most abundant elements after hydrogen and helium. The second part of helium burning is the process of an α particle being captured by a $^{12}\mathrm{C}$ nucleus ($^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$), which produces $^{16}\mathrm{O}$ in an excited state. The excited $^{16}\mathrm{O}$ can then γ decay to the stable ground state of $^{16}\mathrm{O}$. As $^{12}\mathrm{C}$ and $^{16}\mathrm{O}$ also take part in other processes in stars, the total amount of both elements, and the ratio between them, are important factors in how a star evolves. Thus the $^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$ reaction is important in understanding stellar evolution. A new state of the art experiment of the $^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$ reaction will be performed at iThemba LABS. A beam of α particles will be used on a stationary enriched $^{12}\mathrm{C}$ target. The resulting γ rays will be measured using 12 large volume $\mathrm{LaBr_3}$ detectors. The reaction will be measured at α energies of 4-9 MeV. Additionally a pulse shape discrimination (PSD) algorithm will be developed at the Oslo Cyclotron Laboratory. The PSD will mitigate the neutron background resulting from the $^{13}\mathrm{C}(\alpha,n)^{16}\mathrm{O}$ reaction on the $^{13}\mathrm{C}$ contaminant in the target. The data will then be analyzed using the R-matrix code AZURE2 to extrapolate the reaction cross section down to the experimentally inaccessible stellar energy region.

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Presenter: THINGHOLM, Jeppe (University of Oslo)

Session Classification: Parallell B4

Contribution ID: **158** Type: **Oral presentation**

Mestring, verdier og kostnader: Profiler av fysikkstudenter ved skandinaviske universiteter

Tuesday 17 June 2025 13:45 (15 minutes)

Fysikkstudier forbindes med høy vanskelighetsgrad og stor arbeidsmengde, og tiltrekker seg ambisiøse studenter med sterk interesse for faget. Faget anses også som maskulint og har lav kvinneandel blant søkere og studenter. I dette bidraget presenterer vi resultater fra en spørreundersøkelse (N=428) i Norge, Sverige og Danmark som nyanserer dette bildet. Vi undersøker studentenes opplevelse av å studere fysikk gjennom mestringsforventning, verdier de tillegger å studere fysikk og kostnader de forbinder med det. Gjennom klyngeanalyse av det kvantitative materialet finner vi tre grupperinger av fysikkstudenter som vi har kalt «de selvsikre studentene», «de motløse studentene» og «de verdidrevne studentene». Disse grupperingene gjenfinner vi ved ulike universiteter i Skandinaviske land, og begge kjønn er representert i alle gruppene, selv om profilene i noen grad er kjønnet. De motløse og de verdidrevne utgjør en majoritet av fysikkstudentene, og disse viser lav tro på egen mestring og høy relativ kostnad ved å studere fysikk. Vi konkluderer derfor med at institusjonene må gjøre tiltak i undervisning og studiemiljø for å ivareta ulike studentgrupper, og generelt støtte opp om studentenes tro på at de vil klare studiene tross kostnadene. Hva slags tiltak dette kan være presenteres som spørsmål til diskusjon.

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Session Classification: Parallell B3

Contribution ID: **159** Type: **Oral presentation**

Quantum Science: From Fascinating Natural Phenomenon to Tomorrow's Technology

Presenter: VIEFERS, Susanne (UiO)

Session Classification: Plenary talk

Contribution ID: **160** Type: **Oral presentation**

Quantum technology and WACQT

Presenter: KOCKUM, Anton Frisk (Chalmers University of Technology)

Session Classification: Plenary talk