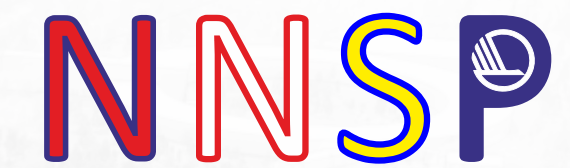
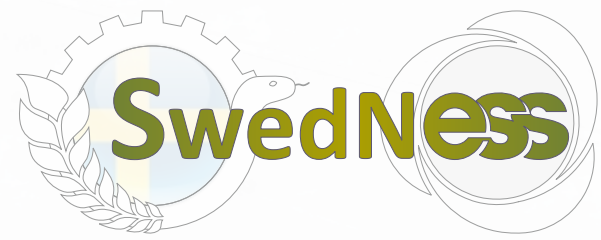


Welcome to the NNSP/SwedNess Intro Course in Neutron Scattering



Welcome to the NNSP/SwedNess Intro Course in Neutron Scattering





Welcome to the NNSP/SwedNess Intro Course in Neutron Scattering



- Neutron scattering is an optimal and very versatile technique to study materials, devices and objects.
- Neutrons are unique in several aspects and are able to directly probe some things other techniques can not.
- Neutron scattering techniques cover a very broad scientific scope.

Why Give this Course?

- Neutron scattering is a optimal and very versatile technique to study materials, devices and objects.
- Neutrons are unique in several aspects and are able to directly probe some things other techniques can not.
- Neutron scattering techniques cover a very broad scientific scope.



1.843 billion €uro

0.7 billion €uro



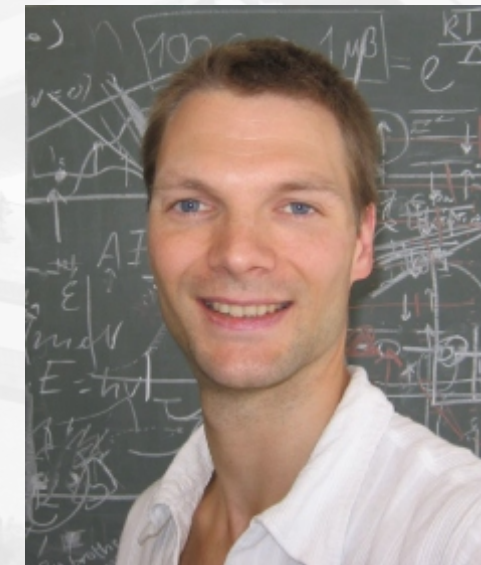
Time / Date	7:00 – 8:30	Lecture Session I 8:30 – 10:00	Exercise Session I 10:30 – 12:00	12:30 – 14:00	Lecture Session II 14:00 – 15:30	Exercise Session II 16:00 – 17:30	17:30 – 19:00	19:00 – ...	
2 Sep	ARRIVAL DAY 1							Free Time	Dinner *
3 Sep	Breakfast	Mathematical Foundation 1 Kim Lefmann,	Mathematical Foundation 2 Kim Lefmann,	Lunch	Mathematical Foundation 3 Kim Lefmann,	Mathematical Foundation 4 Kim Lefmann,	Free Time	Dinner *	
4 Sep	Breakfast	Mathematical Foundation 5 Kim Lefmann,	Mathematical Foundation 6 Kim Lefmann,	Lunch	Solid State Physics Foundation Kim Lefmann,	Magnetism Foundation Kim Lefmann,	WELCOME RECEPTION		
ARRIVAL DAY 2									
5 Sep	Breakfast	Welcome to the School <ul style="list-style-type: none"> Practicals, Examination Process How to write a proposal (45 min) Safety at large-scale facilities Kim Lefmann, University of Copenhagen Martin Månsson, KTH	L0: Overview of the course <ul style="list-style-type: none"> The Neutron/scattering experiment Production / "Filters / Detection Elastic/Inelastic Brief overview of the techniques Martin Månsson, KTH	Lunch	L1.1: Intro <ul style="list-style-type: none"> Basic interaction mechanism (+x-rays) Scattering from 1 & 2 nuclei Coherent / Incoherent / Absorption Kim Lefmann, University of Copenhagen	L1.2: Intro <ul style="list-style-type: none"> Scattering from 1 & 2 Nuclei Coherent / Incoherent Kim Lefmann, University of Copenhagen	Free Time	Dinner *	
6 Sep	Breakfast	L2: Neutron Sources & Instrumentation <ul style="list-style-type: none"> Sources Moderators Monochromators / choppers Collimation / Filters / Guides Detection Kim Lefmann, University of Copenhagen	Ex. 1 <ul style="list-style-type: none"> Wiki problem: Pinhole collimation Quiz: Neutron detection Quiz: Test your knowledge of neutron sources and instrumentation (e-learning)	Lunch	L3: Neutron Interaction with Matter <ul style="list-style-type: none"> Cross Section, Isotope Sensitivity Elastic / Inelastic X-rays/electrons Multiple Scattering Kim Lefmann, University of Copenhagen	Ex. 2 <ul style="list-style-type: none"> Quiz: The neutron cross section Wiki problem: Selection of materials (e-learning)	Free Time	Dinner *	
7 Sep	Breakfast	L4: Magnetic Scattering <ul style="list-style-type: none"> Magnetism Nuclear/Magnetic Scattering Kim Lefmann, University of Copenhagen	<i>Catch up on assignments/e-learning and inquire about things you did not understand</i>	Lunch	L5: Crystallography <ul style="list-style-type: none"> Crystallography k-space Brillouin Zone Johan Cedervall, Stockholm Univ.	Ex. 3 "Reciprocal lattice of Ni" <ul style="list-style-type: none"> Quiz: Reciprocal lattice of Ni Simulation quiz: Diffraction from powder (e-learning)	Free Time	Dinner *	
8 Sep	Breakfast	L6: Diffraction I <ul style="list-style-type: none"> Intro Neutrons vs. X-rays Johan Cedervall, Stockholm Univ.	L7: Diffraction II <ul style="list-style-type: none"> Magnetism Total Scattering Etc. Johan Cedervall, Stockholm Univ.	Lunch	Ex. 4 - TUTORIAL <ul style="list-style-type: none"> The Rietveld method Fullprof intro + start of refinement Johan Cedervall, Stockholm Univ.	Ex. 5 <ul style="list-style-type: none"> Fullprof refinement continued When is Xray or Neutron diffraction suitable? Wiki problem: Bragg scattering from non-Bravais lattices Johan Cedervall, Stockholm Univ.	Free Time	Dinner *	
9 Sep		L8: Reflectometry I <ul style="list-style-type: none"> Instrumentation/applications Specular/off-specular Optical Matrix Kinematic Approximation Adrian Rennie, Uppsala University	Ex. 6 <ul style="list-style-type: none"> Simulation quiz: Reflectometer (e-learning)		L9: Reflectometry II + GiSANS <ul style="list-style-type: none"> Distorted Born approximation GiSANS Instrumentation In plane / out of plane Applications Adrian Rennie, Uppsala University	<i>Catch up on assignments/e-learning and inquire about things you did not understand</i>	Free Time	GALA DINNER	
10 Sep	Breakfast	FREE DAY / EXCURSION							Dinner *

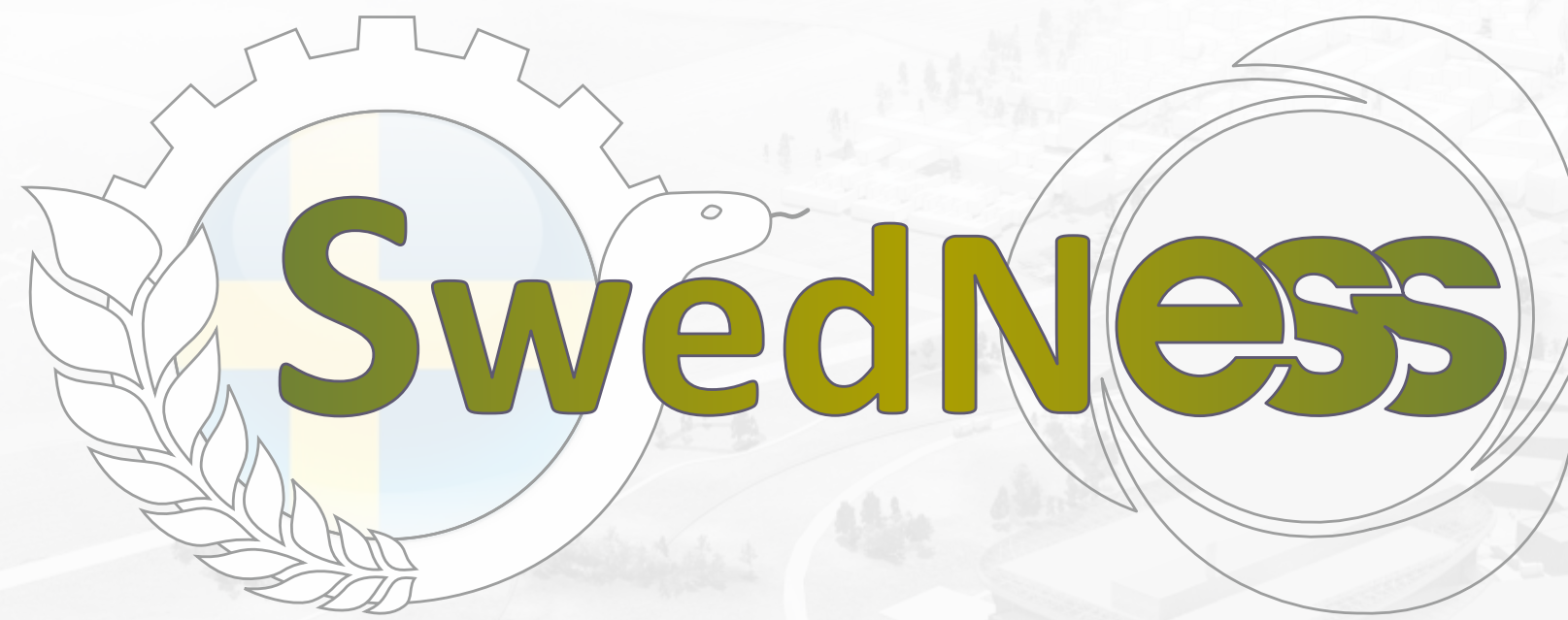
11 Sep	Break-fast	L10: Neutron Imaging <ul style="list-style-type: none"> Instrumentation Radiography / Tomography In operando Neutrons / x-rays Luise Theil Kuhn, DTU	Ex. 7 <ul style="list-style-type: none"> Simulation quiz: Bragg Edge Imaging on Viking Sword (e-learning)	Lunch	L11: SANS I <ul style="list-style-type: none"> Instrumentation2 Scattering Length Density Form-/Structure Factor Approximations Andrew Jackson, Lund University / ESS	Ex. 8 <ul style="list-style-type: none"> Simulation quiz: Small Angle Neutron Scattering Resolution (wavelength vs. angle) Data Treatment (e-learning)	Free Time	Dinner *	
12 Sep	Break-fast	L12: SANS II <ul style="list-style-type: none"> Geometrical models Contrast Variations Time-resolved / stroboscopic Applications Andrew Jackson, Lund University / ESS	<i>Catch up on assignments/e-learning and inquire about things you did not understand</i>	Lunch	L13: INS I "Intro" <ul style="list-style-type: none"> Instrumentations (TAS/ToF) Direct / Indirect geometry Pulsed/Continuous E/p conservation k-space (reminder) Examples (nuclear / magnetic) Kim Lefmann, University of Copenhagen	Ex. 9 <ul style="list-style-type: none"> Simulation quiz: Ni single crystal in a Triple Axis Spectrometer Quiz: Phonons of Ni (e-learning)	Free Time	Dinner *	
13 Sep	Break-fast	L14: INS II "Nuclear" <ul style="list-style-type: none"> Phonons (basics) ω/τ domain Cross sections Applications Gediminas Simutis, Paul Scherrer Institute	L15: INS III "Magnetic" <ul style="list-style-type: none"> Spin waves Magnetic Cross Section Applications Kim Lefmann, University of Copenhagen	Lunch	Ex. 10 - TUTORIAL <ul style="list-style-type: none"> Modelling phonons/spin waves Extract J's Spin-W Simon Ward, ESS / DMSC	Ex. 10 (continued) <ul style="list-style-type: none"> Modelling phonons/spin waves Extract J's Spin-W Simon Ward, ESS / DMSC	Free Time	Dinner *	
14 Sep	Break-fast	L16: Polarized Neutron Scattering: BASICS <ul style="list-style-type: none"> Polarizing/Flipping/Detecting the neutron spin (theory & technologies) Basic theory Examples (Elastic & Inelastic) Werner Schweika, ESS	L17: QENS <ul style="list-style-type: none"> Instrumentation Energy/time-scales Coherent / Incoherent Diffusion, Molecular dynamics Cross section & Isotope labeling Mark Telling, STFC/ISIS	Lunch	Ex. 11 - TUTORIAL <ul style="list-style-type: none"> Polymer Dynamics (dynamics / diffusion) Isotope labeling Mark Telling, STFC/ISIS Miriam Koppel, Univ. Tartu	Ex. 11 (continued) <ul style="list-style-type: none"> Polymer Dynamics (dynamics / diffusion) Isotope labeling Mark Telling, STFC/ISIS Miriam Koppel, Univ. Tartu	Free Time	Dinner *	
15 Sep	Break-fast	L18: Keynote Lecture: "Challenge 1" Neutrons for Sustainability Martin Månsson KTH Royal Institute of Technology Sweden	L19: Keynote Lecture: "Challenge 2" Neutrons for Life Trevor Forsyth LINXS, Sweden	Lunch	L20: Keynote Lecture: "Challenge 3" Neutrons for "Skyrmions" Henrik Rønnow EPF Lausanne, Switzerland	L21: Keynote Lecture: "Challenge 4" Neutrons for Engineering Richard Moat Open University, UK	Free Time	End Dinner	
16 Sep	Break-fast	Help for Proposal Writing + Visit of ESS site			Lunch	L22: Key-Note Lecture: "ESS" Future Science at ESS Andreas Schreyer, ESS	Help for Proposal Writing + Visit of ESS site		Dinner *
17 Sep	Break-fast	DEPARTURE DAY							

* Dinners during the normal lecture days are your own responsibility. SwedNess/NNSP are only organizing the "Welcome Reception", "Gala Dinner" and "End Dinner". Lunch is included.

Most of the exercises (Ex.) are conducted individually via our e-learning platform (<https://pan-learning.org/>)

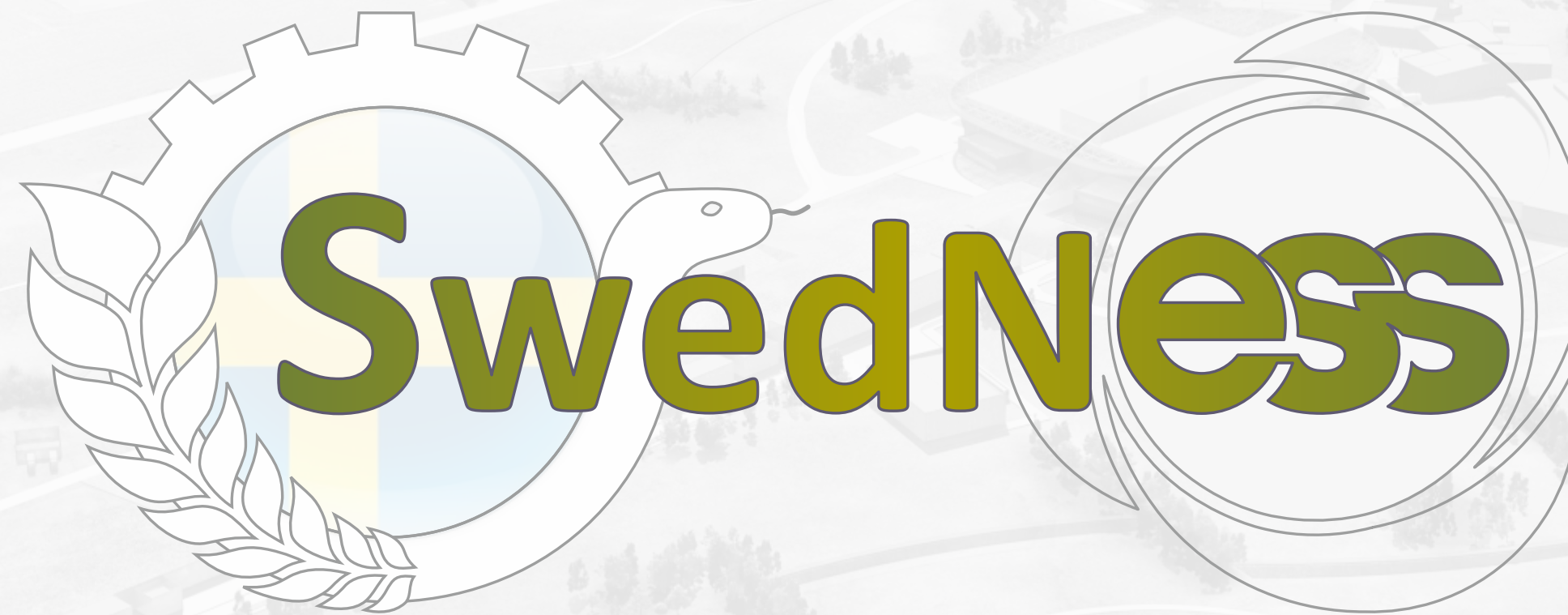
Your Teachers





NNSP

Swedish National Graduate School in Neutron Scattering

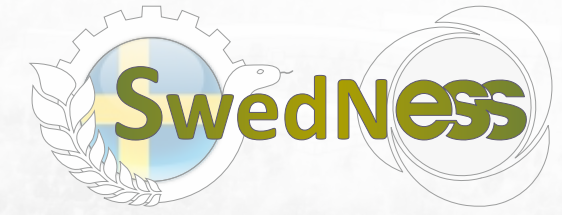


Swedish Neutron Education for Science & Society



SWEDISH FOUNDATION for
STRATEGIC RESEARCH

What is SwedNess?



- Swedish national graduate school in neutron scattering that started officially in September 2016
- Collaboration between six Swedish universities with management at Uppsala University:

CHALMERS



LUND
UNIVERSITY



Stockholm
University

li.u LINKÖPING
UNIVERSITY



UPPSALA
UNIVERSITET



- Fully funded by the Swedish Foundation for Strategic Research (SSF), which main goal is to strengthen Sweden's future competitiveness in science, engineering and medicine.

- Total budget of 220 MSEK (~21 M€) running until 2026



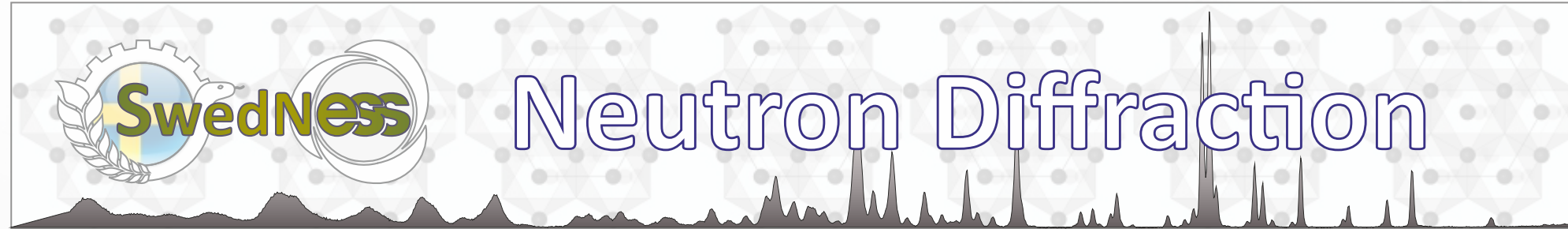
SWEDISH FOUNDATION *for*
STRATEGIC RESEARCH

- This allow us to fully fund course program as well as 40 PhD students with a individual budget of 4.5 MSEK each (salary + 200 kSEK/year in running budget per student)

- Theoretical part (lectures/exercises) is given together with the Nordic Neutron Science Program (NNSP) - Kim Lefmann.
- 2 weeks (4 ECTS) concentrated "late summer" school (now @ESS with visit of the facility)
- Next Time: September 2023 (TBC)
- Funding for travel/hotel is available and the course is **OPEN FOR EVERYONE !!!**
- Fifth time we give this course
- So far ~200 students participated in this course (SE, DK, NO, Baltic states)



Specialized Neutron Courses - Techniques



SwedNess Neutron Diffraction

7.5 ECTS
Stockholm University



SwedNess Neutron Reflectivity & GISANS

4 ECTS
Uppsala University



SwedNess Small-Angle Neutron Scattering (SANS)

3 ECTS
Lund University



SwedNess Neutron Imaging

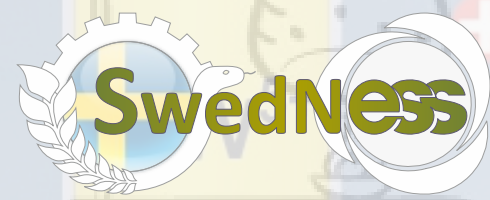
3 ECTS
Lund University



SwedNess Neutron Spectroscopy

5 ECTS
Chalmers
ISIS

Specialized Neutron Courses - Topics

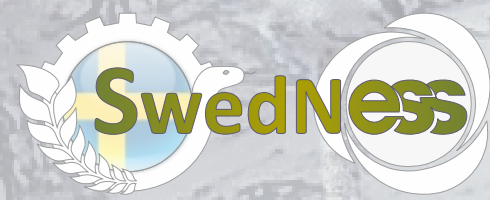


Neutrons for the study of
electrochemical processes

5 ECTS

KTH

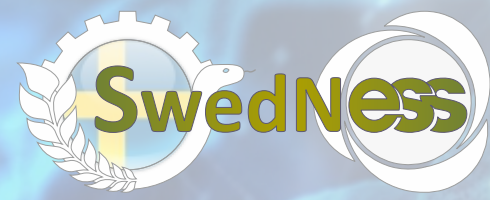
Uppsala University



Engineering Materials
Science using Neutrons

5 ECTS

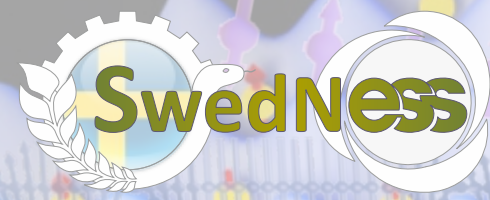
Linköping University,
Chalmers + KTH



Neutrons for Life Science

5 ECTS

Linköping University

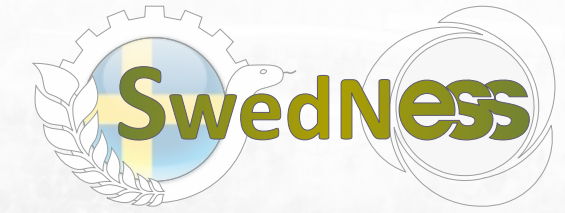


Neutrons & Muons
for Magnetism

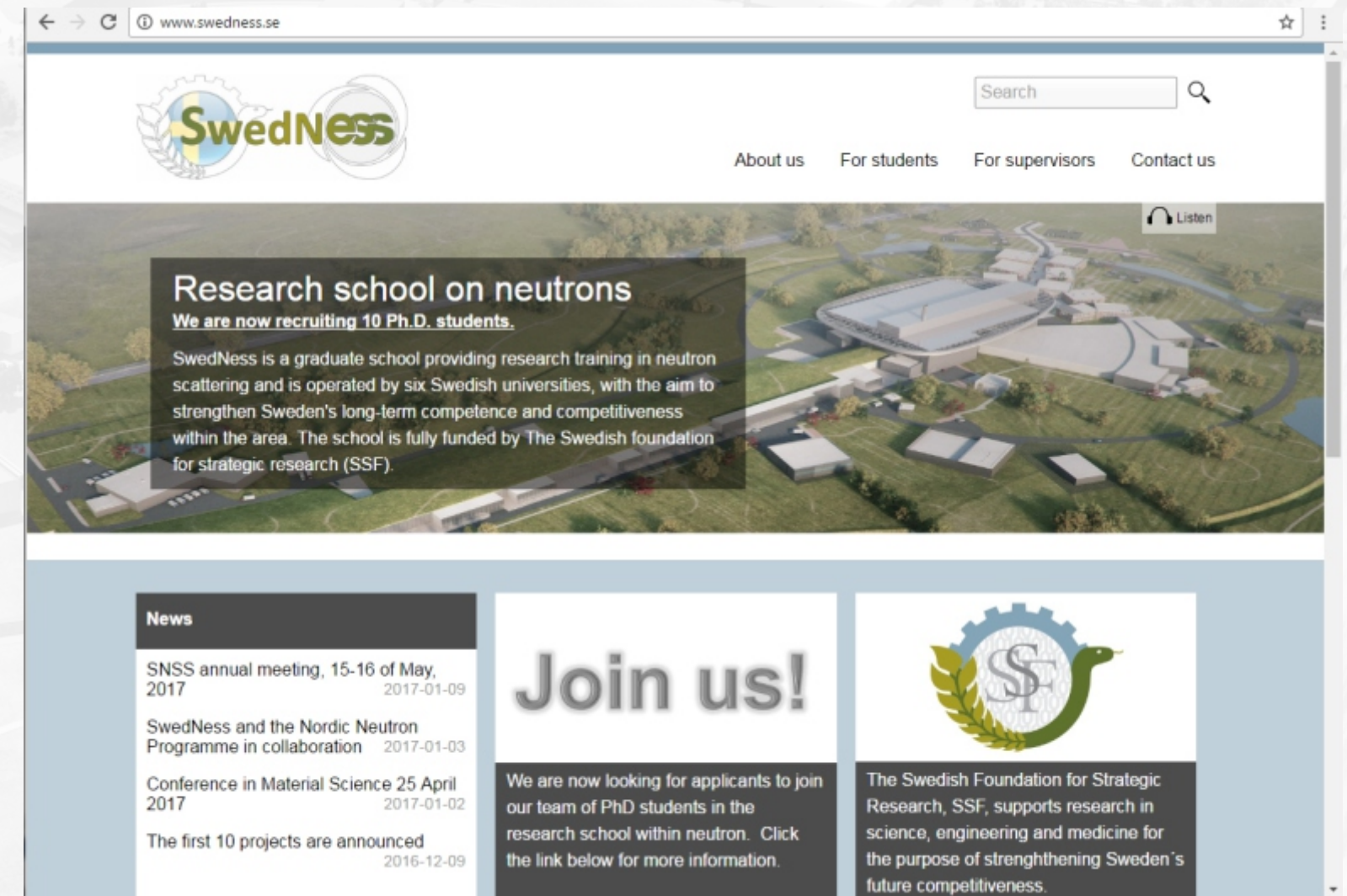
5 ECTS

KTH Royal Inst. Technology
NORDITA

The SwedNess Course Catalogue



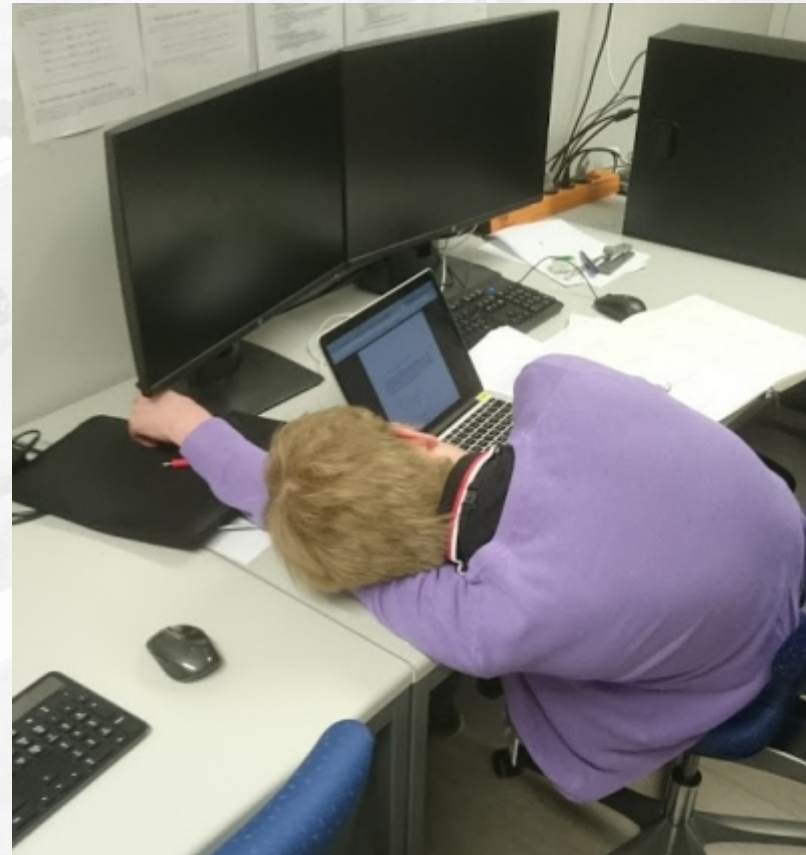
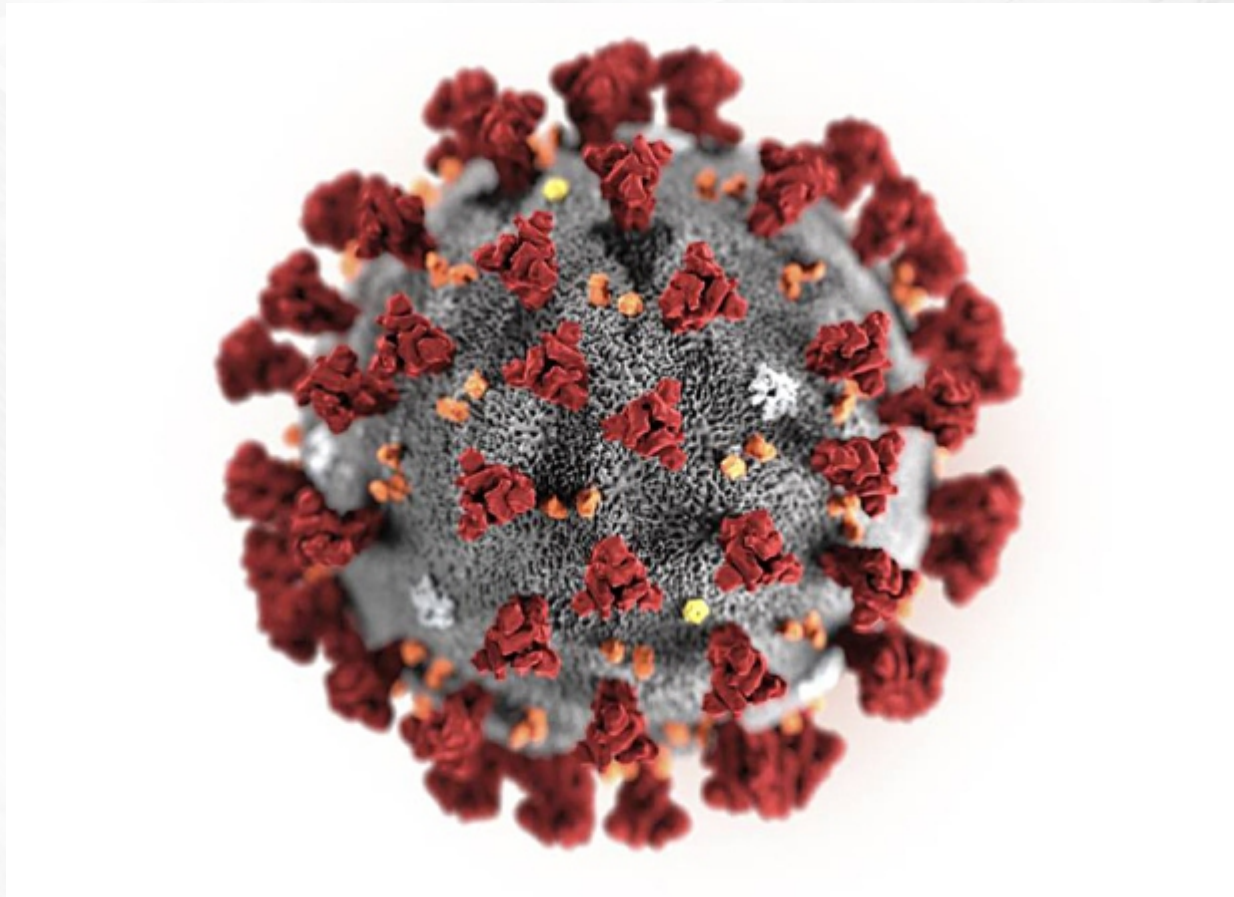
- **ALL courses, intro as well as specialized courses are aimed to be given annually!**
- **ALL courses are OPEN to EVERYONE (Universities outside SwedNess, industry...)**
- **ALL courses are FREE (except potential travel and accommodation in specialized courses)
(Covid-19 = online courses in progress)**
- **Joint effort together with NNSP and pan-learning.org**
- **Information is available at www.SwedNess.se**
- **So far we had close to 500 registered participants in our courses.**

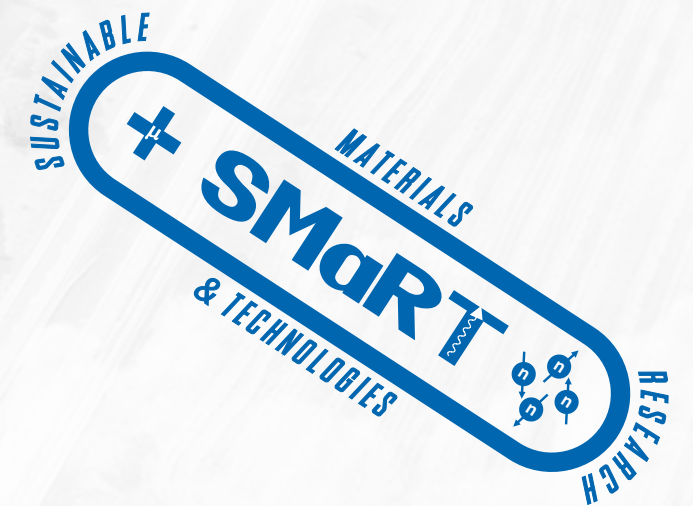


- **SwedNess is also participating in & contributing to several other educational programs/efforts, e.g. RACIRI, MIRAI, etc.**









- Idea for how neutrons can help your research (specific question = piece of the puzzle)
- Talk to an expert (this will soon be You !!!)
- Consider your sample!!! (available size/mass, crystal/powder/thin film).
- Think about if you sample contains elements with low scattering or high absorption
<http://www.ncnr.nist.gov/resources/n-lengths/>
- Select appropriate source & instrument for your experiment (**check deadlines + shutdowns!**)
- Contact instrument responsible to discuss experiment (**> 1 week before you submit proposal!**)
- Write a proposal and apply for beamtime at your selected neutron source/instrument
- Cross your fingers and wait for the review committee + in some cases "national quota"
- If you obtain beamtime start to prepare your experiments well advance (align crystals, manufacture sample holders etc.)
- If you plan to do experiments at different sources with same samples: consider activation of your samples (active sample transport is complicated and expensive!)
- Check necessary paperwork (**visa!**) at source and perform the mandatory "safety training"

- Depending on your nationality you might need a visa to visit some of the neutron sources around the world.
- Take this seriously and apply in time !!! Invitation letter from source (talk to respective user office) + letter from head of department. We could possibly also write something from SwedNess / NNSP...
- Always make sure you do the safety training before going to beamtime and follow the rules when you are there! This is your health we are talking about and... radiation safety officers do not usually have a sense of humor!!!
- Talk to your respective university about getting a “dose pass” to keep track of your total radiation dose during all of your experiments.
- Nowadays: check also the rules for vaccine-pass etc.



Remember to apply for beamtime NOW !!!

NIST



**ISIS
Science & Technology
Facilities Council**



PAUL SCHERRER INSTITUT



NEUTRONS
FOR SCIENCE



**OAK RIDGE
National Laboratory**



- Slides from the lectures will be made available (as soon as possible but sometimes “a bit later”).
- e-learning Exercises are conducted “individually” during the dedicated sessions (in program) and there will be assistance available. **Note the web-links in the program (PDF file)!**
- Web links: we have two parallel websites with the course material/info:

<https://indico.nbi.ku.dk/event/1828/>

<https://www.neutrons.se/Tartu2022/>

- Alumni Lectures from “old Tartu 2017 students” will be made available during these weeks as videos. Will both describe their projects and as well as give some “tips-and-tricks” for your conducting a PhD using neutrons. We advice to watch these towards the end of the school (or after).
- We have three more extensive Tutorials (Rietveld/Fullprof + SpinW/OMDB + QENS) that requires some preparations in the form of software installations. See the following slides...

Diffraction / Fullprof & Vesta (8 September)

Please install the following (3) things during first week of the school:

1.

Download / Install the Fullprof suite + Exercises-dat (tutorials)

<https://www.ill.eu/sites/fullprof/php/downloads.html>

The screenshot shows the FullProf Suite website with a search bar for 'Fullprof' and a navigation menu. A red arrow points from the 'Examples & Tutorials' link to a table of available items. Another red arrow points from the 'Downloads' link to a table of download options.

Available items in Catalogs section:

Name:	Description:	File size	Link:
FullProf Manual	Users' Guide of FullProf	1,769,341	Download

Available items in Tutorials section:

Name:	Description:	File size	Link:
Atlanta-doc	PDF-docs of a School in Atlanta	2,171,360	Download
ECM-21-Workshop	PDF-docs of ECM-21 Workshop	1,055,669	Download
Exercises-dat	Data files, FullProf exercises	54,250	Download
Exercises-pcr	PCR files, FullProf exercises	35,608	Download
HoCa_Tutorial	Tutorial magnetic structure	1,130,682	Download
KTb3F12_Tutorial	Tutorial magnetic structure	501,244	Download
Microstructural_effects	Documents about microstructure	544,914	Download
pcr_dat	Data and PCR files	824,597	Download
size-sph	Notes about size effects	14,298	Download
sr_oxalate	Simulated annealing in FullProf	30,958	Download

Available items in Examples section:

Name:	Description:	File size	Link:
FullProf examples	A set of PCR examples files to run on FullProf program	546,446	Download

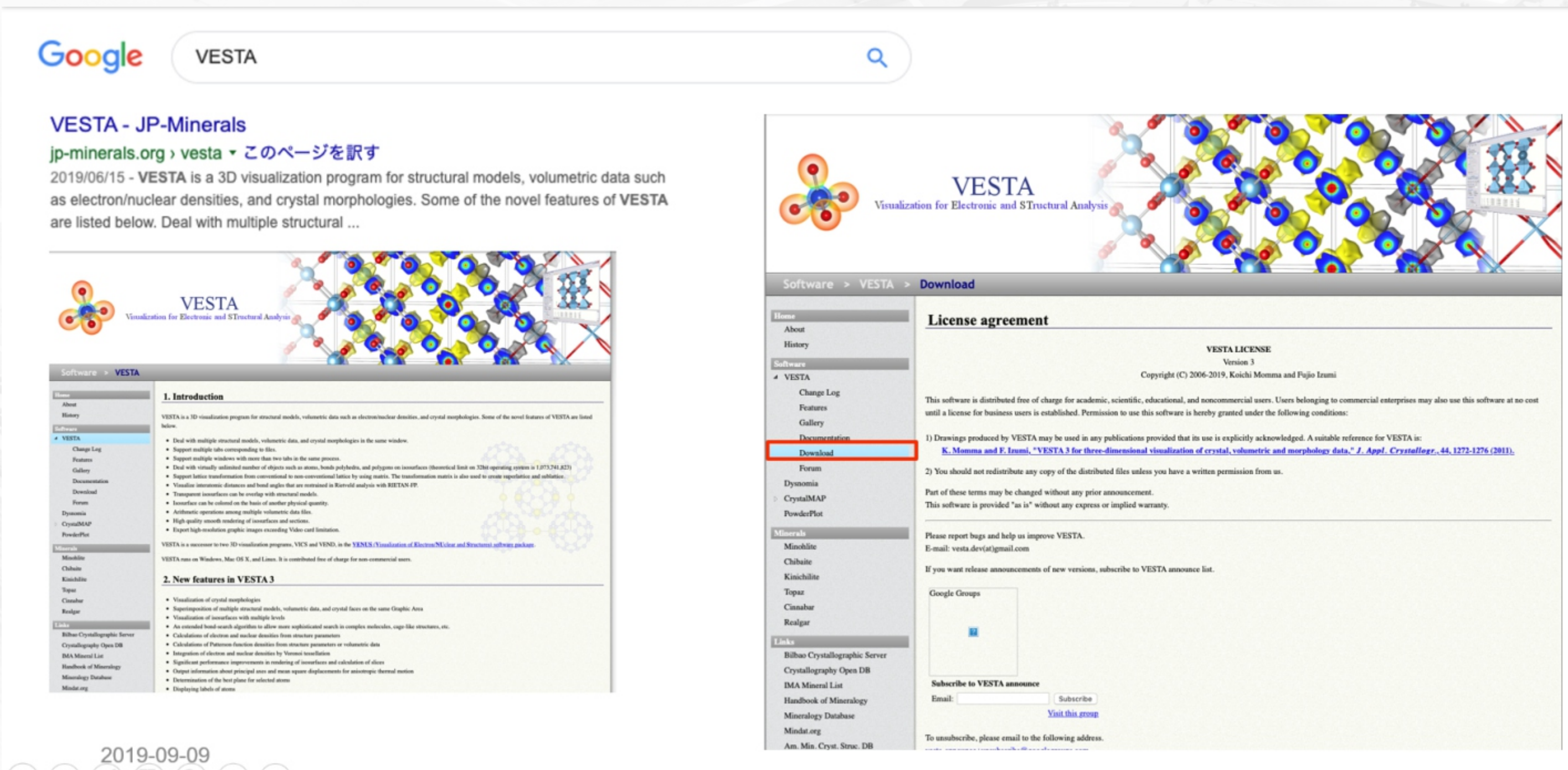
Downloads

Name:	Version date:	Platform:	File size	Link:
FullProf_Suite Windows (32 bits, XP-compatible)	12 - July - 2019	Windows XP-7-10 (Last Supported Version)	91,601,889 bytes	Download
FullProf_Suite Windows (32 bits)	11 - July - 2019	Windows 7-10	94,113,228 bytes	Download
FullProf_Suite Windows (64 bits)	11 - July - 2019	Windows 7-10	104,545,007 bytes	Download
FullProf_Suite Linux (64 bits)	12 - July - 2019	Linux - Intel	113,320,114 bytes	Download
FullProf_Suite MacOS (64 bits, unsigned)	1 - October - 2018	macOS - Intel (.Agx)	116,326,479 bytes	Download
FullProf4Mac.app (64 bits, signed) - v2.5.4	18 - May - 2018	macOS - Intel (.dmg)	116,707,285 bytes	Download

- (1) Install Fullprof Suite
- (2) Download Exercises -dat

2.

Download / Install the Vesta software:
<https://jp-minerals.org/vesta/en/download.html>



The image shows a Google search for "VESTA" and the resulting website page. The search results show "VESTA - JP-Minerals" with the URL "jp-minerals.org" and a description of VESTA as a 3D visualization program. The website page includes a navigation menu, a "Download" link highlighted in red, and a "License agreement" section. The license agreement states that the software is distributed free of charge for academic, scientific, educational, and noncommercial users. It also includes a reference to a publication by K. Momma and F. Izumi.

Google Search Results:

VESTA - JP-Minerals
 jp-minerals.org › vesta › このページを訳す
 2019/06/15 - VESTA is a 3D visualization program for structural models, volumetric data such as electron/nuclear densities, and crystal morphologies. Some of the novel features of VESTA are listed below. Deal with multiple structural ...

Website Content:

1. Introduction

VESTA is a 3D visualization program for structural models, volumetric data such as electron/nuclear densities, and crystal morphologies. Some of the novel features of VESTA are listed below.

- Deal with multiple structural models, volumetric data, and crystal morphologies in the same window.
- Support multiple tabs corresponding to files.
- Support multiple windows with more than two tabs in the same process.
- Deal with virtually unlimited number of objects such as atoms, bonds, polyhedra, and polygons on isosurfaces (theoretical limit on 32bit operating system is 1,073,741,824).
- Support lattice transformation from conventional to non-conventional lattice by using matrix. The transformation matrix is also used to create superlattice and substitution.
- Visualize interatomic distances and bond angles that are constrained in Rietveld analysis with REFTAN-IP.
- Transparent isosurfaces can be overlaid with structural models.
- Isosurface can be colored on the basis of another physical quantity.
- Arithmetic operations among multiple volumetric data files.
- High quality smooth rendering of isosurfaces and sections.
- Export high-resolution graphic images exceeding Video card limitation.

VESTA is a successor to two 3D visualization programs, VICS and VENS, in the **YENUS** (Visualization of Electron/Nuclear and Structural) software packages.

VESTA runs on Windows, Mac OS X, and Linux. It is contributed free of charge for non-commercial users.

2. New features in VESTA 3

- Visualization of crystal morphologies
- Superposition of multiple structural models, volumetric data, and crystal faces on the same Graphic Area
- Visualization of isosurfaces with multiple levels
- An extended bond-search algorithm to allow more sophisticated search in complex molecules, cage-like structures, etc.
- Calculations of electron and nuclear densities from structure parameters
- Calculations of Patterson function densities from structure parameters or volumetric data
- Integration of electron and nuclear densities by X-ray tomography
- Significant performance improvements in rendering of isosurfaces and calculation of slices
- Output information about principal axes and mean square displacements for anisotropic thermal motion
- Determination of the best plane for selected atoms
- Displaying labels of atoms

License agreement

VESTA LICENSE
 Version 3
 Copyright (C) 2006-2019, Koichi Momma and Fajio Izumi

This software is distributed free of charge for academic, scientific, educational, and noncommercial users. Users belonging to commercial enterprises may also use this software at no cost until a license for business users is established. Permission to use this software is hereby granted under the following conditions:

- Drawings produced by VESTA may be used in any publications provided that its use is explicitly acknowledged. A suitable reference for VESTA is: [K. Momma and F. Izumi, "VESTA 3 for three-dimensional visualization of crystal, volumetric and morphology data," J. Appl. Crystallogr., 44, 1272-1276 \(2011\).](#)
- You should not redistribute any copy of the distributed files unless you have a written permission from us.

Part of these terms may be changed without any prior announcement.
 This software is provided "as is" without any express or implied warranty.

Please report bugs and help us improve VESTA.
 E-mail: [vesta.dev\(at\)gmail.com](mailto:vesta.dev(at)gmail.com)

If you want release announcements of new versions, subscribe to VESTA announce list.

Google Groups

Subscribe to VESTA announce
 Email:
[Visit this group](#)

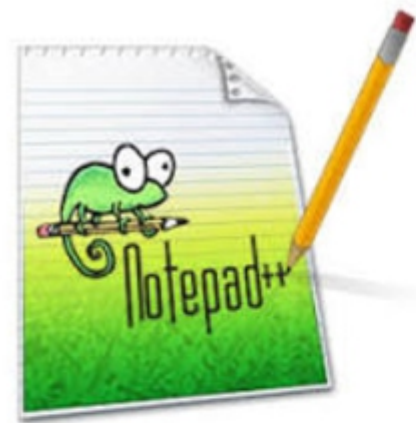
To unsubscribe, please email to the following address.

2019-09-09

Diffraction / Fullprof & Vesta (8 September)

3.

Have a “good” text editor installed on your laptop



Notepad++ : MS



TextWrangler: Mac



For the linear spin wave theory tutorial, a few software will be needed. Please try to complete the following preparations during the first week of the school and please ask if you need help!

(a) If you have access to a license, install Matlab. Many universities provide student licenses. If you do not want to (or can) install it on your computer you can also try the online version:

<https://se.mathworks.com/products/matlab-online.html>

(b) Install the spinW software for linear spin wave theory from

<https://github.com/spinw/spinw/releases/tag/v3.1>

For the installation, additional details can be found at

<http://spinw.org/installation/>

(c) Register for an account on the Organic Materials Database (OMDB) on <https://omdb.mathub.io/>

Quasi-Elastic Neutron Scattering (QENS) / Mantid

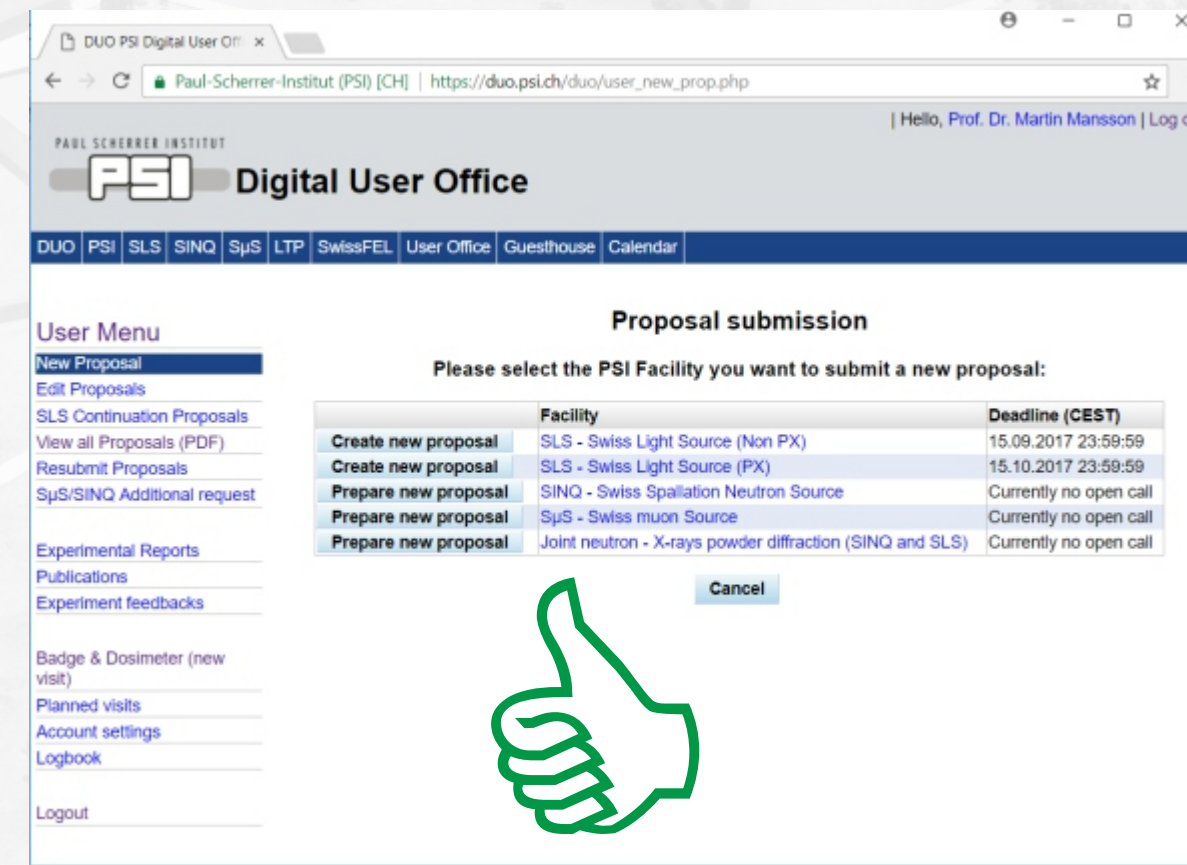
**For QENS Lecture / Exercise
Wednesday 14 September
Please download and install the
latest version of Mantid 4.0.0**

mantid



<https://sourceforge.net/projects/mantid/files/4.0/mantid-4.0.0-win64.exe/download>

- You should all write a proposal for neutron beamtime (details will follow...)
- Time during these 2 weeks and dedicated “assistance sessions”
- Submit to Me (Martin Månsson, condmat@kth.se) by latest **30 September 2022 at 23:59**
- **You also need to attend all/most lectures and actively participate in the e-learning exercises**

DUO PSI Digital User Office

Paul-Scherrer-Institut (PSI) [CH] | https://duo.psi.ch/duo/user_new_prop.php

Hello, Prof. Dr. Martin Månsson | Log out

PSI Digital User Office

DUO | PSI | SLS | SINQ | SpS | LTP | SwissFEL | User Office | Guesthouse | Calendar

User Menu


- New Proposal
- Edit Proposals
- SLS Continuation Proposals
- View all Proposals (PDF)
- Resubmit Proposals
- SpS/SINQ Additional request
- Experimental Reports
- Publications
- Experiment feedbacks
- Badge & Dosimeter (new visit)
- Planned visits
- Account settings
- Logbook
- Logout

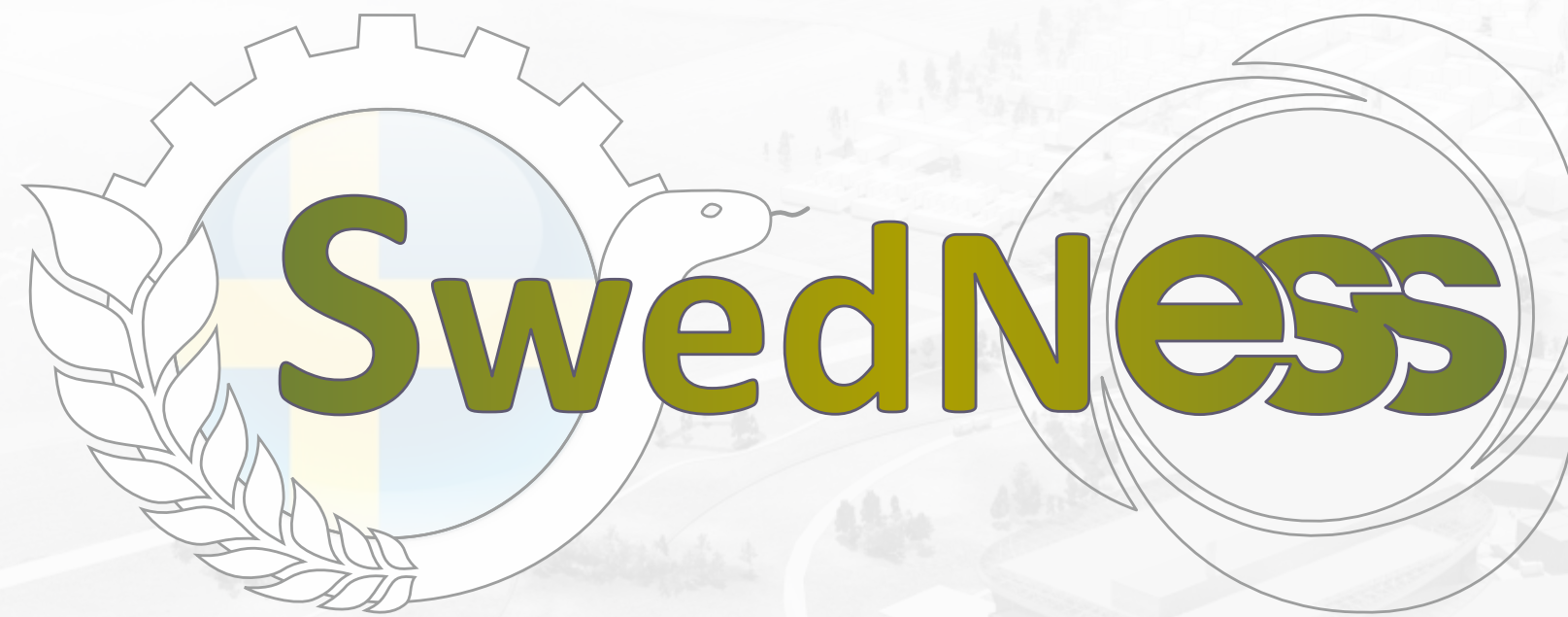
Proposal submission

Please select the PSI Facility you want to submit a new proposal:

	Facility	Deadline (CEST)
Create new proposal	SLS - Swiss Light Source (Non PX)	15.09.2017 23:59:59
Create new proposal	SLS - Swiss Light Source (PX)	15.10.2017 23:59:59
Prepare new proposal	SINQ - Swiss Spallation Neutron Source	Currently no open call
Prepare new proposal	SpS - Swiss muon Source	Currently no open call
Prepare new proposal	Joint neutron - X-rays powder diffraction (SINQ and SLS)	Currently no open call

Cancel





NNSP