SeRC
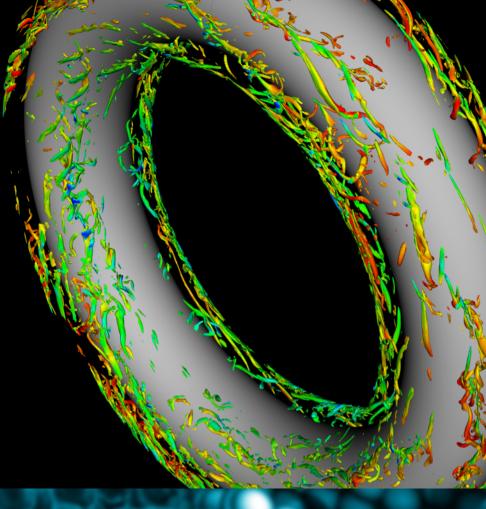
Swedish e-Science Research Centre

www.e-science.se

What is e-Science?

- e-Science = using digital information and the processing of this information to gain new scientific insights
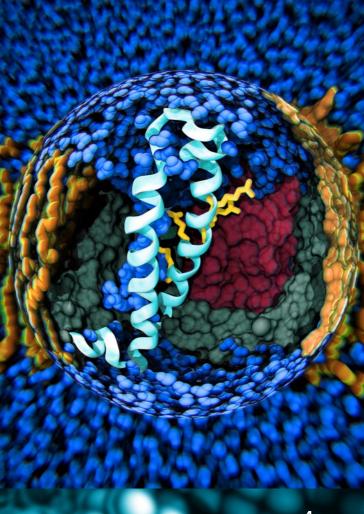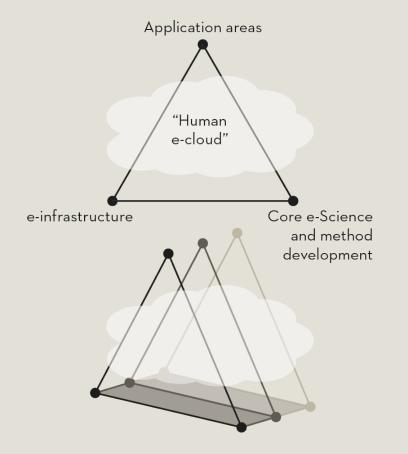
What is SeRC?

- A strategic research centre within the strategic research area (SRA) of e-Science …
- … which is one of 24 SRAs
- Funded by the Swedish government Strategic Research Area Initiative
- Founded in 2010 resulting from the Swedish Government Bill on Research Policy
- Based on a collaboration between KTH, SU, KI, and LiU
- Funding: 30 million SEK/year

SeRC's vision and strategy

- Through e-Science enable world leading research within strategic application areas …
- … with the help of:
  - e-infrastructure
  - core e-Science and method development

How do we work?
SeRC's three-pillar model

- Pillar 1 – application areas
- Pillar 2 – e-infrastructure
- Pillar 3 – core e-Science and method development
- "Human e-cloud" of application experts facilitate interaction
- Bottom pillars mutual for several application areas
- Multidisciplinary Collaboration Programs (MCPs) encompass several pillars

e-Science infrastructure

- Two supercomputer centres:
  - PDC, KTH
  - NSC, LiU
- Two visualisation centres:
  - Visualization Center C, Norrköping
  - Visualisation Studio, KTH
- A number of e-Science experts part of the "Human e-cloud"
- Close cooperation between KTH, LiU infrastructure: MOU regarding PDC-NSC

What do we do?
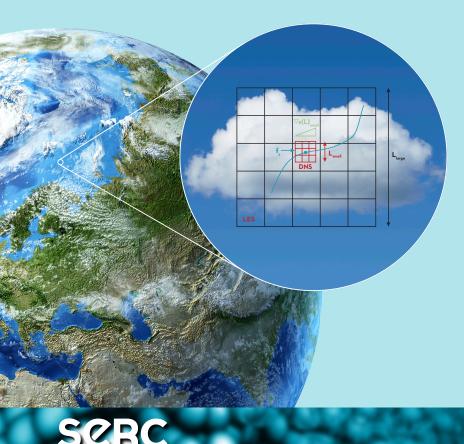# Our main current activities

- Multidiciplinary collaboration programmes (MCPs) consolidating the SeRC efforts into larger constellations
    - e-Science for Cancer Prevention and Control
    - Visualisation In e-Science Applications
    - SeRC Exascale Simulation Software Initiative
    - Data-Driven Computational Materials Design
    - FAST Climate Science
    - Brain-IT

- Increased emphasis on Data-driven research
- Initial PDC co-location hub with interaction space

SeRC

The first five years:
Success stories

Success story: **Climate modelling**

- Contributed to the development of the EC-Earth global climate model (www.ec-earth.org)
- Conducted global-scale simulations contributing to the IPCC Report 2013
- Collaboration with FLOW to understand cloud turbulence

Success story: **Personalised cancer screening – eCPC**

- Goal is to design trials and evaluate public policy for cancer screening using micro-simulation
- Integrates scientific expertise in computer science, statistics, and mathematics with molecular medicine and clinical epidemiology
- Contributed to landmark STHLM3 study for improved screening of prostate cancer

Success story: "Virtual wind tunnel"

- Large-scale simulations (3.2 billion grid points) to analyze turbulent flow around wing
- Complementing university wind tunnel tests
- Detailed characterization of flow physics of transition, turbulence and separation
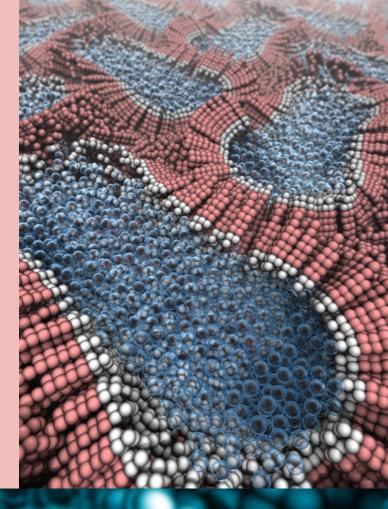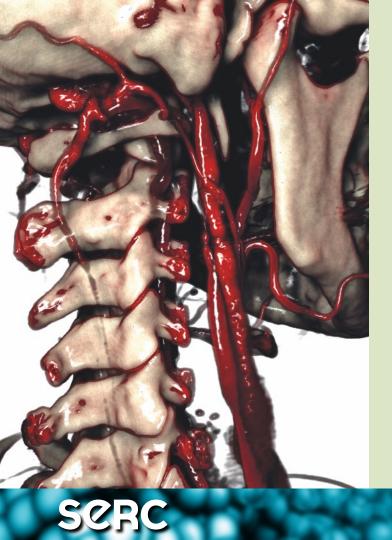- Important for decreasing turbulent drag

Success story: GROMACS – molecular simulation

- Cornerstone in materials and biomolecular research
- SU/KTH developed GROMAX code 1000's of users world wide
- Optimization resulting in world-leading simulation performance
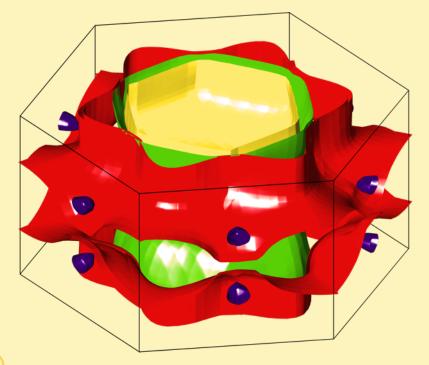- Understanding how outer layer of skin forms

Success story: **Visualisation**

- An essential tool for accessing and understanding large generated data of use for most SeRC communities
- Development of advanced visualization tools
- Development of virtual autopsies in regular use at hospitals and police

Success story: **Electronic structure**

- Simulation of material science properties using quantum mechanics methods
- Brand new states of matter simulated
- Valence electron surface give important properties of Osmium metal

Evaluation

- SRA evaluation:
  - "KTH has … excellent … SRAs". (One of the two acknowledged was SeRC.)
  - SeRC = "… a strong national network …"
- SeRC evaluation:
  - "… appears to be internationally competitive …"
  - "… systematically bridged the gap between tool developers and the actual users …"
  - "… appears to have been particularly strategic …" (Refers to Flagships)

New government decision fall 2016

- SeRC earmarked SRA funding continue …
- … with conditions:
    - evaluation after 5-years (2021)
    - emphasize impact
    - interface with education
    - work on gender profile

- We will continue for at least five more years!

**Strategy for the future:
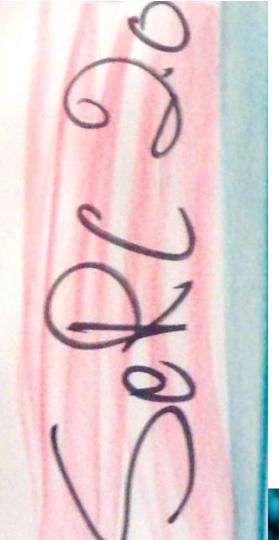SeRC 2.0**

Developing SeRC 2.0

- SeRC will be renewed entirely
- board decided all funding will be discussed
- process on-going

- Build on strengths of collaboration programs and "human e-cloud" experts

Strategy developed within five areas

- **New and renewed multidisciplinary collaboration programs (MCPs)**

- **Data-driven research including AI/Machine learning**

- Impact
- Education
- Gender

sERC

Thank you!