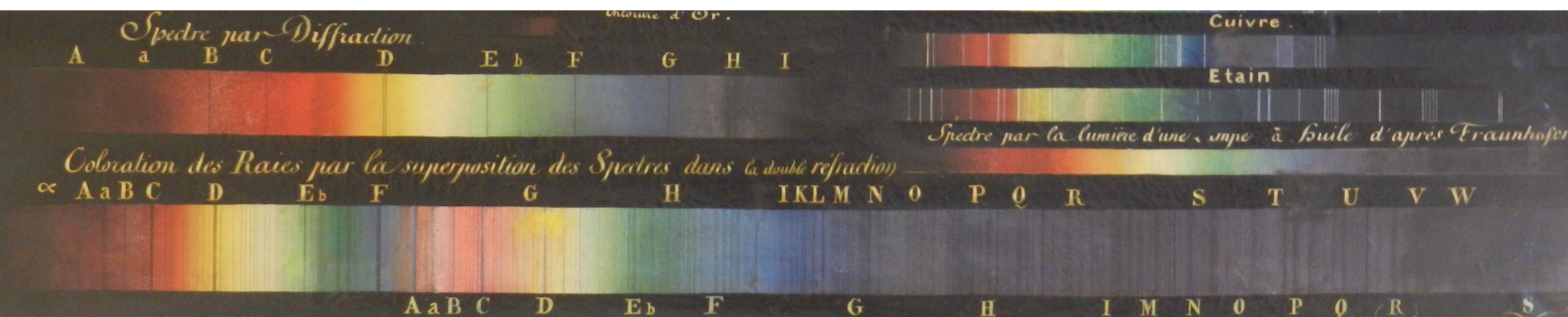


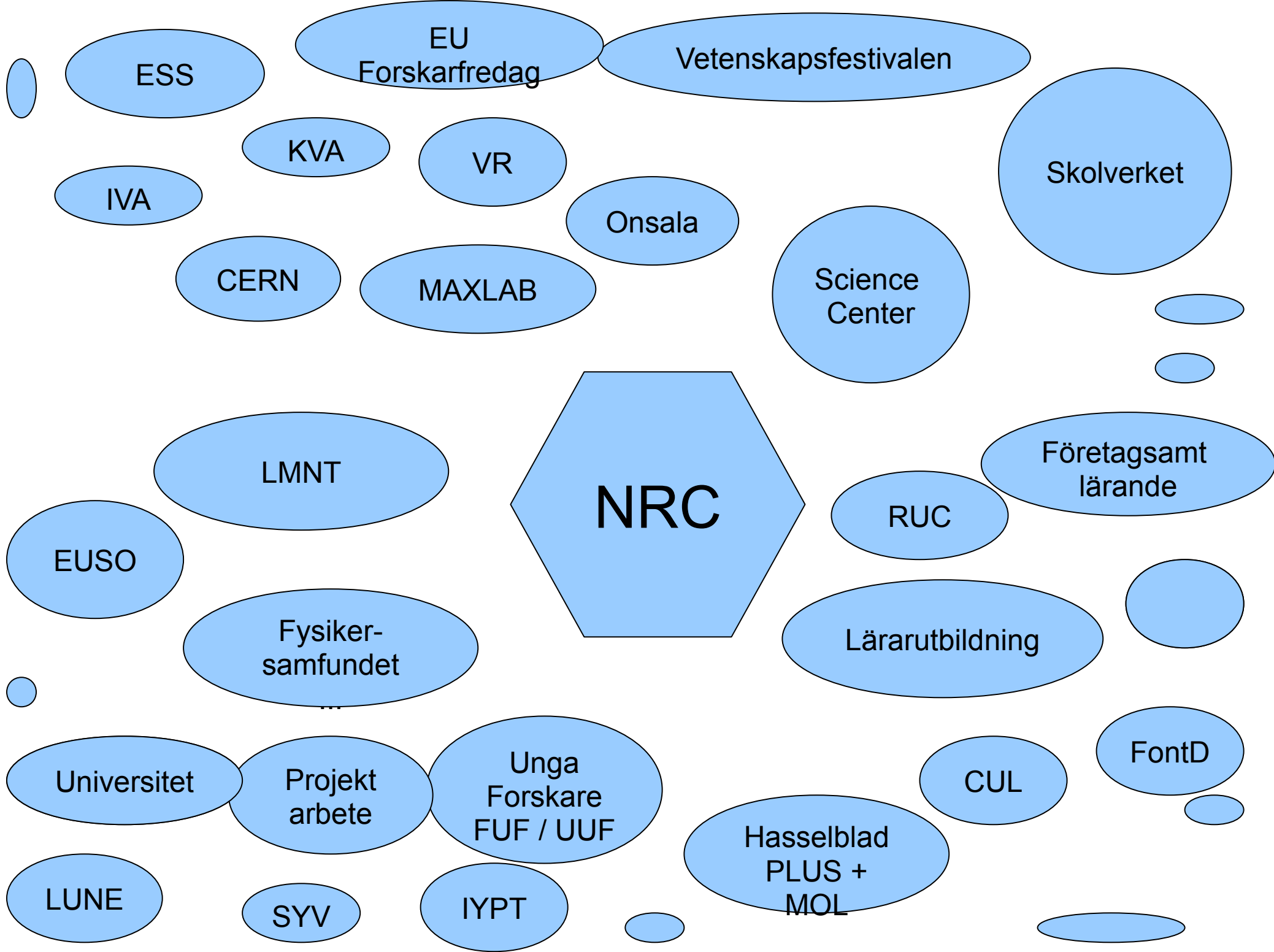


Swedish National Resource Centre
for Physics Education

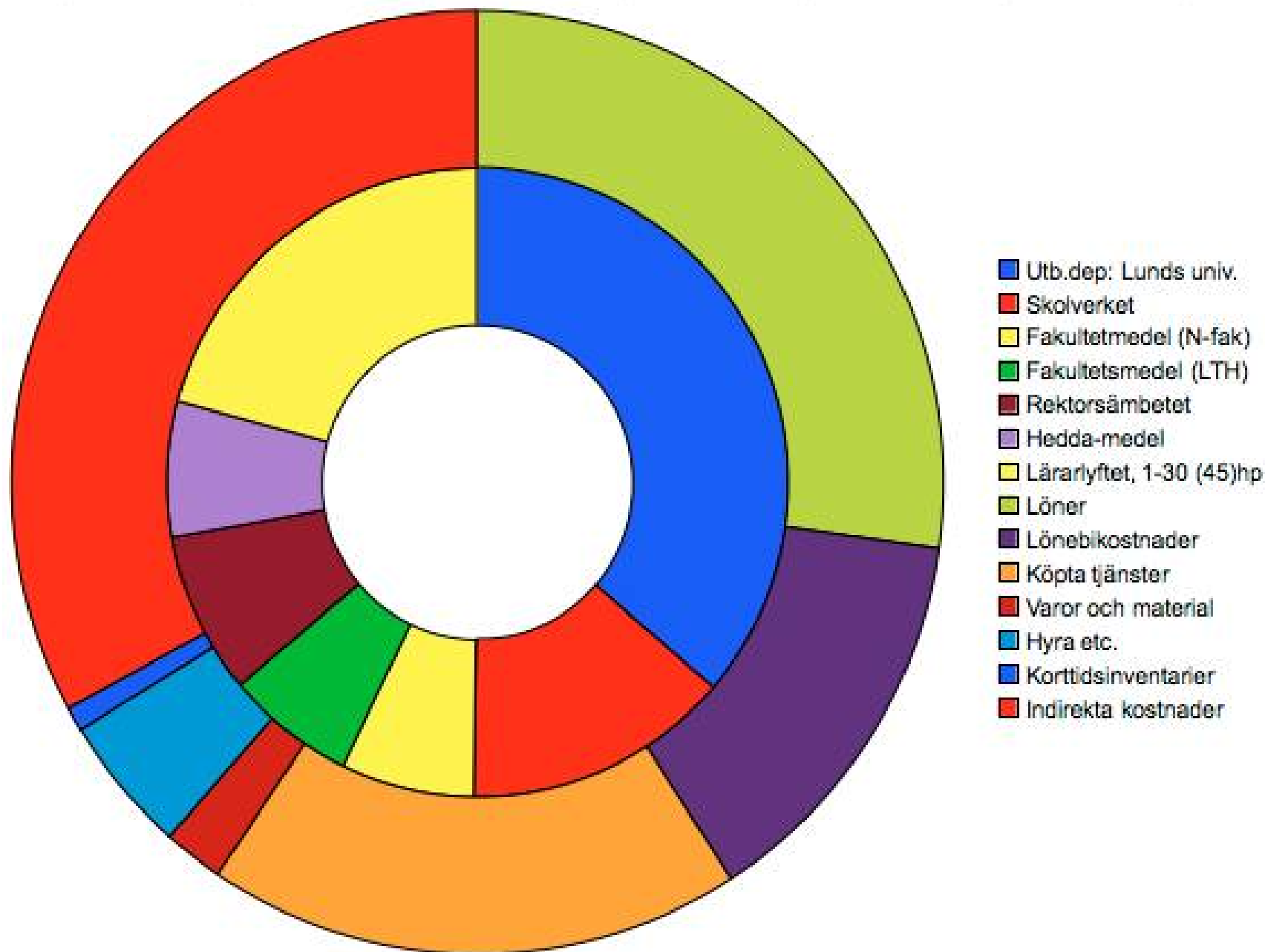
NRCFs role

- Ensure that teachers from preschool to high-school can get support for their physics teaching
- Provide CPD - often in collaboration with others
- Develop material + collect, evaluate and share information from other actors



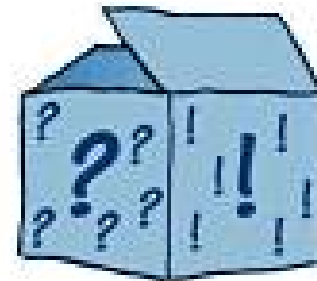


Economy: In - out (≈ 3600 kSEK)



Personnel

- Ann-Marie Pendrill 75%
(25% at U. Gothenburg)
- Lassana Ouattara (50%)
(50% teaching at Lund)
- Lena Hansson 25%
(science education, + HKr)
- Peter Ekström, 20%, Ask-a-physicist



Frågelåda

Collaborations

- Swedish physical society
- Resource Centers, Chem, Bio, Math ..
- Linneus University - teacher conference + ICT
- University of Göteborg (Atomic Physics demonstrations)
- School Malmö - IYPT
- 10% Malmö Högskola
- 20% School S. Sandby: Playground physics
- 20% School Skövde - Amusement park physics

Activites 2013

- "Teacher lift", 1-45 hp 50%, vt13-vt14 + ht13-ht14
- NO-biennials, School teachers (7-15) 9-10 april
(Umeå 25-26 sept, Karlstad, 7-8 oktober)
- Bohr 2013 - 100 years with the atomic model
- Teknik&Natur: Www site for K-6 teachers
- Meetings with "Skolverket"
- (WWW + "NT-developers")
- Nordic Physics Days 2013, Lund (High-school + research)
- Physics Bridge - high school - university
- Playground physics
- Physics Day at Liseberg and Gröna Lund
- Preschool science conferences

<http://www2.fysik.org/gymnasiet/>

Teacher CPD in Sweden from 2011 ...

Lärarlegitimation (Certification)

- Nearly all extended CPD directed to teachers who lack certification in their subject
- **Lärarlyftet ("Teachers' lift"):**
 - For teacher who teach physics, without having sufficient qualifications.
 - Requires teachers to study half time or more. No pay from the state, and usually no pay from school
- **(From 2013) Matematiklyftet ("Math lift"):**

Bohr 2013

- Kick-off, NBI -
Scandinavian teachers
- Bohr - Scandinavian
booklet for schools -
available on line
- Science festival
- Teacher conferences ...





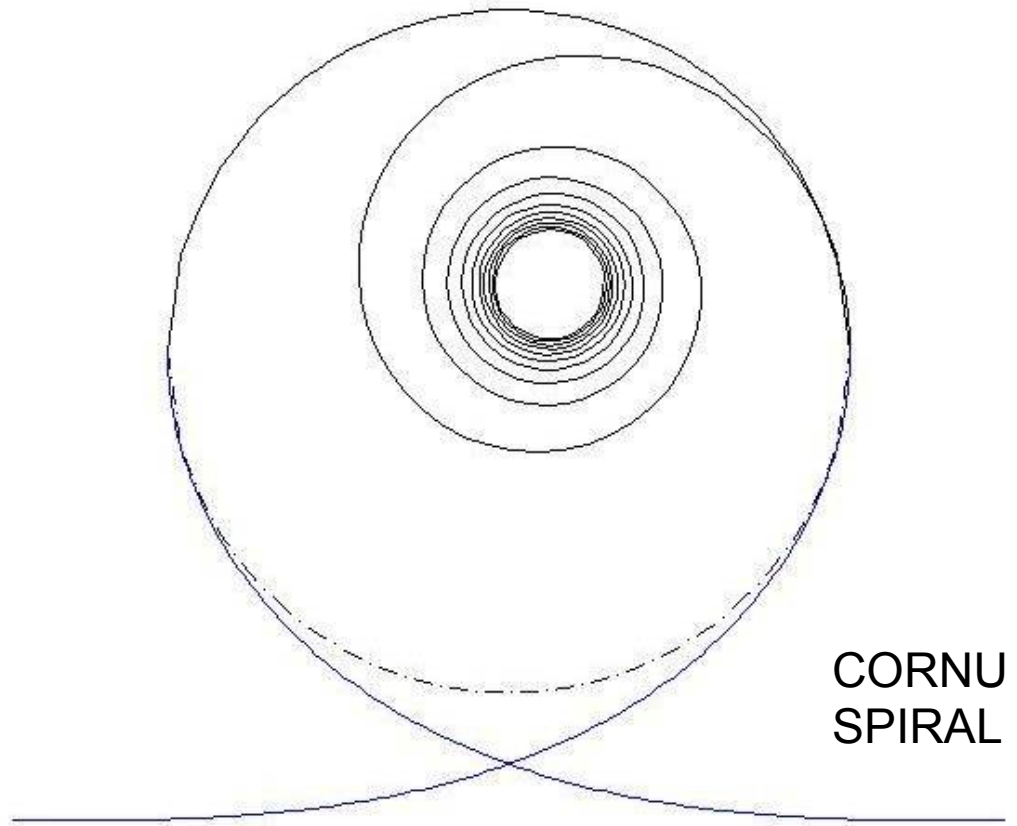
Frågelåda

NRCF page
342 "likes"

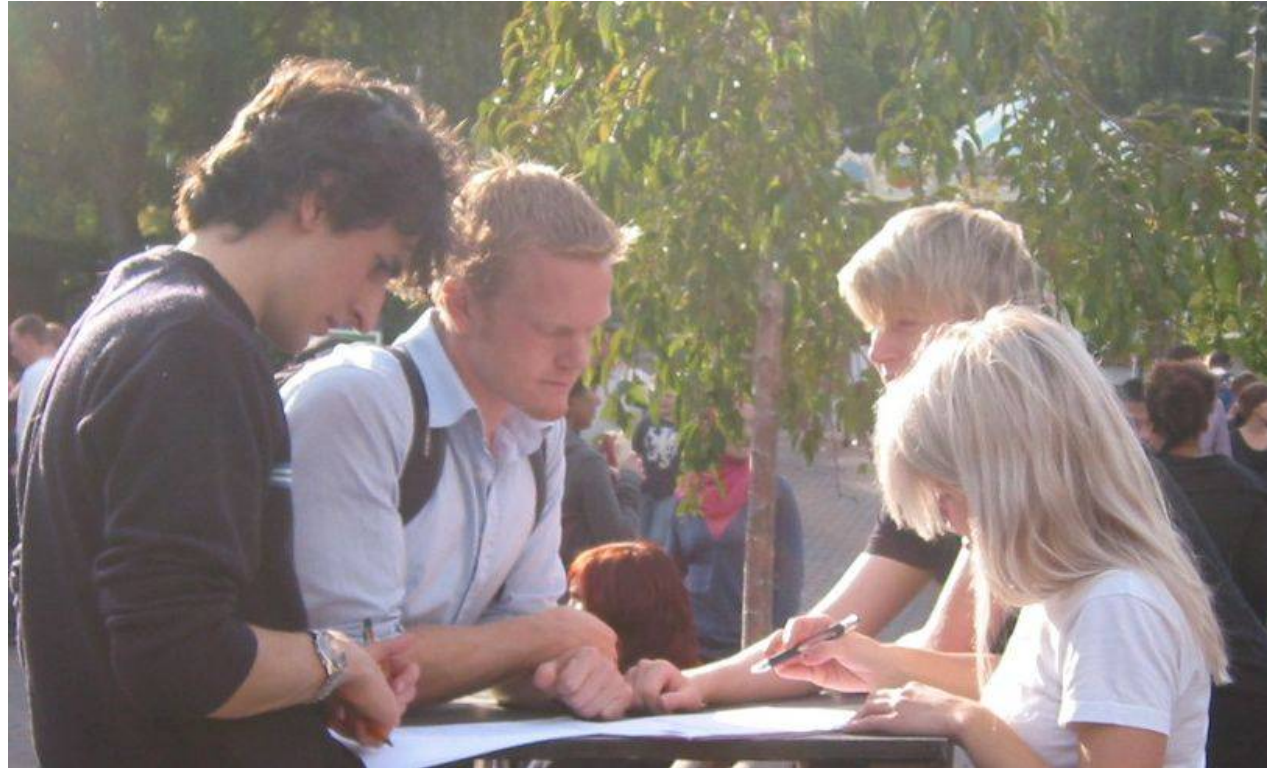
Groups

- Lekplatsfysik 539
- Förskola 299
- Gymnasium 142
- Tivolifysik 148

- Active since 1994
- More than 6000 answered and indexed questions



Learning?



"The one who learns most about a subject is the one who talks about it ... usually the teacher" (or IBSE?)

+

"Variation theory" (Marton): Experience a phenomenon in qualitatively different ways transferrable knowledge

Physics Bridge (start 2011)

9 universities with
networking schools (key teachers)

+ "Skolverket"



BUILDING RELATIONS

Physics Bridge, cont'd

- IYPT
- Project work,
- Amusement park activities
- ICT
- PER
- Diagnoses,
- "Physics 3"
- New curriculum topics, ...



Presentations +
small group discussions
+ forming work groups

Klein Days (Math), 2.5 days

- Each half day (2 days)
 - 1h: Klein Lecture
 - 1h Brain storming - teaching opportunities
 - 1h Summaries
- Last half day:
- Lesson planning in groups (2h)
- After: Carry out lessons
- Document + publish

- Lesson planning model: "5E"
 - Engage
 - Explore
 - Explain
 - Elaborat
 - Evaluate
- Supported by 2 "lesson pilots"



Network models

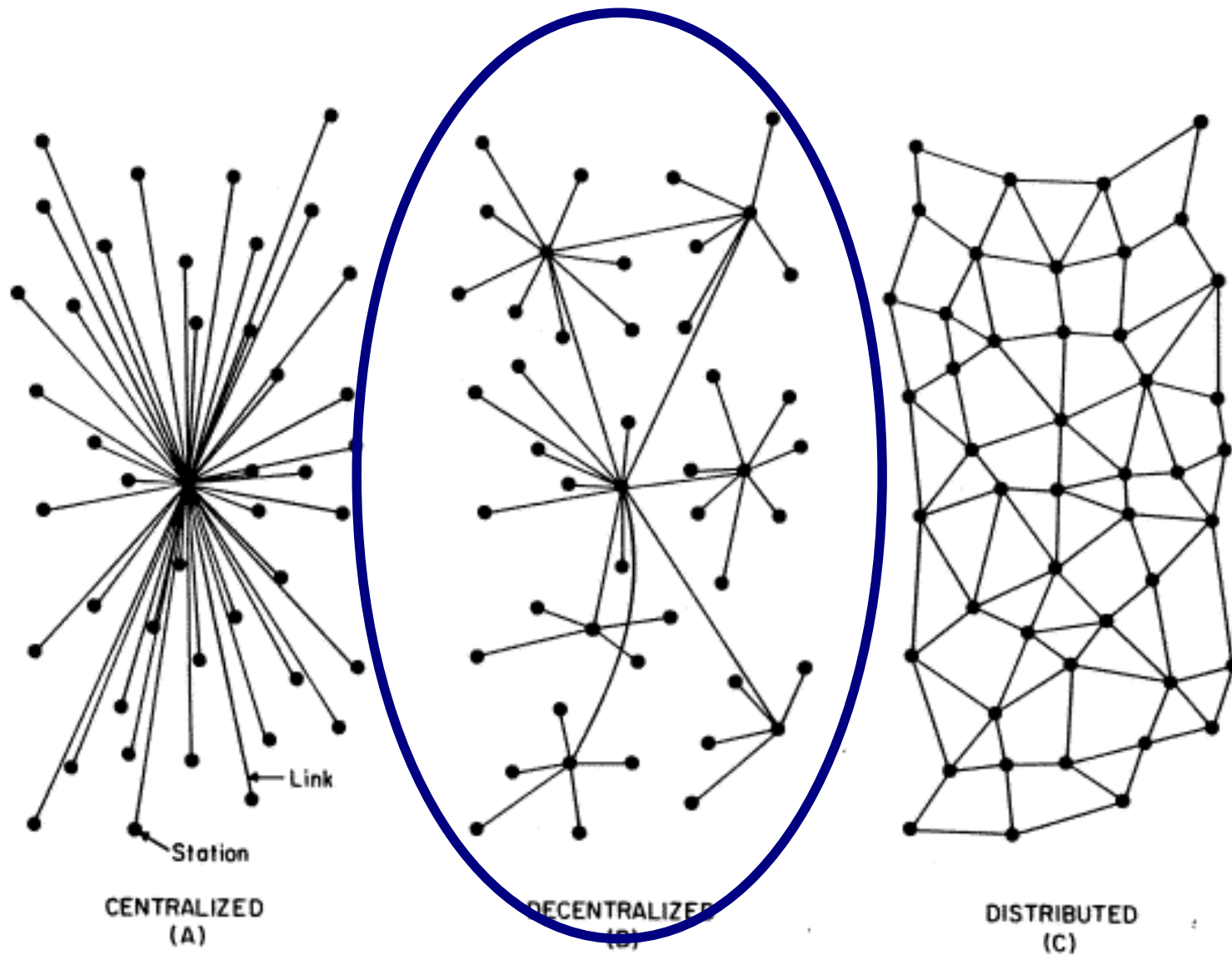


FIG. 1 – Centralized, Decentralized and Distributed Networks

Below follow slides intended for the follow-up discussion, but not shown

Aim for teacher program?

- CPD and support of teachers
- Help them maintain their enthusiasm
- Network with other teachers
- Empower teachers to teach about particle physics

Swedish CERN-scientists with teacher contacts

(organised or ad hoc?)

- LUND: Torsten, Joakim, Else, ...?
- Stockholm: Erik, Sten, Kerstin, Barbro, Sten,...
- Uppsala: ...
- Göteborg: Björn, Göran, Thomas, ...?
- Linköping

Swedish CERN Physicists - list?

Comments: I found the page

<http://international-relations.web.cern.ch/International-Relations/ms/se.html>

I think this could be complemented with direct link to the research group www-page

Engaging with the public

(Comment: Paths to outreach are personal, but coordination is helpful)

- (Visit to the Exploratorium with family, 1988)
- Participating in Gothenburg international Science festival, 1997 -
 - Amusement park physics (1995 -) 1999 -
 - "Modern" physics talk in town center
 - One-to-one in interrogation style room
 - Session coordinator
- Teacher CPD
- School contacts (project work, drama ... teacher networks)
- Physics/Science on Stage
- + Member of committee for funding Swedish Science Centres



Educational research?

- FontD - National graduate school in Sci.Ed. (one licentiate student, 80% looking into teachers perception of experiments)
- Chalmers: 2 teachers (80%) doing atomic physics education project
- CUL (GU) - two teachers (50%) looking into "teachers professional growth"
- LU proposal, "contemporary science in school"

<http://cul.gu.se>

<http://www.isv.liu.se/fontd/>

Curriculum (high school, from 2011)

Physics 1

- Energy, Energy resources
- Radiation

Physics 2:

- Waves, electromagnetism, signals
 - Structure and development of the Universe
- + "Nature of Science"

Curriculum links

- NRCF could possibly go through the CERN educational material (in Swedish, English, ...) and link it to different aspects of the high-school curriculum
- Possible workshop activity with teachers and someone from CERN involved in the discussions.
- Suggestions what to include would be appreciated

Role sharing

CERN

- Structure for visits
- Local organization
- Materials
- Contact point(s)
- Quality assurance of visit

Comment: I enclose a presentation from a Science Centre in Slovenia about their way of preparing young people to be "explainers" and do science shows.

NRCF (Possible roles)

- Information to teachers
- "Curriculum fit"
- EEEEE in material?
- Follow-up:
 - Evaluation
 - Arrange alumni network meeting

I need help to mail teachers and will send out draft questionnaire for review, before asking for help with mailing /A-M

Maximize Benefit/"Cost" (long term?)

Teachers prepare visit at home

- View introductory video
- Webinar with questions
- Masterclasses for teachers?

- With increased demand, you could require that teachers should have demonstrated previous commitment to be eligible for participation.
- This might decrease NUMBERS but increase impact

Evaluation - long-term impact ?

- HOW ?
 - We could set up a questionnaire
 - E-mail to previous participants?
 - Possible presentation in Fysikaktuellt asking for feedback
 - Coupled to invitation to future activities
- Questions ?
 - When did they participate?
What program
 - How organized? Financed?
 - Best memories?
 - What material have they used after?
 - Shared with colleagues?
 - Material developed?
 - Assessment of student learning and engagement?

Possibilities

- "V44" (last week of October)
- Week before Midsummer (strong competition)
- Possibly Thursday-Sunday
- Plan WELL ahead
- If possible: Arrange agreement with headmasters for teachers to have time for preparation and follow-up (later stage)

How do we continue?

- NRCF: Establish links
 - NRCF + Lennart,
 - NRCF+ Richard + IEDC
 - Agree on what is offered when and how to present it!
- Particle Physicists
 - Alert section in Fysikersamfundet on dates
 - Tord: Prepare letter to Dept. of Education (Mats Jonson), Who Signs and who supports?
 - (Question: What about Nuclear Physics)

CERN

- Contact points:
- Logistics at CERN - Mick Storr
- Program: Lennart Jirden
- Flexible program structure - no charge from CERN
- (Est. total cost per person: Travel, food, lodging: 800 CHF)

NRCF

- NRCF: Swedish Contact point: "Information and registration service"
- Article in Fysikaktuellt about Teachers' programs, including invitation + some data about previous SE participation
- Invitations through different channels
- Questionnaire (see suggestions above)