

# Norway and CERN

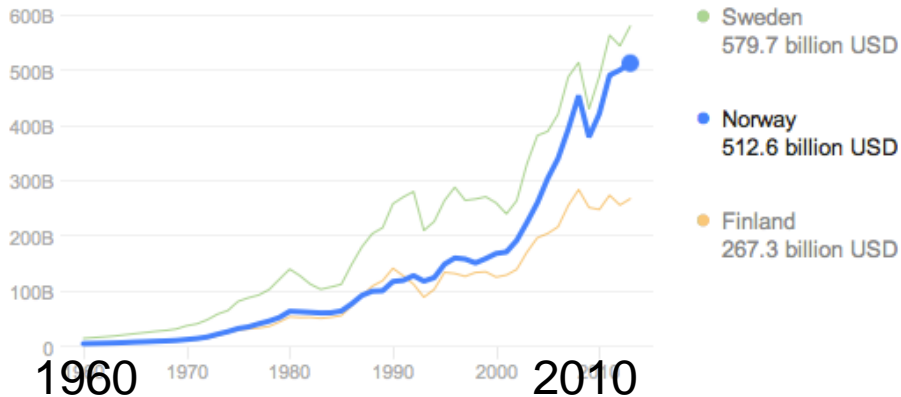
- Norway fun facts
- University system and numbers
- CERN users, staff and fellows
- Project resources (in general)
- Some key developments since 2009
- Summary

S. Stapnes (A. Read)  
R-ECFA visit to Norway  
U. Oslo, 2 October 2015

# Norway fun facts

## Norway / Gross domestic product

512.6 billion USD (2013)



Explore more

Sources include: World Bank

Feedback

### Norway GDP - Trading Economics

[www.tradingeconomics.com/norway/gdp](http://www.tradingeconomics.com/norway/gdp)

The Gross Domestic Product (GDP) in Norway was worth 500.10 billion US dollars in 2014. The GDP value of Norway represents 0.81 percent of the world ...



## Norway

Country in Europe

Norway is a Scandinavian country encompassing mountains, glaciers and deep coastal fjords. Oslo, the capital, is a city of green spaces and museums, including the Edvard Munch Museum and the Norsk Folkemuseum, a collection of open-air historic buildings. Preserved 10th-century Viking ships are displayed at the Vikingskipshuset. Norway is also known for fishing, hiking and skiing – notably at Lillehammer's Olympic resort.

### Related statistics

GDP per capita	100,818.50 USD (2013)
Population	5.084 million (2013)
GNI per capita	66,520 PPP dollars (2013)

Norway contributes ~2.6% of CERN membership fees  
(180 Mkr in 2011)



# University education in Norway

- Bachelor (3 y), Master (2 y), Ph.D (3-4\* y)

**Students in higher education, by category of educational institution<sup>1</sup>**

	2000/01	Per cent female	2013/14	Per cent female
<b>Total students</b>	<b>186 002</b>	<b>60.0</b>	<b>253 317</b>	<b>59.1</b>
Universities	69 195	55.3	105 628	57.1
Specialised institutions at university level	7 706	48.9	31 788	51.5
University colleges	84 880	65.9	93 440	64.4
National institutes of the arts	770	68.3	853	64.8
Norwegian Police University College	940	29.7	2 522	40.0
Military colleges	949	6.0	4 141	14.2
Private university colleges	21 562	56.7	14 945	71.2

<sup>1</sup> Norwegian students abroad are not included.  
Source: Statistics Norway.

<http://www.ssb.no/en/utuvh/>

Norwegian University of Life Sciences	Ås
Norwegian University of Science and Technology	Trondheim
University of Agder	Kristiansand, Grimstad
University of Bergen	Bergen
University of Nordland	Bodø
University of Oslo	Oslo
University of Stavanger	Stavanger
University of Tromsø	Tromsø

- Numerous University Colleges, some with good technology programmes
- UiO+UiB produce around 300-400 PhD/year
- (\*) 4yr with 25% teaching duty (typical)

# PhD education

- 4 years (8 semesters FTE)
  - 1 year teaching (2 semesters FTE)
  - Formal courses (30 st.p, 1 semester FTE)
  - \* Author qualification 80 days (1 semester FTE)
  - Research \* and OTP (shifts and/or other service) (4 semesters FTE)
  - All this multi-tasked
  
- More on this tough life in Steffen Mæland's talk end of the day

# Physics students – 1<sup>st</sup> choice BSc

	<b>UiO (*)</b>	<b>NTNU</b>	<b>UiB</b>
Places (2015)	90	50	45
2011	120	70	45
2012	116	85	46
2013	155	89	60
2014	179	75	57
2015	207	113	54
(*) Physics, Astronomy, Meteorology			



# High Energy Physics in Norway



Blue: Oslo, Bergen, Trondheim: Traditional Universities, the two first with experimental particle physics groups

Red: New Universities or University Colleges currently involved at CERN (offering up through master level). Some also involved in the ATLAS/ALICE experiments. Supply, with NTNU, all technical students at master level (10-12 yearly)

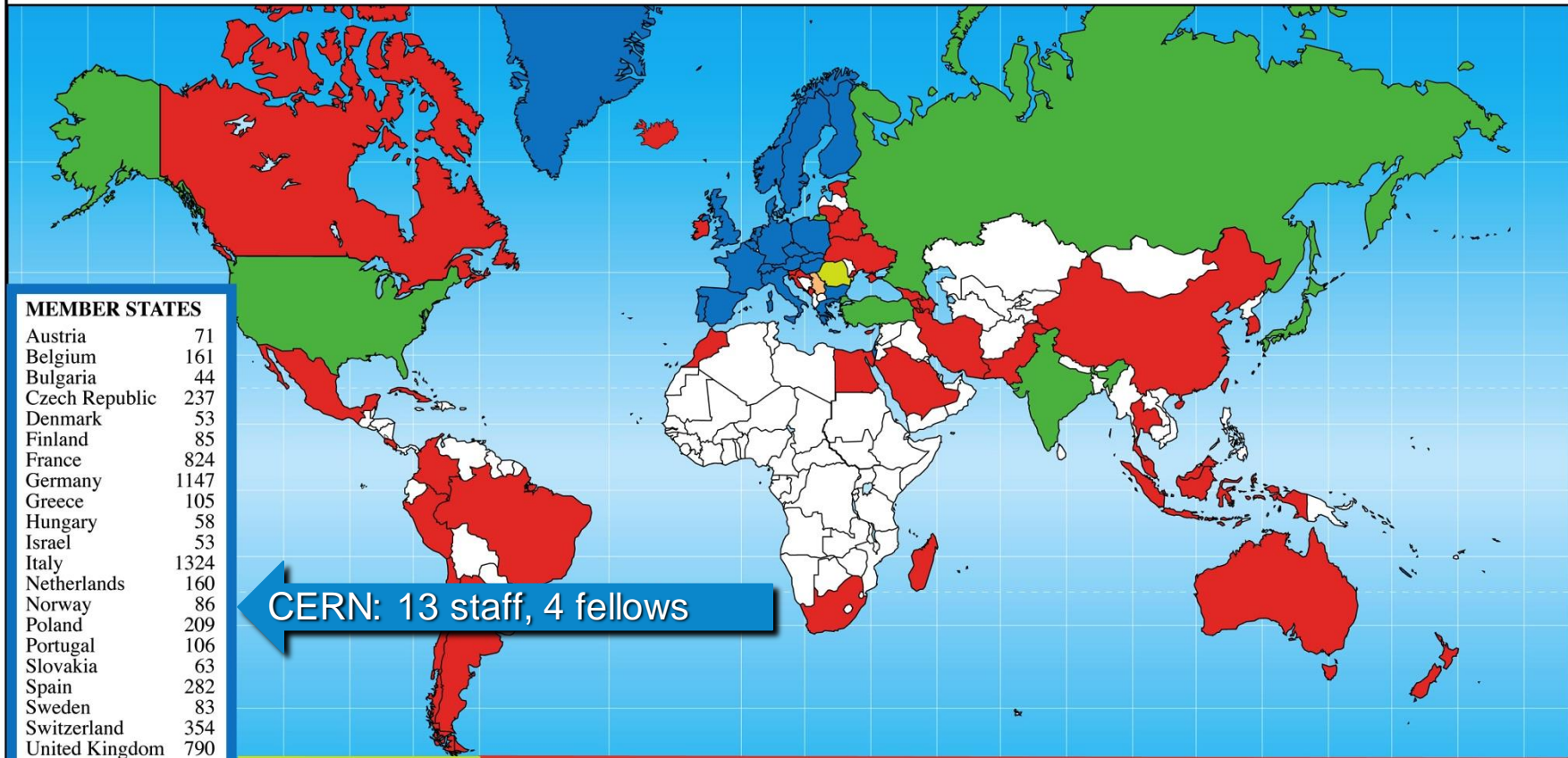
Today (2014) around 140 Norwegian researchers, engineers, postdocs, PhD students and master students are involved in the CERN activities:

- At CERN: Around 15 technical students at CERN in addition to the Norwegian staff (10-12 at master and ~5 PhD level)
- Around 90 Norwegian researchers (of all categories above) are registered as users travelling frequently to CERN
- The rest travel less frequently or work in Norway within the CERN-related research programmes



# CERN users (2014)

## Distribution of All CERN Users by Location of Institute on 15 September 2014



### MEMBER STATES

Austria	71
Belgium	161
Bulgaria	44
Czech Republic	237
Denmark	53
Finland	85
France	824
Germany	1147
Greece	105
Hungary	58
Israel	53
Italy	1324
Netherlands	160
Norway	86
Poland	209
Portugal	106
Slovakia	63
Spain	282
Sweden	83
Switzerland	354
United Kingdom	790

**6295**

### OBSERVERS

India	154
Japan	225
Russia	860
Turkey	122
USA	1672

**3033**

### CANDIDATE FOR ACCESSION

Romania	95
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### ASSOCIATE MEMBER IN THE PRE-STAGE TO MEMBERSHIP

Serbia	32
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### OTHERS

Argentina	17
Armenia	16
Australia	35
Azerbaijan	2
Belarus	22
Brazil	123
Canada	155
Chile	11

China	130
Colombia	14
Costa Rica	1
Croatia	23
Cuba	3
Cyprus	12
Egypt	22
Estonia	17
Georgia	12
Hong Kong	10

Iceland	4
Indonesia	7
Iran	17
Ireland	5
Korea	115
Lithuania	13
Madagascar	3
Malaysia	8
Mexico	53
Montenegro	1

Morocco	7
New Zealand	6
Pakistan	23
Peru	2
Saudi Arabia	1
Singapore	1
Slovenia	21
South Africa	35
Taiwan	76
Thailand	8

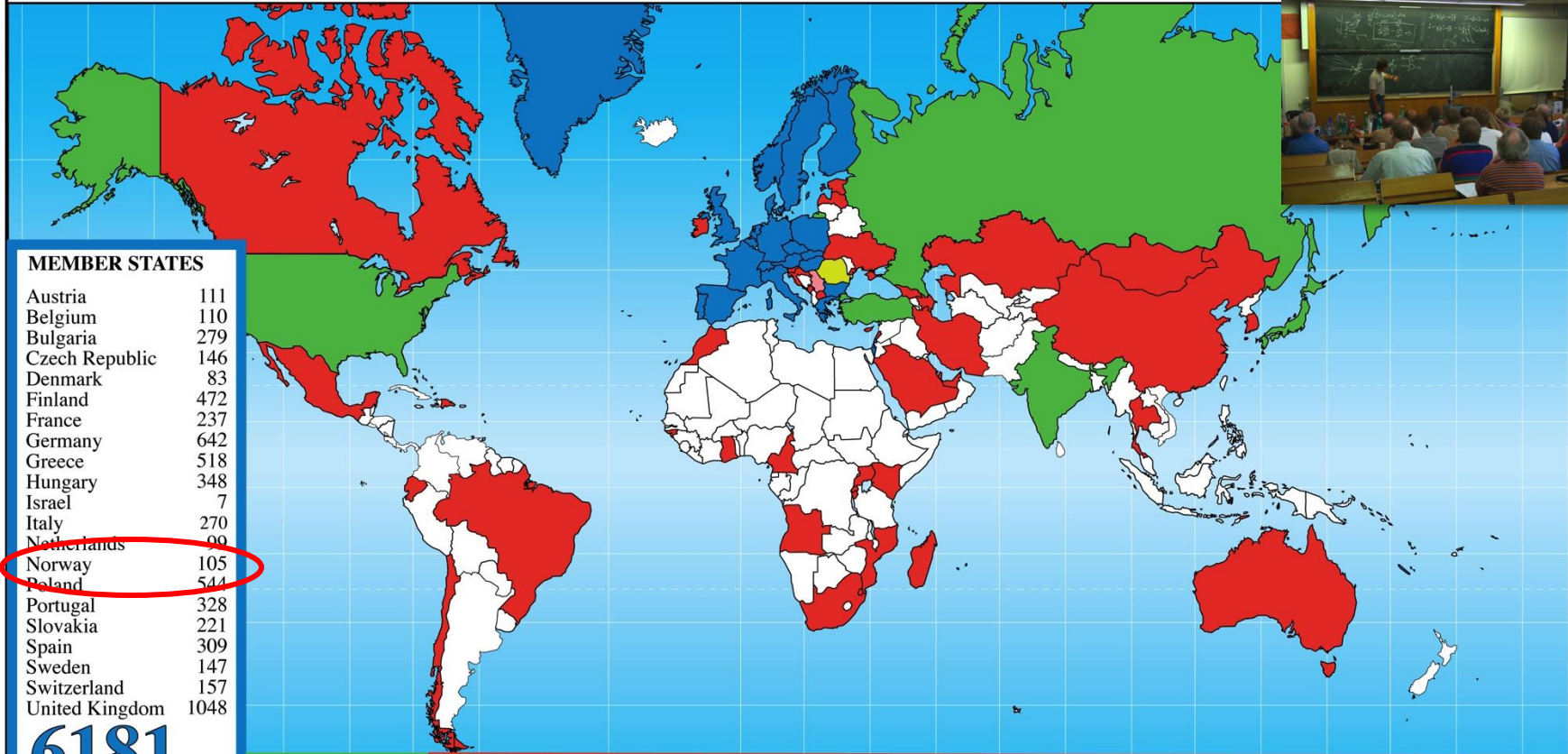
Ukraine	25
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**1056**



# CERN Teacher Programme

## Teacher Programme Participants 1998 - 2013 (Total: 7067)



### MEMBER STATES

Austria	111
Belgium	110
Bulgaria	279
Czech Republic	146
Denmark	83
Finland	472
France	237
Germany	642
Greece	518
Hungary	348
Israel	7
Italy	270
Netherlands	99
Norway	105
Poland	544
Portugal	328
Slovakia	221
Spain	309
Sweden	147
Switzerland	157
United Kingdom	1048

**6181**

### CANDIDATE FOR ACCESSION

Romania	12
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### ASSOCIATE MEMBER IN THE PRE-STAGE TO MEMBERSHIP

Serbia	14
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### OBSERVER STATES

India	2
Japan	5
Russia	193
Turkey	3
USA	65

**268**

### OTHERS

Angola	4
Australia	5
Azerbaijan	1
Brazil	114
Burundi	1
Cameroon	3
Canada	3
Cape Verde	3
Chile	3

China	1
Croatia	1
Cyprus	8
Dominican Rep.	21
Ecuador	2
Estonia	46
Georgia	74
Ghana	6
Guinea Bissau	1
Iran	1

Ireland	5
Kazakhstan	3
Kenya	4
Latvia	1
Lebanon	1
Madagascar	2
Malta	36
Mexico	6
Mongolia	1
Montenegro	13

Morocco	2
Mozambique	17
Qatar	1
Rwanda	17
Sao Tome	4
Saudi Arabia	1
Singapore	2
Slovenia	21
South Africa	6
South Korea	44

Swaziland	1
Thailand	7
T.F.Y.R.O.M.	11
Timor-Leste	7
Uganda	3
Ukraine	77
U.A.E.	1

**592**





# Resources and programme

- Universities supported by Research Council (RC) grants, the three main ones (ATLAS, ALICE, “Technology”) covering for now 2012-19
  - PhD grants from universities crucial
  - Typically 50-50 financing, migrating towards 70-30 (RC-U)
- Additional smaller projects (also the RC or FP7/Horizon2020 or other type of grants) – accelerator R&D, ISOLDE, AEGIS, etc
- All presented in the following talks
- Technology Project – CERN exploitation: Links to CERN master (next slide) or Ph.D programmes (Adli later), and covers also ILO/TTO (Nordahl later)

# Technical Students

- The Norwegian Technical student program is currently very successful with 10-12 bachelor/master students at CERN every year – from institutes outside traditional HEP/NP providing access to CERN from “everywhere”
- From an initial investment of support for 3-4 months the students are typically extended by CERN to 12 months, and even 14 months in some cases. The monthly cost is 3414 CHF
- The two Norwegian CERN staff members who have been doing most of the work have been Jens Vigen and Nils Høimyr, and they are willing to continue to promote the program. Jens Vigen leads the sub-project.
- Focus mainly on areas where we have Norwegian activities and/or staff (order arbitrary):
  - CLIC, AWAKE and accelerator technology in general, Information Technology, Information Systems, Technology transfer, Silicon sensors and electronics
- These students are prime candidates for later PhD grants at CERN

# Developments since last visit (2009)

- Staff in experimental particle physics (ATLAS and ALICE) renewed (Bugge, Stapnes, Løvholden, Skaali -> Sandaker, Roed, Postdoc)
- Staff increase in Nuclear Physics (Siem, Goergen)
- Increased activity related to astroparticle physics (see talks of Sandaker and Theory)
- Accelerator Physics (new position: Adli)
- Renewal in theory (Høgåsen, Eeg, Osland - > Raklew, Bringmann, Kersten)
- Permanent Researcher contracts (project-financed)
- Unfavorable exchange rate to CHF

# Exchange rate to CHF



01.2006

01.2009

01.2012

01.2015

01.2010



# Summary

- Many positive developments but two main problems on the table:
  - Financing of the LHC experimental upgrades, and without sacrificing all other parts of the programme
  - The Norwegian staff numbers at CERN