European Strategy for Particle Physics & Efforts Towards an ECR White Paper

Workshop on neutrinos@CERN
23 January 2025

Marvin Pfaff (Imperial College London)
on behalf of the EPPSU ECR input organisers
(esppu-ecr-organisers@cern.ch & marvin.pfaff21@imperial.ac.uk)

European Particle Physics Strategy Update

https://europeanstrategy.cern/

- **Cornerstone of Decision-Making**: Guides Europe's long-term future in particle physics.
- **Broad Community Input**: Developed through extensive consultation with the global particle physics community.
- **Previous Strategies**: Building upon decisions from previous strategies.
- **Status of the Field**: Consideration of recent advances and the international landscape of the field.
- **Promote Synergies:** Coordination with similar processes in the US and Japan.
- In **March 2024**, the CERN Council launched the process for the *3rd* **European Strategy Update**.

Previous Updates!

Focus of 3rd EPPSU

As declared in the ESG remit

The Strategy update should include the preferred option for the next collider at CERN and prioritised alternative options to be pursued if the chosen preferred plan turns out not to be feasible or competitive.

The Strategy update should also indicate areas of priority for exploration complementary to colliders and for other experiments to be considered at CERN and at other laboratories in Europe, as well as for participation in projects outside Europe.

The ESG should review and update the Strategy and add other items identified as relevant to the field, including accelerator, detector and computing R&D, the theory frontier, actions to minimise the environmental impact and to improve the sustainability of accelerator-based particle physics, the **strategy and initiatives to attract, train and retain the young generations**, public engagement and outreach.

Key Bodies of the EPPSU Process

- **CERN Council**: The highest authority of CERN, overseeing its activities and strategic direction.
- **European Strategy Group (ESG)**: A body set up by the CERN Council approximately every five years to establish the European Strategy which it submits to the CERN Council for approval.
- **Physics Preparatory Group (PPG)**: The body which prepares the scientific contribution to the work of the ESG (the “Briefing Book”), based on the input it gathers from the community and discussions within 9 working groups.
- **Strategy Secretariat**: The body which organises the whole process. This includes establishing a detailed plan, preparing the work of the ESG and PPG (organising their meetings and producing their documents) and handles the final submission to the CERN Council.

EPPSU Timeline and Structure

Input Guidelines

EPPSU Timeline and Structure

Input Guidelines

many possibilities for participation

EPPSU Timeline and Structure

many possibilities for participation

Input Guidelines

- Anyone can submit input to the strategy (31st of March)
  - Future collider communities, **ECFA*** countries, collaborations, …
  - And **Early Career Researchers (ECRs)** → White Paper
    - Focus on topics relevant to ECRs, not covered in topical WGs

ECFA Early-Career Researchers response to the 2020 Update of the European Strategy for Particle Physics

*** European Committee for Future Accelerators: https://ecfa.web.cern.ch/**

EPPSU Timeline and Structure

many possibilities for participation

Participate!

Input Guidelines

participation possible through input adaption

participation possible through input adaption

ECFA Guidelines for National Input

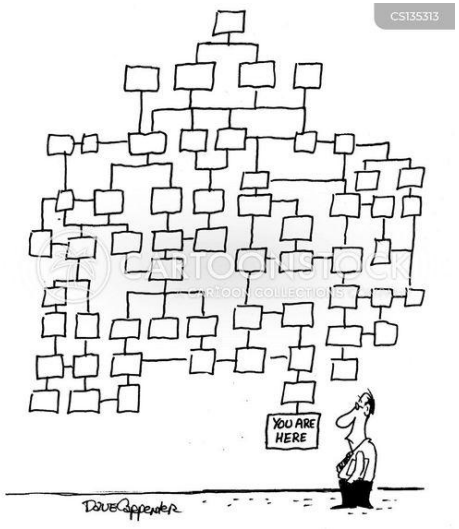
ECR White Paper Input to EPPSU

Initiated by **ECFA ECR panel**, but **open to all European* ECRs†**

***: Focus on ECRs employed in European institutes, but input beyond Europe appreciated**

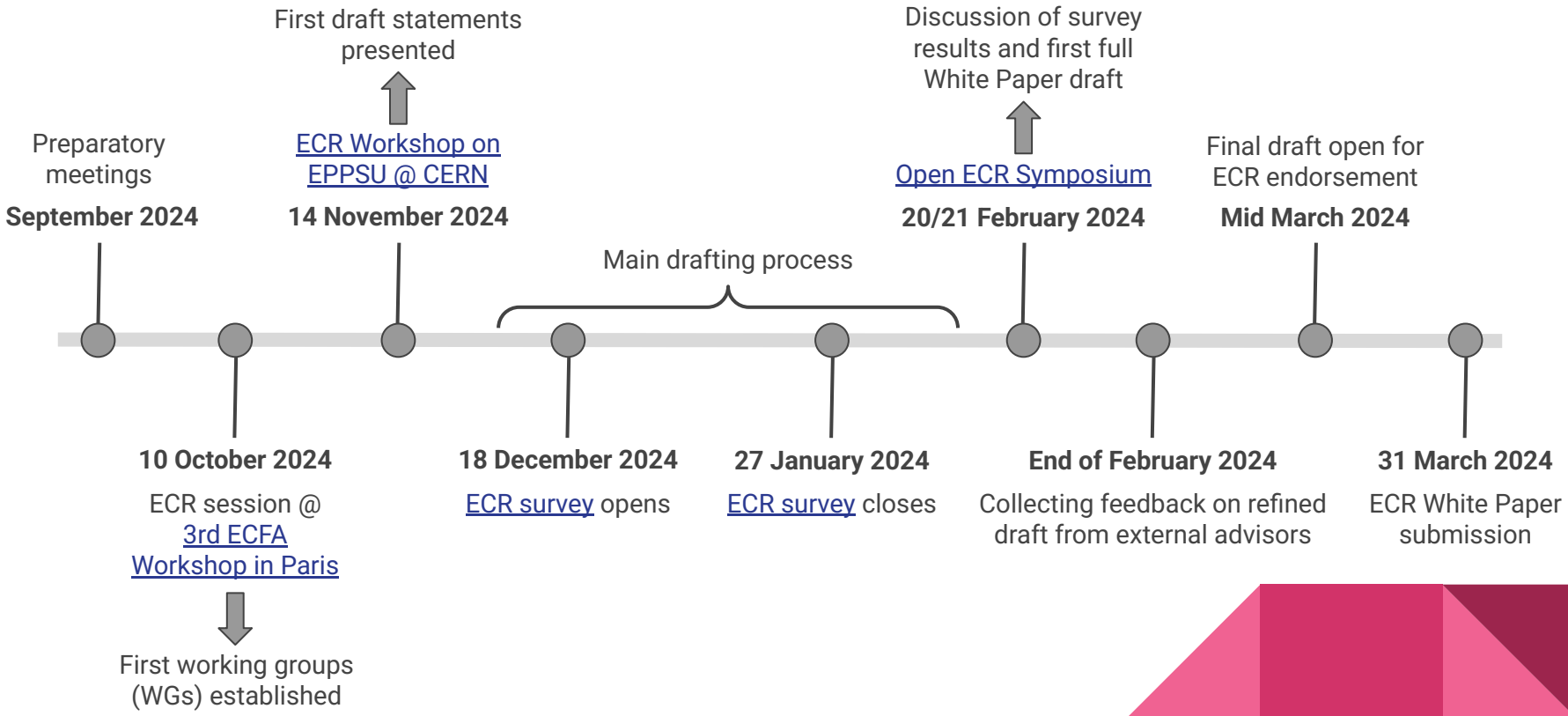
†: Non-permanent position or <10 years after PhD

- **Highlight ECR Challenges and Positive Aspects**: Document ECR difficulties and ensure they are considered in shaping the future of the field. Proposing recommendations for institutes, senior scientists, and funding agencies.

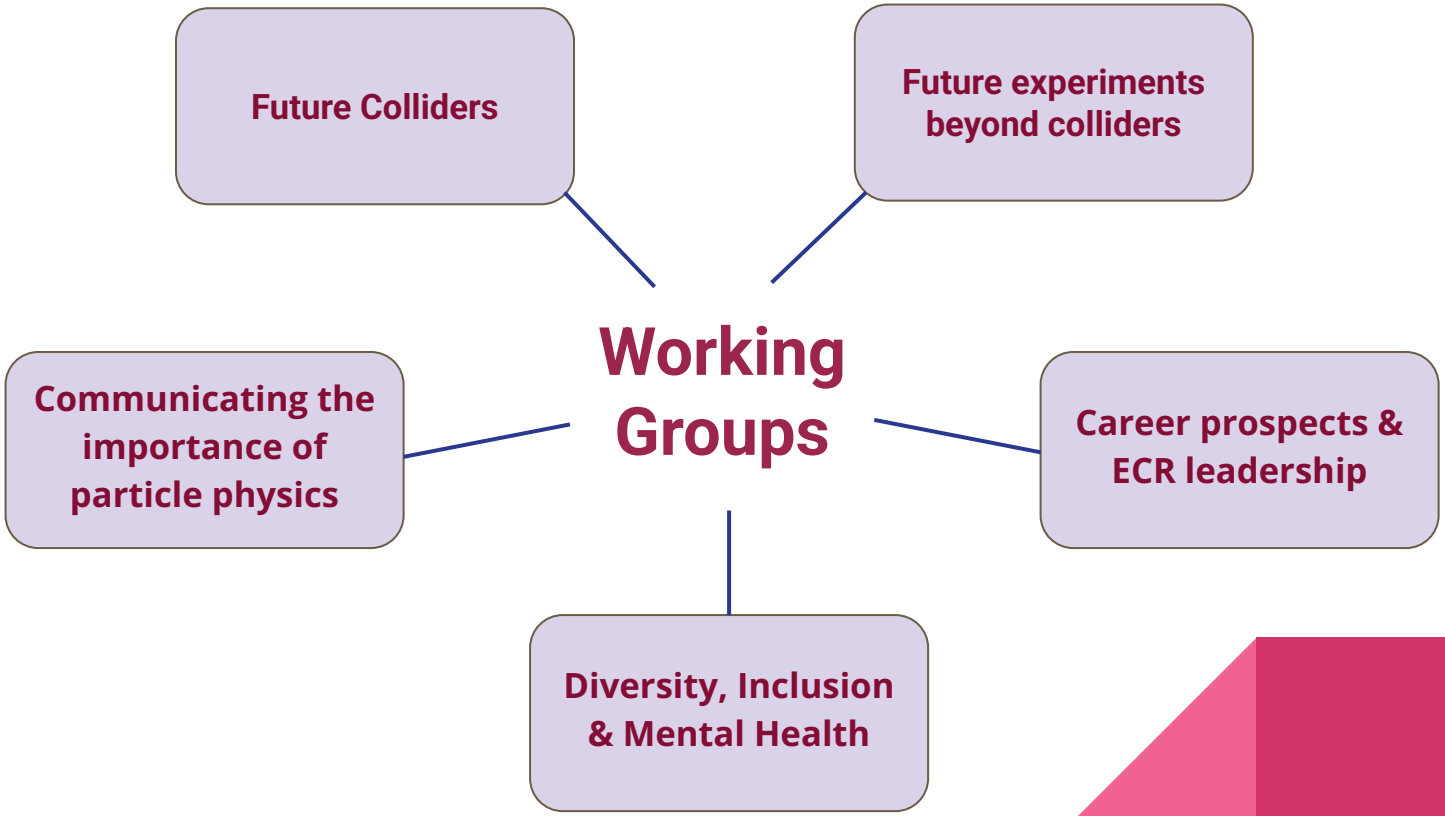


General spirit:
today's ECRs are tomorrow's leaders

Process towards ECR White Paper Input to EPPSU



Working Groups



Overview of Working Groups

Future Colliders

- **Input on Selection Criteria:** Define essential criteria for selecting a future collider.
- **Proposal ranking:** Query preference of collider proposals and related questions.
- **Significance:** Emphasise the importance of a future collider, especially for ECRs.
- **Process transparency:** Advocate for a transparent selection and decision-making process.

Future experiments beyond colliders

More on this later!

Overview of Working Groups

Communicating The Importance of Particle Physics

- **Valued Communication Skills:** Communication skills are as important as technical expertise in the field.
- **Mentorship Program** linking senior researchers down-to high school students.
- **Raising Awareness** of current work and future projects.
- **Broad Outreach:** target audiences from university students to the general public.

Diversity, Inclusion and Mental Health

- **Healthy Research Career:** Focus on work-life balance, mental health, inclusion, and supportive supervision.
- **Career Support Needs:** Push for centralized mental health services, as well as family and DEI support centers.
- **Monitoring Progress:** Encourage periodic surveys to assess mental health and DEI issues and ensuring institutions address them.

Overview of Working Groups

Career prospects and ECR leadership

Career

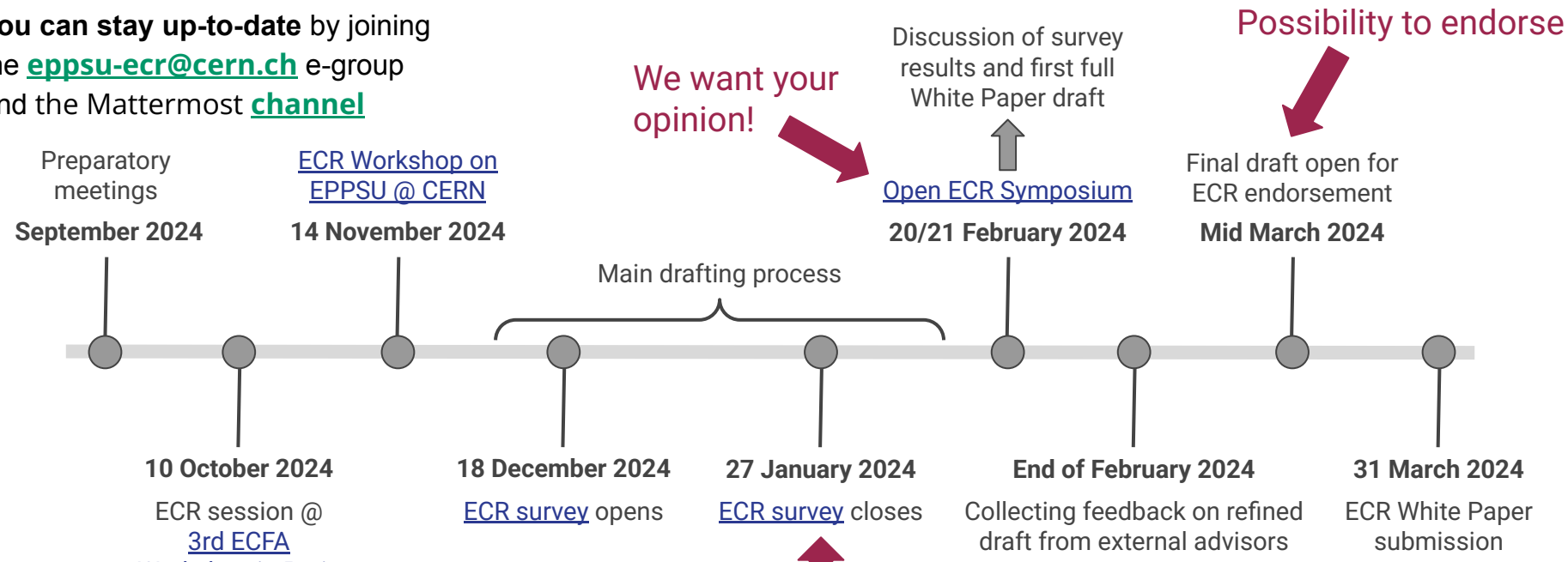
- **Appealing Career Paths** by providing clearer paths to permanent positions and enhancing job security.
- **Training for Versatile Skills** relevant to both academic and industry roles.
- **Career Insights for Undergraduates:** Provide statistics for informed PhD decisions.
- **Ease of Transition** for engineers and technical experts into HEP.
- **Relocation Considerations** for temporary roles and support mobility challenges.
- **Mentorship by Senior Academics** to guide ECR career development.
- **Dedicated Time** to pursue projects beyond main duties.

ECR Leadership and Funding

- **Inclusive Decision-Making:** Engage ECRs in key decisions and major events**.**
- **Acknowledge** ECR contributions and **involve them** in EPPSU preparations.
- **Dedicated Funding** for ECRs activities.

Process towards ECR White Paper Input to EPPSU

You can stay up-to-date by joining the **eppsu-ecr@cern.ch** e-group and the Mattermost **channel**



Every voice matters!

The Role of Neutrino Physics & other Beyond Collider Physics in the European Strategy Update

Previous EPPSU

Historically collider dominated process as this area constitutes a large part of the community and CERN's flagship activities. But the beyond-collider community is growing and was part of the last Strategy Updates as well:

- **Neutrino Physics:** One paragraph in main body and side note in Preamble.
  →Allowed for the expansion of the Neutrino Platform and key activities within several neutrino experiments.

- **Other Beyond-collider Physics:** One paragraph in main body shared between dark matter, flavour physics and fundamental symmetries (including collider programme thereof) with one sentence highlighting experiments complementing the energy frontier. Also side note about flavour puzzle in Preamble.
  (The Physics Beyond Collider Study Group emerged from the 2016 EPPSU.)

- **Nuclear & Astroparticle Physics** (often considered *neighbouring fields*)**:** One paragraph each in main body.

This EPPSU

- **ESG remit** puts *significant weight on plan for beyond-collider physics*
- **ECFA guidelines** for national inputs and respective guiding questions *focus predominantly on CERN's next flagship project*
- **PPG working group (WG) restructuring** *beneficial (at least) for neutrino and dark matter physics*

WGs of 2nd EPPSU:

- Social and career aspects for the next generation
- Issues related to Global Projects hosted by CERN or funded through CERN outside Europe
- Relations with other groups and organisations
- Knowledge and Technology Transfer
- Public engagement, Education and Communication
- Sustainability and Environmental impact

WGs of 3rd EPPSU:

- Electroweak physics
- Strong interaction
- Flavour physics
- BSM physics
- Neutrino physics and cosmic messengers
- Dark matter and dark sector
- Accelerator science and technology
- Detector instrumentation
- Computing

now topical WGs & ECR Scientific Secretaries!

Beyond-Collider Community

- **Diverse community:** From neutrino physics to EDM searches covers a vast range of physics
- Many **small collaborations**
- This brings **many benefits**, e.g.:
  - Dynamic environment with broad expertise & shorter timescales
  - Many chances to take responsibilities as ECRs
- But also **many challenges**, e.g.:
  - Scattered & disjoint community
  - ECRs often have to take responsibilities

ECR Draft Statements of the Beyond-Collider WG

Note: phrasing will be changed

- It is important that beyond-collider experiments and activities maintain a prominent role in the European particle physics landscape.
- In particular, the EPPSU should pose concrete recommendations for the different beyond-collider subfields to underline their role, allow for the procurement of funding, and give researchers a notion of security.
- A concrete plan for particle physics in Europe between major collider programmes will also help to retain expertise.
- The utilisation of smaller laboratories and institutes, also within other domains, should be continued to produce excellent particle physics research all around Europe.
- Cross-disciplinary collaboration should be further encouraged and facilitated between particle physics and neighbouring fields, e.g. astroparticle physics and nuclear physics.

ECR Draft Statements of the Beyond-Collider WG

Note: phrasing will be changed

- A dedicated career support programme should be initiated for researchers from beyond-collider experiments, who face unique challenges to ease the transition between different experiments and sub-fields.

- The establishment of a forum for the European beyond-collider community to facilitate networking, collaboration, and career opportunities would bring significant exchange and knowledge transfer between different experiments and other benefits to their researchers such as the dedicated career support mentioned previously.

- Beyond-collider experiments oftentimes face challenges regarding the development and maintenance of outreach programmes due to limited resources. Therefore, a dedicated support framework for such activities should be created to help these experiments share their exciting science with the general public and increase the visibility of the broad diversity within particle physics.

Any questions or comments?

Let’s discuss!

Thank you for participating!

Let's chat more in R1!

Is there anything that we as neutrino (ECR) community need?

Process towards ECR White Paper input to EPPSU

Initiated by ECFA ECR panel, but **Open to all European* ECRs†**

- **September 2024: Preparatory Meetings for the EPPSU Input**
  - ➢ Discuss the process and explore initial ideas on potential topics to address
- **October 10th, 2024: ECR session @ 3rd ECFA Workshop in Paris (~55 participants)**
  - ➢ Engage the ECR community and encourage contributions to the ECR White Paper
  - ➢ Identify *key topics* for the White Paper
  - ➢ Establish *Working Groups* to address the most important issues
  - ➢ **Outcome:** ECRs need *stable funding* and *career certainty* for their professional growth, a *timely decision* on future colliders and a focus on *sustainability*
- **Oct-Nov 2024:** 2-3 meetings per WG since the event in Paris

*: Focus on ECRs employed in European institutes, but input beyond Europe appreciated

†: Non-permanent position or <10 years after PhD

Process towards ECR White Paper input to EPPSU

- **Nov 14th, 2024: ECR Workshop on EPPSU @ CERN** adjacent to the 115th Plenary ECFA meeting
  - Introductions from Individual WGs, Draft Statements presentation and subsequent discussions
  - Parallel sessions for each WG

Up to 35 people at CERN, 56 people on Zoom

Introduction	*Armin Ilg*	
40/S2-D01 - Salle Dirac, CERN		09:00 - 09:20
WG: Communicating the importance of particle physics	*Abdelhamid Haddad*	
40/S2-D01 - Salle Dirac, CERN		09:20 - 09:50
WG: Future Colliders	*Leonhard Reichenbach*	
40/S2-D01 - Salle Dirac, CERN		09:50 - 10:20
Workshop photo		
40/S2-D01 - Salle Dirac, CERN		10:20 - 10:25
Coffee break		
40/S2-D01 - Salle Dirac, CERN		10:25 - 10:50
WG: Future particle physics experiments beyond colliders	*Dr Alexander Burgman et al.*	
40/S2-D01 - Salle Dirac, CERN		10:50 - 11:20
WG: Interplay with neighboring fields	*Dr Alexander Burgman*	
40/S2-D01 - Salle Dirac, CERN		11:20 - 11:50
WG: Career prospects and ECR leadership	*Jan Franciszek Klamka*	
40/S2-D01 - Salle Dirac, CERN		11:50 - 12:20
Discussion about scope of WGs	*Emanuela Musumeci et al.*	
40/S2-D01 - Salle Dirac, CERN		12:20 - 12:40
Summary and next steps	*Krzysztof Mekala*	
40/S2-D01 - Salle Dirac, CERN		12:40 - 13:00

Parallel WG Meetings		
CERN		14:00 - 16:00
Informal ECR discussion	*Krzysztof Mekala et al.*	
40/S2-D01 - Salle Dirac, CERN		16:00 - 17:30
Open Networking in R1		
R1, CERN		17:30 - 19:00