

2020 Review of the

NuPECC

Nuclear Physics European Collaboration Committee

EXPERT COMMITTEE

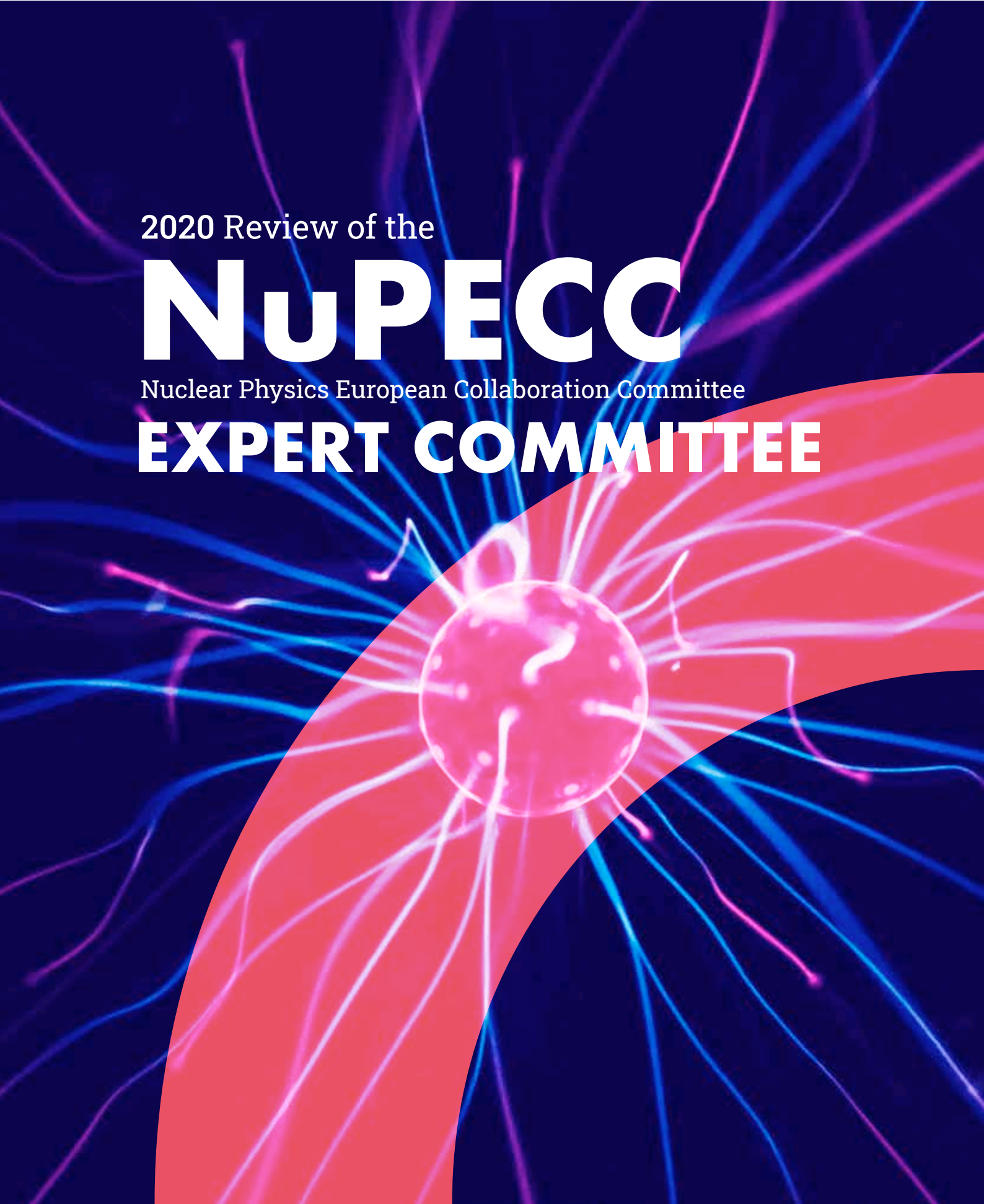


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Introduction

The Nuclear Physics European Collaboration Committee (NuPECC -www.nupecc.org) is an expert committee established in 1988 and hosted by the European Science Foundation (www.esf.org) since 1991.

NuPECC aims at developing the strategy for European cooperation in nuclear science by supporting collaborative ventures between research groups within Europe, and promoting nuclear physics and its trans-disciplinary use in applications for societal benefit.

The committee is composed of representatives from 21 European countries as well as representatives from five research institutions, three non-European associated members, and 9 permanent observers (see Appendix 1).

The scientific domain of NuPECC includes hadron physics and phases of strongly interacting matter; nuclear structure & reactions; nuclear astrophysics; symmetries & fundamental interactions; as well as some applications of nuclear physics.

In achieving its mission, NuPECC aims at:

- providing advice and making strategic recommendations to funding agencies and decision-making bodies;
- defining a network of complementary facilities and research activities within Europe and encouraging optimisation of their usage;
- providing a forum for discussions on the provision of future facilities, research activities and instrumentation;
- contributing to public education and awareness.

Over the past 30 years, NuPECC has produced five Long Range Plans (LRPs, the most recent in 2017) aiming to providing integrated prospective views on European nuclear physics. The committee also produces the Nuclear Physics News journal, published quarterly since September 1990.

Over the past years, NuPECC has been very active in pursuing its objectives. In 2019, the European Science Foundation set up a review panel of four experts (see Appendix 2) with the mandate of reviewing the activities of NuPECC over the period 2014-2020.

This panel was specifically asked to comment on the activities and achievements of NuPECC and to provide recommendations for the next period, taking into account the NuPECC mandate as well as the European and global research landscape (for the Review Panel Terms of Reference, see Appendix 3).

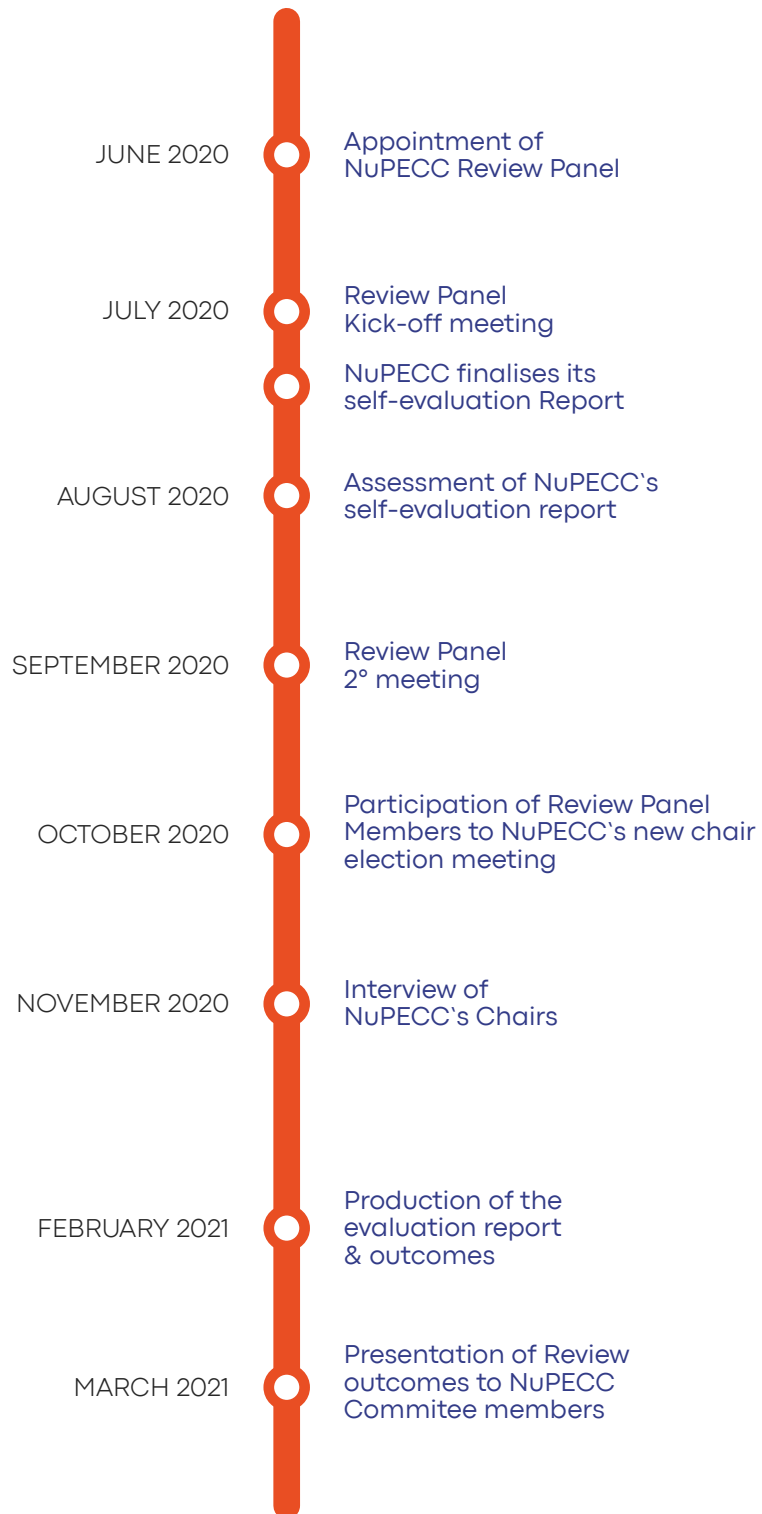
The review was based on a thorough self-evaluation report provided to the Review Panel in July 2020, the participation of panel members in the Autumn 2020 NuPECC plenary meeting, and an interview of the current and past committee chairs, current vice-chair, and executive scientific secretary.

The Review Panel met for the first time on 16 July 2020 and held subsequent meetings on 25 September, 15-16 October (in connection with the NuPECC plenary meeting), 30 November, and 5 January 2021.

This report presents the Panel's consensual findings on NuPECC's profile and activities. It also contains a number of recommendations.

The Review Panel would like to thank the leadership of NuPECC for all their hard work on the review, for the high quality of the materials provided to the Review Panel, informative presentations, and for their excellent responses to requests for additional information.

Review Process Timeline





1. NuPECC membership and related interactions

Membership

The membership of NuPECC is institutionally defined (see below). It is nevertheless very important that it reflects all aspects of the broadly understood field of nuclear physics.

⇒ *The Review Panel recommends that the European nuclear physics community continues to revisit the broad range of the field at the time of each LRP and that NuPECC aligns its membership with the updated scope.*

Receiving feedback from funding agencies and reporting to funding agencies are both core activities of NuPECC.

⇒ *The Review Panel recommends that NuPECC develops a mechanism to ensure that its members appointed as representatives of funding agencies are (i) acquainted with the agencies' positions and (ii) maintain back-and-forth communication.*

The addition of ESFRI (European Strategy Forum on Research Infrastructures) Large Scale Facility members to the Committee is seen as a positive step. NuPECC intends to extend this to other ESFRI facilities with a sizeable nuclear physics component

⇒ *The Review Panel recommends an institutional membership for CERN, which is an important host to various nuclear physics activities at ISOLDE, ALICE, other LHC experiments, and the AD. In addition, the membership of ILL, PSI, and other multipurpose large-scale facilities with a sizeable nuclear physics research component should be considered.*

⇒ *The Review Panel recommends that NuPECC develops mechanisms to ensure that all its members adequately contribute to NuPECC's programmatic activities.*

Relation with funding agencies

In the course of the reviewed period, NuPECC has spoken directly to some of the funding agencies on the implementation of the LRP in the framework of the 'Task Force' mechanism.

⇒ *The Review Panel finds this a good practice; it helps to strengthen understanding of the role of nuclear physics in the member countries. The Review Panel recommends broadening this practice.*

Coupling to the community

Connection with the community comes to the fore when formulating the LRP.

⇒ *In this respect the work of NuPECC is excellent, and is arguably its most important activity. The journal of NuPECC (Nuclear Physics News) and its website are excellent communication vehicles to maintain links with the community (See item 3, Dissemination and Outreach).*

NuPECC Member Organisations





2. Relation with external bodies

Over the past decade, NuPECC has developed or strengthened connections with various institutions within and outside Europe.

Sister bodies

In the past years NuPECC has developed links and joint actions with ECFA (European Committee for Future Accelerators - <https://ecfa.web.cern.ch/>) and ApPEC (European Astroparticle Physics Committee - <https://www.appec.org/>). These committees have reciprocal observer status. They also host joint seminars, issue joint calls for expressions of interest on fields of common interest and produce joint position statements. They also contribute to their respective long-range strategy planning efforts.

⇒ *The Review Panel congratulates NuPECC on this very visible effort aiming at broadening the scope of the field and recommends reinforcing the coordination of ambitious joint scientific goals and projects. This should be driven by the community, with the approval of funding agencies.*

Nuclear Physics of Large-Scale Infrastructures

NuPECC Large-scale infrastructure members, of which four are on the ESFRI roadmap, are treated on the same footing as funding agencies and research organisations supporting the Committee as they also appoint NuPECC members. In addition, they actively contribute to the activities of the LRP Task Force in particular, when meeting with national programme managers.

⇒ *The Review Panel encourages the increase in interactions with large scale infrastructures. NuPECC's expertise can contribute to solving problems, making sure that sufficient support is provided to Large-scale facilities and that the community is offered adequate access. However, this approach could result in too much emphasis being put on efforts around large-scale infrastructures, especially when compared to research at smaller facilities and theory centres. Clearly, the right balance must be found.*

NuPECC was successful in developing links with ESFRI and with the European Commission's services. In particular, its advisory role in the area of proposal review has had a strong impact.

⇒ *The Review Panel recommends that NuPECC continues offering expert advice on nuclear physics, for instance, to a forum of funding agencies under the umbrella of the European Commission.*

Other European Organisations

NuPECC has developed links with the European Physical Society (EPS), especially the Nuclear Physics Division (NPD) of EPS. NPD sends an observer to NuPECC meetings, and NuPECC has an observer status at the EPS NPD Board meeting. Joint actions have been undertaken. Since its inception, NuPECC has been hosted by the European Science Foundation. This should continue, enhancing mutual benefits.

Beyond Europe

NuPECC has three Associated Partners outside Europe: iThemba Labs in South Africa, RIKEN Nishina Center in Japan, and Israel. These Associated Partners appoint representatives to NuPECC who provide regular updates on their activities.

⇒ *In addition to associated membership, the Review Panel acknowledges that NuPECC should continue to maintain close contact with its corresponding organisations in the USA (NSAC, the Nuclear Science Advisory Committee of the Department of Energy and of the National Science Foundation), in Canada (CINP, the Canadian Institute of Nuclear Physics), in Asia (ANPhA, the Asian Nuclear Physics association), and in South America (ALAFNA, the Association of Latin American Nuclear Physics and Applications).*

Through the membership of the present and past NuPECC Chairs in Working Group 9 of the International Union of Pure and Applied Physics (IUPAP), NuPECC is strongly involved in the discussion on nuclear physics affairs worldwide. It is worth noting that NuPECC has developed contacts with the IAEA (International Atomic Energy Agency) and was invited to contribute to NSAC Long-Range Plan meetings.

⇒ *Overall, NuPECC is well integrated into the worldwide nuclear physics landscape. In addition, it has even developed numerous interdisciplinary links.*



3. Dissemination and Outreach

Outreach and dissemination activities pursued by NuPECC are designed to engage a large audience and to bring knowledge and expertise on Nuclear Physics and its applications to the scientific community and the general public.

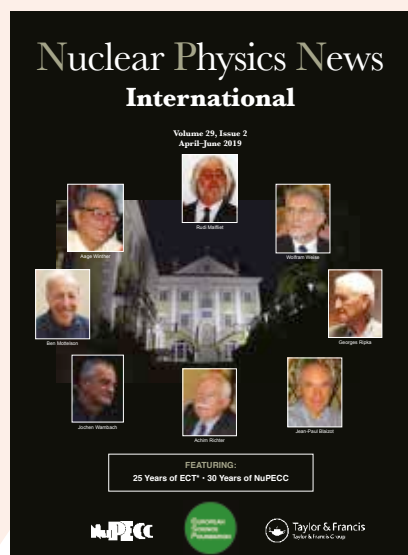
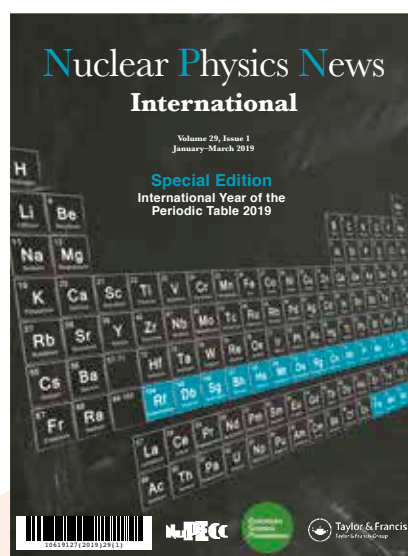
The NuPECC website forms the central hub that contains all information on its organisation, activities and publications in a recently refurbished and topically-extended format.

⇒ *The Review Panel appreciates the comprehensive and well-maintained communication platform provided by the NuPECC website.*

The quarterly publication Nuclear Physics News', with its regular and special issues, has been established by NuPECC over the past 30 years as a well-known and well-managed source of information for and from the Nuclear Physics community worldwide, addressing interested scientists from various fields, stakeholders and decision makers.

⇒ *NuPECC is encouraged to further develop this successful media tool by, for example, sharpening its topical profile by producing focused issues on a regular basis.*

Promoting nuclear physics and its transdisciplinary use in applications for societal benefits is one of the grand missions of NuPECC. The picture of nuclear physics would not be complete without various applications of nuclear techniques emerging from basic research and contributing to society. Following the route successfully pursued by NuPECC with the topical report and brochure on [Nuclear Physics for Medicine \(2014\)](#), and the brochure [Light to reveal the heart of matter \(2015\)](#), the Review Panel strongly supports the anticipated Special Report on *Nuclear Physics in Everyday Life*.



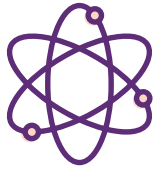
Moreover, besides informing experts and the general public, NuPECC should take an active part in coordinating the diverse national activities of applied nuclear physics on the European level. In order to further strengthen public awareness of Nuclear Physics, NuPECC, together with the Nuclear Physics Board (NPB) of the EPS, maintains the PANS initiative (Public Awareness of Nuclear Science) with the objective of coordinating and stimulating a European-wide network for communicating easily accessible information on achievements, techniques and diverse applications of nuclear physics to the general public. A PANS-dedicated part of the [NuPECC website](#) is maintained, it comprises information and learning materials that are provided by different organisations and collaborations.

⇒ *The Review Panel acknowledges the commitment of the PANS Board to coordinate ongoing activities and encourage new ones (like Nuclear Physics Masterclasses). Nonetheless, the Panel believes that more already-existing activities could be made visible to wider audiences, and new partners could contribute to PANS.*

⇒ *The Review Panel encourages NuPECC to consolidate its PANS activities by, for example, looking for new contributors and structuring the website according to the various subject groups. Increasing the number of PANS Board members from NuPECC (and NPD) could be a means to activate new resources and contribute to increasing the participation of NuPECC members in programmatic activities.*

Complementing PANS activities, the [NUPEX \(Nuclear Physics Experience\) website](#) provides educational material on Nuclear Physics for the classroom and general public, made available in recent years in (so far) 13 languages. Constant topical updates and amendments (e.g. sections on particle accelerator and detector technologies, key references for teachers, etc.) of this excellent platform are strongly encouraged.

⇒ *The Review Panel recommends that NuPECC's outreach activities be more connected to other initiatives worldwide, thus forming a coherent global outreach effort.*



4. Impact of NuPECC on the European Nuclear Physics landscape

By far the most important and visible activity of NuPECC is the definition and production of Long-Range Plans (LRP) –key instruments in establishing future directions in nuclear physics.

The LRP reports, led and coordinated by NuPECC, are developed by the whole European nuclear physics community. The last LRP report [NuPECC Long Range Plan 2017: Perspectives for Nuclear Physics](#) contains a set of recommendations related to the different research areas followed by a description of large and smaller facilities, both existing and planned, as well as various new initiatives.

The role of the LRP report in shaping the European nuclear physics agenda cannot be overstated: these well-disseminated reports are used by both the community and funding agencies. Equally important is the LRP process that is crucial for community building purposes.

⇒ *The Review Panel commends the completion of the influential NuPECC LRP 2017 report. It also strongly supports the current plan to organise the next LRP that will define a vision for nuclear physics in the next decade.*

As in other areas of science, nuclear physics uses an 'observation–theory–prediction–experiment' cycle of the scientific method to investigate phenomena, build knowledge and define future research. Such an approach guides the relationship between theory and experiment: theory is modified or rejected based on new experimental data, and the improved theory can be used to make predictions that guide future measurements and observations. Consequently, in order for the field to prosper, healthy nuclear theory is absolutely essential.

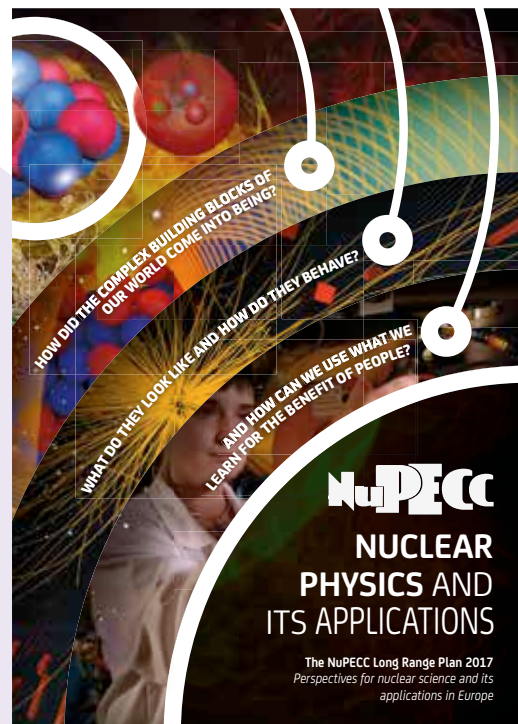
In this context, the European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*) in Trento, the only European infrastructure solely devoted to nuclear theory, plays a key role in incorporating theoretical efforts and fostering connections between theory and experiment. One of the major activities of NuPECC is to make sure that ECT* prospers. The NuPECC Chair is a member of the ECT* Scientific Board and the ECT* Director reports on the Centre's activities at NuPECC meetings. ECT* and its activities are presented in the NuPECC LRP report as of paramount importance for nuclear physics in Europe.

⇒ *The Review Panel is very concerned about the recent budgetary uncertainties of ECT*, especially in view of the relatively low cost of running the Centre when compared to the budgets of large experimental infrastructures. The Review Panel appreciates the fact that NuPECC is working actively on improving the situation and is taking all necessary efforts to help ECT*. The Review Panel strongly supports the anticipated survey of nuclear theory in Europe, and of the role of ECT* in the overall landscape of nuclear physics.*

Positive feedback in the cycle of the scientific process can be enhanced if advanced statistical methods, machine learning and artificial intelligence tools as well as computational methodologies (including quantum computing) are applied.

- ⊕ *The Review Panel recommends that NuPECC encourages partnerships between nuclear physics and applied mathematics, statistics, and computer science. This could be done by, for example, issuing a special report.*
- ⊕ *The Review Panel appreciates the broad scope of NuPECC's agenda. Its activities involve large-scale and smaller-scale European infrastructures and research facilities; experiments; theory and applications; building new knowledge; and evolution of the scientific landscape, especially in the context of interdisciplinary areas.*

To implement the agenda described in the LRP and to support emerging activities, the NuPECC Task Force meets periodically with representatives of funding agencies of various European countries, European bodies, IUPAP, and international sister organisations and entities, etc. The Review Panel strongly supports such meetings as they are crucial for the recognition of the overall LRP strategy.





5. Feedback from NuPECC leadership on the review report and Acknowledgments

The NuPECC management, as well as the whole committee, thanks the evaluation panel for its time and efforts in preparing a thorough review of our work carried out in the last six years.

We appreciate the overall positive assessment by the review panel, which we regard as fair and well justified. The resulting suggestions for improvements contained in the review will be considered and implemented to the best degree possible.

Many of these findings and suggestions are indeed likely to improve the work and visibility of NuPECC in the future. As such, the review process has been very fruitful.

NuPECC thanks the ESF-Science Connect for the excellent organisation of the evaluation process.

NUPECC CHAIR

Prof. Dr.
Marek
Lewitowicz

NUPECC DEPUTY
CHAIR

Prof. Dr.
Eberhard
Wildmann

NUPECC SCIENTIFIC
SECRETARY

Dr. Gabriele
Elisabeth
Körner

29 March 2021

Appendix 1 NuPECC Representatives and Members

Representatives from Funding Organisations	Country	Acronym	Organisation
ALVES Eduardo	Portugal	FCT	Fundaçao para a Ciêncica e a Tecnologia
BRACCO Angela	Italy	INFN	Instituto Nazionale di Fisica Nucleare
COURTIN Sandrine	France	IN2P3	Institut national de physique nucléaire et de physique des particules
Jens-Jørgen GAARDHØJE	Denmark	NICE	National Instrument Center for CERN Experiments
GÖRGEN Andreas	Norway	RCN	The Research Council of Norway
GOMEZ CAMACHO Joaquin	Spain	CSIC/CNA	Consejo Superior de Investigaciones Cientificas / Centro Nacional de Aceleradores
GREENLESS Paul	Finland	AKA	Academy of Finland
HARISSOPOULOS Sotirios	Greece	NCSR	National Centre for Scientific Research
HERZBERG Rolf-Dietmar	United Kingdom	STFC	Science and Technology Facilities Council
IRELAND Dave	United Kingdom	STFC	Science and Technology Facilities Council
JOHANSSON Tord	Sweden	VR	Vetenskapradet
KALANTAR-NAYESTANAKI Nasser	The Netherland	FSSC	Rijksuniversiteit Groningen Financial Shared Service Centre
KRUSCHKE Bernd	Switzerland	SNF	Schweizerischer Nationalfonds
LEIFELS Yvonne	Germany	HGF	Helmholtz-Gemeinschaft Deutscher Forschungszentren
MAJ Adam	Poland	PAN	Polska Akademia Nauk
MEISSNER Ulf-G	Germany	HGF	Deutsche Forschungsgemeinschaft
NEYENS Gerda	Belgium	FWO/FNRS	Fonds voor Wetenschappelijk Onderzoek / Fond National de la Recherche Scientifique
To be identified	Croatia	RBI	Rudjer Boskovic Institute
NAPPI Eugenio	Italy	INFN	Instituto Nazionale di Fisica Nucleare
SABATIE Franck	France	CEA	Commissariat à l'énergie atomique
SNELLINGS Raimond	The Netherlands	NIKHEF	Nationaal instituut voor sbatomaire fysica
STRÖHER Hans	Germany	HGF	Helmholtz-Gemeinschaft Deutscher Forschungszentren
URSU Ioan	Romania	CNCSIS	Consiliul National al Cercetarii Stiintifice din Invatamantul Superior
VENHART Martin	Slovakia	SAS	Slovak Academy of Sciences
WAGNER Vladimir	Czech Republic	NPI	Nuclear Physics Institute of the Czech Academy of Sciences
WIDMANN Eberhard	Austria	ÖAW	Österreichische Akademie der Wissenschaften
WOLF György	Hungary	MTA	Hungarian Academy of Sciences

Institutional Members			
WAMBACH Jochen	Italy	ECT	European Centre for Theoretical Studies in Nuclear Physics and Related Areas
GIUBELLINO Paolo	Germany	FAIR	Facility for Antiproton and Ion Research
LEWITOWICZ Marek	France	GANIL-SPIRAL2	Grand Accélérateur National d'Ions Lourds
SHARKOV Boris	Russia	JINR	Joint Institute for Nuclear Research
POPESCU Lucia	Belgium	MYRRHA	Multi-purpose hYbrid Research Reactor for High-tech Applications
Associated Members			
AZAEZ Faiçal	South Africa		iThemba Labs
SAKURAI Hiroyoshi	Japan		Nishina Center RIKEN
TSERRUYA Itzhak	Israel		Israel (Weizman)

Appendix 2 NuPECC Review Panel members

CHAIR
**Dr. Michel
Spiro**

President of IUPAP (International Union of Pure and Applied Physics)
Chair of the Steering Committee for the proclamation of the International
Year of Basic Sciences for Sustainable Development in 2022
Former President of CERN Council (2010-2013)
France

MEMBER
**Prof. Witold
Nazarewicz**

John A. Hannah Distinguished Professor
Chief Scientist, FRIB
Dept. of Physics and Astronomy and FRIB/NSCL
Michigan State University
USA

MEMBER
**Prof. Peter
G. Thirolf**

Department f. Physik der LMU
Ludwig-Maximilians-Universität München
Germany

MEMBER
**Prof. Hans
Wilschut**

Professor emeritus
van Swinderen Institute
University of Groningen
The Netherlands

Appendix 3

Review Panel Terms of Reference

The International Review Panel's tasks will be to review the Nuclear Physics European Collaboration Committee (NuPECC) hosted by ESF.

The ESF office will provide coordination and secretarial support to the Review Panel and the implementation process. The point of contact for the Review Panel is M. Nicolas Walter, Chief Executive.

The evaluation of NuPECC shall:

1. Be conducted by an independent review panel of 4 Experts (3 European and 1 non-European)
2. Be based on a self-evaluation report produced by the Committee, NuPECC Terms of Reference, other relevant documents and additionally collected information,
3. Cover the period 2014-2019,
4. Involve an interview of the Committee Chairs (Angela Bracco from 2014-2018 and Marek Lewitowicz from 2018-2019) and Executive Secretary,
5. Take into account the wider context of the European and global research system in which NuPECC and ESF operate.

The International Review Panel will:

1. Comment on the achievements of NuPECC over the period;
2. Consider the strategies, activities and operations of NuPECC in the light of its missions;
3. Provide recommendations on the strategies, activities and structure of NuPECC that will be appropriate to allow the Committee to further to fulfil its missions.
4. Meet remotely as needed, including a physical meeting to interview NuPECC's Chairs at ESF offices in Strasbourg, France mid-November 2020. Remote participation to this meeting will also be possible.

The findings and recommendation from the Review Panel will be compiled into a report that will be addressed to the NuPECC Chair, NuPECC Member Organisations and ESF Executive Board.

It is expected that the review report will be ready by February 2021.

Composition of the international Review Panel:

The international review panel will be composed of 4 Experts (3 European and 1 non-European) including the following 4 broad areas of research:

1. Hadronic Physics and Strongly Interacting Matter
2. Nuclear Structure, Reaction Dynamics and Nuclear Astrophysics
3. Symmetries and Fundamental Interactions
4. Applications of Nuclear Physics

The review panel will include one theoretician and one expert of large-scale nuclear physics infrastructures.

About ESF-Science Connect

The **European Science Foundation-Science Connect** (ESF-SC) is a non-governmental, internationally oriented, non-profit association established in France in 1974. ESF-SC is committed to promoting the **highest quality science in Europe** to drive progress in research and innovation.

ESF-SC implements high-quality, independent science operations on the European Research Area. It partners with its members and diverse institutions by leading **successful projects** and facilitating informed decision-making through a broad range of science support partnerships:

- Research Project Grant Evaluation,
- Coordination of European project and funding programmes
- Administration of scientific platforms.



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