

American Nuclear Society

# Reactor Physics Division

## Summer 2021 Newsletter

### Officers

Florent Heidet – Chair  
fheidet@anl.gov

Amanda.Lang – Vice-Chair  
amanda.lang@duke-energy.com

Matt Jessee – Treasurer  
jesseema@ornl.gov

Chris Perfetti – Secretary  
cperfetti@unm.edu

Todd Palmer – Past Chair  
palmerts@ne.orst.edu

### PHYSOR 2022 News



Join us for PHYSOR 2022 in Pittsburgh, Pennsylvania! Check out the PHYSOR Call for Papers at the end of this newsletter!

For more information visit:  
<https://www.ans.org/meetings/physor2022/>

### A Message from the Chair

Florent Heidet  
fheidet@anl.gov

Dear RPD members,

Almost two years ago I started serving as the chair of our division. Then, I was going to focus our efforts on promoting and growing our division, working on bridging the gap between YMG and our division, strengthening coordination with the rest of ANS and continuing supporting advancements in our field. While the RPD leadership team and I worked towards those objectives, we also had to divert some of our focus to deal with immediate situations such as the reorganization of ANS as a whole and the impact on the professional divisions, and thereafter the COVID situation which forced all of us to learn new ways to go about our activities.

Despite it being a challenging couple years for everybody, we have seen great opportunities shaping up and more than ever I am personally excited for the future. With so many new reactor designs and construction plans in the making, this will lead to significant growth in our field. From gaining validation data, to developing new methods and tools to better support emerging technologies, we ought to stand ready to tackle these new opportunities. I am entirely confident that the RPD leadership team in place will continue making RPD the catalyst for promoting advances in our field!

As a final note, I would like to remind you that you are RPD, not just the leadership team. Your input, suggestions and involvement with the division are essential in ensuring that the division keeps delivering on the needs and expectation of all members. You should always feel free to reach out to any of the RPD officers and are strongly encouraged to participate in the RPD Executive Committee and Program Committee meetings taking place at each ANS meeting. I hope to “see” you all at the upcoming ANS meeting this month, and hopefully in person later in the year!

Florent Heidet, RPD Chair

## Advanced Reactor Spotlight:

### Oklo Inc.'s COL Application Accepted for Review by the Nuclear Regulatory Commission



In 2020, the privately funded startup Oklo Inc. became the first advanced fission company to have its combined license application accepted for review by the U.S. Nuclear Regulatory Commission (NRC). This historic acceptance marks a transformation in how advanced reactors can be evaluated and licensed within the regulatory framework developed for large light-water reactors.

Currently, Oklo is in the process of developing a fast microreactor that uses metallic fuel, allowing for long core lifetimes with

minimal refueling. The application detailed a flexible siting methodology which will allow microreactors to be installed in a broad variety of different sites without requiring significant site characterization. Furthermore, Oklo's use of a maximum credible accident methodology and analysis approach led to the utilization of novel approaches to transient and event analyses, which are well suited to the passive and inherent safety characteristics of microreactors.



### Oklo's Aurora powerhouse design concept, which has been accepted for review by the NRC.

This license application demonstrates that advanced fission technology can be developed efficiently and cost-effectively, which is critical for the broad application and adoption of nuclear technology in the future.

## Reactor Physics Standards

Dimitrios Cokinos

cokinos1@outlook.com

RPD Standards Committee Chair

For the past 15 months the Standards Subcommittee (ANS-19) and its working groups have been meeting virtually due to COVID-19. Below is a summary of ANS-19 activities during the past six months:

### ANS-19.1, Nuclear Data Sets for Reactor Design Calculations

This standard has been revised, published and is available for purchase as an American National Standard, ANSI/ANS-19.1 (2020). This standard is in the process of being proposed for adoption as an international (ISO) standard.

### ANS-19.3, Steady State Neutronic methods for Power Reactor Analysis

With the revision completed, the revised draft has been circulated among the Working Group for review and approval.

The next step is review and balloting by ANS-19.

### ANS-19.3.4, Thermal Energy Deposition Rates in Nuclear Reactors

This standard has been revised and the draft is ready to move ahead in the ANS-19 review process. It is a complex standard as it involves a complicated set of atomic physics, nuclear physics and reactor physics calculations. The current draft contains an Appendix which is particularly useful for the user.

### ANS-19.6.1, Reload Startup Physics Tests for PWRs

This standard has been revised in 2019, was approved and published and begins its new five-year life span. It is a widely used standard by utilities in the U.S. and abroad.

### ANS-19.10, Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals

This standard was reaffirmed in October 2016. The revision is nearing comple-

tion. An expanded working group has produced a draft which is about to be submitted to ANS-19 for review.

### ANS-19.11, Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Water Reactors.

Revised in 2017 and due for action in 2022.

### ANS-5.1, Decay Heat Power in Light Water Reactors

An extended revision has been completed. This area has been identified by the National Nuclear Data Center (NNDC) as the most important activity in preparation for the next international release of the NNDC's ENDF/B-VIII.1 cross section library.

## INTERNATIONAL STANDARDS ORGANIZATION (ISO)

Three ANSI/ANS standards have been adopted by ISO as international standards: ANSI/ANS-19.1, ANSI/ANS-19.6.1 and ANSI/ANS-19.10.

## Program Chair's Report

Pavel Tsvetkov  
tsvetkov@tamu.edu  
RPD Program Chair

Even though the global pandemic seems to be going away into history books, the ANS Annual 2021 meeting is still being organized and held as a virtual meeting. This meeting is being built on the strong foundation of the two successful virtual meetings in 2020, Annual and Winter. We are looking forward to see our division members and guests virtually. The reactor physics division maintains significant presence at the conference with 32 papers in 7 standing and special sponsored and co-sponsored sessions. There are sessions on advancements in reactor physics methods, reactor design innovation, emerging advanced reactors for terrestrial and space applications. In each of our sessions, speakers come to present their cutting-edge research and to discuss the state-of-the art reactor physics advances for current and emerging nuclear systems. We would like to recognize our three panels focused on Versatile Test Reactor, Machine Learning and Artificial Intelligence in Reactor Physics and Design, and on Education in Criticality Evaluations and Reactor Physics. Experts from industry, national labs and academia are coming together as panelists to discuss successes and frontiers in these areas.

## Technical Sessions:

- Monday, June 14, 1:00 pm, Reactor Physics: General – I
- Monday, June 14, 3:15 pm, Reactor Analysis Methods – I
- Wednesday, June 16, 2:15 pm, Reactor Physics Design, Validation & Operational Experience
- Wednesday, June 16, 2:15 pm, Reactor Physics of Advanced Reactors – I
- Wednesday, June 16, 2:15 pm, Reactor Physics: General – II
- Wednesday, June 16, 4:30 pm, Reactor Physics of Advanced Reactors – II
- Wednesday, June 16, 4:30 pm, Reactor Analysis Methods – II

## Panel Sessions:

- Tuesday, June 15, 12:00 pm, Machine learning & Artificial Intelligence in reactor physics & design
- Tuesday, June 15, 2:15 pm, Education in Criticality Evaluations and Reactor Physics
- Wednesday, June 16, Versatile Test Reactor - Current Developments

The ANS 2021 Winter Meeting Call for Papers seeks contributions for 20 panels and technical sessions. The meeting is planned to be in-person and will be held in Washington DC, November 30 – December 4. We are looking forward to seeing everyone there.

## RPD Program Committee

### 2018 – 2021

- Andrea Alfonsi
- Liangzhi Cao
- Brandon Haugh
- Dan Kotlyar
- Alex Levinsky
- Ben Betzler
- Benjamin Collins
- Abdalla Abou Jaoude
- Vefa Kucukboyaci
- Zeyun Wu

### 2019 – 2022

- Scott Palmtag
- Massimiliano Fratoni
- Yunlin Xu
- Paolo Balestra

### 2021 – 2023

- Ching-Sheng Lin
- Jason Hou
- Tian Jing
- Wei Shen
- Benjamin Betzler
- Blair Bromley
- Zeyun Wu
- Abdalla Abou Jaoude
- Vladimir Sobes
- Vefa Kucukboyaci
- Rike Bostelmann
- Eva Davidson

## Introducing our incoming RPD Secretary: Dr. Shane Stimpson



Since July 2020, Dr. Shane Stimpson has been employed as a nuclear engineer at BWX Technologies, Inc. (BWXT) focusing on developing computational capabilities for reactor design. Prior to joining BWXT, Dr. Stimpson worked at ORNL as staff member of the Reactor Physics Group, primarily working in the Consortium for Advanced Simulation of Light Water Reactors, serving as the ORNL lead developer of MPACT, the primary deterministic neutron transport code in the Virtual Environment for Reactor Applications. He

holds a BS from Georgia Tech, MSE/PhD from Michigan, and an MBA from Illinois. He has more than 60 publications in journals and conference proceedings including several at PHYSOR and within RPD sections at National Meetings, earning an RPD Best Paper Award at the 2018 Winter Meeting. Additionally, he has served in multiple leadership roles in the Oak Ridge/Knoxville local section of the American Nuclear Society.

## Executive Committee

### (Terms Expiring June 2021)

Nicholas R. Brown  
nbrown49@utk.edu  
Stephanie A. Kempf  
sakempfne@gmail.com  
Dave J. Kropaczek  
kropaczekdj@ornl.gov  
Zach McDaniel  
mcdanizb@westinghouse.com

### (Terms Expiring June 2022)

Nathan J. Roskoff  
roskofnj@gmail.com  
Pavel V. Tsvetkov  
tsvetkov@tamu.edu  
Alireza Haghighat  
haghighat@vt.edu  
Hyung Jin Shim  
shimhj@snu.ac.kr

### (Terms Expiring June 2023)

Zeyun Wu  
zwu@vcu.edu  
Christophe Demaziere  
demaz@chalmers.se  
Paul Romano  
promano@anl.gov  
Luiz Leal  
luiz.leal@irsn.fr  
Benjamin Betzler  
betzlerbr@ornl.gov

### (Terms Expiring June 2024)

Jason Hou  
jason.hou@ncsu.edu  
Andrew Osborne  
osbornea@mines.edu  
Steven J. Douglass  
steven.douglass@unnpp.gov  
Ville Valtavirta  
ville.valtavirta@vtt.fi  
Sterling M. Harper  
sterlingmharper@gmail.com

## RPD Trivia: 6/14 at 7pm

Join us for some fun trivia and networking on Monday, June 14th at 7:00pm ET with your host, the marvelous Chris Perfetti!

There's no need to form a team in advance - sign on and we'll give you all of the instruction that you need!

You can join the meeting at:

<https://us02web.zoom.us/j/82266260139?pwd=RDQ3MGIcZzB4c-DZneFI5MzY4T0lzZz09>

Meeting ID: 822 6626 0139  
Passcode: 779993

## Newsletter Prepared By:

Chris Perfetti  
cperfetti@unm.edu  
RPD Secretary



Chris is an Assistant Professor at the University of New Mexico whose research interests include sensitivity and uncertainty analysis methods, Monte Carlo methods, reactor physics, criticality safety, radiation transport and shielding, and isotope production. In his spare time he enjoys hiking, cycling, swing dancing, brewing beer, and puns.

## Scholarships

Benoit Forget  
bforget@mit.edu  
RPD Scholarships Chair

The reactor physics division is proud to announce the winners of our RPD sponsored scholarships. The recipient of the Rudi J.J. Stamm'ler award is Timothy Kiefer of North Carolina State University. Also, exceptionally this year, we have two recipients for the Allan Henry / Paul Greebler award: William Dawn of North Carolina State University and Gavin Ridley of the Massachusetts Institute of Technology. Congratulations to all the recipients!

## Honors & Awards

Dimitrios Cokinos  
cokinos1@outlook.com  
RPD Honors & Awards Comm. Chair

### EUGENE P. WIGNER REACTOR PHYSICIST AWARD

RPD members are invited to submit nominations for the Eugene P. Wigner Reactor Physicist Award. The deadline for nominations is April 1st, 2022, and nomination forms and a list of past winners are available through the ANS Headquarters..

### EARLY CAREER REACTOR PHYSICIST AWARD

This relatively new RPD award is intended to honor the contributions of reactor physicists who at the time of nomination are thirty-nine years of age or younger. Nomination forms may be obtained from the ANS headquarters and the deadline for nominations is August 1st, 2021.

The 2020 winner of this award is Benjamin Betzler of ORNL. Dr. Betzler will deliver his ECRP Lecture during the opening RPD technical session "Reactor Physics - General I" on Monday afternoon starting at 1:00 pm EDT. The RPD Honors and Awards Committee congratulates Dr. Betzler for his accomplishments.

## Treasurer's Report

Matthew Jessee  
jesseema@ornl.gov  
RPD Treasurer

The 2021 RPD financials were received from ANS in April 2021, providing the status as of the end of the 1st quarter of 2021. The RPD fund balance as of Janu-

ary 1st was \$41,291. \$554 in membership dues revenue was received through the first quarter, providing a new balance of \$41,844.

For the 2021 fiscal year, the budget includes a \$2,500 allocation for student support and an anticipated revenue of \$2,600.

The RPD financial health would not be possible without your contributions. Please take a few minutes to renew your membership by the end of this calendar year.

*Matthew Jessee is a senior R&D staff in the Nuclear Energy and Fuel Cycles Division at ORNL. He loves running and spending time with his family.*



# International Conference on Physics of Reactors 2022 (PHYSOR 2022)

Making Virtual a Reality: Advancements in Reactor Physics to Leap Forward Reactor Operation and Deployment  
May 15-20, 2022 | Pittsburgh, PA

## CALL FOR PAPERS

### EXECUTIVE CHAIRS

#### General Chairs

Fausto Franceschini (Westinghouse)  
Jason Murphy (Exelon)

#### Assistant General Chairs:

Cenk Guler (Westinghouse)  
James Tusar (Exelon)

#### Technical Program Chair

Vefa Kucukboyaci (Westinghouse)

#### Assistant Technical Program Chairs:

William J. Walters (Penn State University)  
Andrew Godfrey Oak (Ridge National Laboratory)  
Patrick Blaise (Commissariat à l'Énergie Atomique et aux Énergies Alternatives)  
Deokjung Lee (Ulsan National Institute of Science and Technology)

#### Logistic Chair & Local Section:

Temí Adeyeye (Westinghouse)

## FULL PAPER DEADLINE: SEPTEMBER 30, 2021

SEPTEMBER



FULL PAPERS DUE: **September 30, 2021**

NOVEMBER



FULL PAPERS NOTIFICATION TO AUTHORS: **November 15, 2021**

DECEMBER



FINAL FULL PAPERS DUE: **December 15, 2021**

## ABOUT THE MEETING

Following the success of the past meetings, the PHYSOR topical meeting is back in Pittsburgh. PHYSOR 2022 will focus on the future of reactor physics and related nuclear technologies. The meeting aims to provide a platform for international experts from vendors, utilities, research laboratories, and universities to exchange ideas and latest developments on a wide spectrum of topics. Technical sessions include standard topics of interest as well as special sessions including novel analysis methods, advanced reactor designs, machine learning and artificial intelligence applications, high enrichment/high burnup core design challenges, space nuclear technologies, and high-performance computing. The meeting will also include plenary sessions focusing on advanced reactor design development and demonstration programs, panel sessions, and several workshops on state-of-the-art reactor physics tools.

## GUIDELINES

Submit full papers describing work that is of value to the reactor physics community and the nuclear industry in general. Papers are presented orally at the meeting, and presenters are expected to register for the meeting. All accepted papers will be published in the Proceedings of the Topical. Published papers become the property of ANS. Under no circumstances should a paper be published in any other publication prior to presentation at the PHYSOR 2022 meeting. An ANS copyright form is required for all papers and posters.

## FORMAT

We are soliciting full papers with ten pages maximum. Word and LaTeX templates are available at <https://www.ans.org/meetings/physor2022>. Papers not formatted according to the template will be rejected. Papers exceeding 10 pages will be rejected. Accepted papers will be published in the Proceedings of the Topical.

## POSTERS

Authors desiring a poster presentation must also submit a full paper in the proper format as described above. A poster template is available at <https://www.ans.org/meetings/physor2022>.

## JOURNAL COLLABORATION

We will invite some authors to submit a full-length journal article for a special issue of Nuclear Science and Engineering.

## SUBMIT A FULL PAPER

<https://epsr.ans.org/meeting/?m=353>

## PROGRAM SPECIALIST

Janet Davis  
708-579-8253  
[jdavis@ans.org](mailto:jdavis@ans.org)



# International Conference on Physics of Reactors 2022 (PHYSOR 2022)

Making Virtual a Reality: Advancements in Reactor Physics to Leap Forward Reactor Operation and Deployment

May 15-20, 2022 | Pittsburgh, PA

## TOPICS OF INTEREST

TRACK 1: DETERMINISTIC TRANSPORT METHODS

TRACK 2: MONTE CARLO METHODS

TRACK 3: MULTI-PHYSICS REACTOR SIMULATIONS & VALIDATION (W/ OECD)

TRACK 4: CORE ANALYSIS METHODS

TRACK 5: LIGHT-WATER REACTORS DESIGN & CORE ANALYSIS

TRACK 6: ADVANCED REACTORS DESIGN & CORE ANALYSIS

TRACK 7: TRANSIENT SYSTEMS & ANALYSIS

TRACK 8: DATA, METHODS, CODE VALIDATION

TRACK 9: FUEL MANAGEMENT AND OPTIMIZATION

TRACK 10: FUEL-CYCLE PHYSICS AND SCENARIOS

TRACK 11: CORE MONITORING SYSTEMS

TRACK 12: NUCLEAR CRITICALITY & SAFETY

TRACK 13: ISOTOPES PRODUCTION

TRACK 14: NONPROLIFERATION AND SAFEGUARDS

## SPECIAL SESSIONS

### Track 15S: In Memory of Massimo Salvatores (invited)

A tribute to Massimo Salvatores with submissions from his colleagues and younger generation researchers, covering different reactor physics aspects, experimental techniques and integral experiments, methods, and analyses.

### Track 16S: PHYSOR 2020 Highlights (invited)

Select papers representing best research trends in PHYSOR2020 and update on accomplishments/developments in 2022

### Track 17S: Neutronics Benchmark of CEFR Start-up Tests (In cooperation with IAEA)

Session to present up-to-date research and results from key participants in the IAEA effort on CEFR Start-up benchmarks.

### Track 18S: High Enrichment/High Burnup Core Analysis

Core physics analyses and experiments to fulfill licensing needs for the nuclear industry.

### Track 19S: Micro-reactors Design & Core Analysis

Focus on multi-physics and higher order analyses along with challenges due to aggressive deployment plans of micro-reactor designs.

### Track 20S: Challenges and Improvements in Accident Dose Analysis; Regulatory and Industry Perspective

Focus on recent regulatory changes along with continued evolution of analysis methodologies to address both evolving regulatory and operational requirements.

### Track 21S: Challenges and Improvements in Vendor Independent Nuclear Analysis and Regulatory Approval

Session to share industry experience for process and method development, benchmarking, and topical report development for NRC approval. The session invites participants from utilities and other organizations to present their experiences and challenges in this area.

### Track 22S: VERA Industry Applications (in cooperation with VERA User Group)

Most recent applications for VERA to solve PWR and BWR challenge problems.

### Track 23S: Trends in HPC/Exascale in Reactor Physics

Most recent reactor physics analysis applications using HPC/Exascale Computing using advanced computer platforms (e.g., GPUs) for "ultimate" fidelity analyses (e.g., CFD coupled with Monte Carlo)

### Track 24S: Advancements in UQ and Validation Methodologies

Latest progress in uncertainty quantification with particular focus on advanced reactor concept deployment.

### Track 25S: Machine Learning and Artificial Intelligence for Reactor Physics

Focus on applications of ML and AI in reactor physics analyses (e.g., loading pattern optimization, surrogate model developments, etc).

### Track 26S: Designing Reactors for Integrated Energy Systems

Focus on the analysis and design of advanced reactors to be operated as part of integrated energy systems on the path to deep decarbonization

### Track 27S: Advances on open-source software for nuclear reactor analysis (In cooperation with IAEA)

Most recent contributions from the participants of IAEA's initiative on the use of open-source code for nuclear reactor applications, as well as from the nuclear open-source community at large.

### Track 28S: Space Nuclear Program

Design and analysis of radioisotope systems and micro-reactors with heat pipes for propulsion and terrestrial power.

### Track 29S: Hybrid Methods in Reactor Physics Analyses

Research and applications combining deterministic and stochastic methods for solving reactor physics problems.

### Track 30S: Neutronics for Fusion Reactors

Deterministic or Monte Carlo neutronics simulations to support fusion reactor design and safety analyses, radioactive waste issues, neutron generator characterization, and other topics related to fusion reactor neutronics.

## PANEL SESSIONS

### Track 31P: Past, Present and Future Direction of Industry Core Simulators

A forum to discuss new developments in core simulators used routinely for LWR core design analyses.

### Track 32P: Current Issues in LWR Core Development and Design

A forum for the utilities to gather key stakeholders and discuss relevant industry issues in LWR core design development and operation

### Track 33P: Application and Development of Digital Twins for Nuclear Reactors

Panel on potential benefits of developing digital twins for nuclear reactors with focus on the most promising methodologies and challenges.

### Track 34P: Digital Collaboration in Reactor Physics

Discussion on new ways to collaborate across the universities, national laboratories, and vendors to develop the next generation analysis codes and tools

### Track 35P: Advanced Reactor Demonstration Program

Continuation of the high-level plenary discussions to allow for detailed technical discussions and presentations on advanced reactor design and developments.

## PLANNED WORKSHOPS

- Open MC (half-day)
- McCARD uncertainty analysis workshop (half-day)
- Kraken: a Serpent-based multi-physics framework (half-day)
- URANIE open source platform for uncertainty propagation, surrogate models, optimizations, code calibration (full-day)
- VERA training (full-day)

- OpenFOAM for the analysis of advanced nuclear reactors (full-day)
- Multi-physics analysis and UQ of REA with STREAM/RAST-K (half-day)
- RAPID (half day)
- FRENDA nuclear data processing system (full day)
- New physics, new capabilities, what's changing in ENDF/B (half day)
- NEAMS (Full Day)