ADRIAN S. SABAU, Ph.D., Fellow ASME, Fellow ASM

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RESEARCH INTERESTS

Dr. Sabau seeks to advance manufacturing and energy systems for harsh service conditions (extreme environments). His research is focused on advancing materials development/manufacturing for process electrification and industrial decarbonization through the development of multiphysics simulation models for processing-microstructure-property optimization. He developed multiphysics simulation models and source-codes (fluid dynamics, energy transport, phase change, and solid mechanics) for new design explorations and evaluation of component performance in extreme environments and harsh service conditions (utility power plants, nuclear fusion). His expertise includes process modeling and experimental design of additive manufacturing, metalcasting, heat exchangers, and cooling/structural integrity of high-heat flux components, leading multidisciplinary teams.

EMPLOYMENT

10/18-present	**Computational Materials Scientist** (Senior) Multiscale & Materials Group Computational Sciences & Eng. Division	Oak Ridge National Laboratory (MMG) (CSED)
01/08-09/18	**Senior Research Staff Member** Materials Processing and Joining Materials Science & Techn. Division	Oak Ridge National Laboratory (Materials Processing Group, MPG) (MSTD)
10/99-12/07	**Research Staff Member**	Oak Ridge National Laboratory, MPG
05/97-10/99	**Post-Doctoral Fellow**	Oak Ridge National Laboratory, MPG
07/96-04/97	**Research Associate**	Tennessee State University Mechanical Engineering Department
08/92-06/96	**Graduate Assistant**	Southern Methodist University Mechanical Engineering Department

OTHER APPOINTMENTS

- *Adjunct Professor* - 2018-Present - Mechanical, Aerospace and Biomedical Engineering Department, University of Tennessee, Knoxville, TN.
- *Joint Faculty* - 2013-2018 - Mechanical, Aerospace and Biomedical Engineering Department (0 %), University of Tennessee, Knoxville, TN.
- *Adjunct Professor* - 2007-2013 - Mechanical, Aerospace and Biomedical Engineering Department, University of Tennessee, Knoxville, TN.

EDUCATION

Ph.D. **Mechanical Engineering** Computational Fluid Dynamics (CFD), 8/92-5/96, **Southern Methodist University**, Dallas, TX

BSc/MSc **Mechanical Engineering and Materials Processing**, 9/87-6/92, **University of Craiova**, Craiova, Romania.

THESES

Stability Analysis of the Dynamic Model of a Manipulator and its Hydraulic Power Circuit
Diploma Engineer Thesis, University of Craiova, Craiova, Romania, July 1992.

Numerical Methods for Fluid-Solid Interaction Problems with Moving Boundaries
Ph.D. Dissertation, Southern Methodist University, Dallas, TX, May 1996.

LEADERSHIP/MANAGEMENT

- PI and project leader on 14 large multidisciplinary projects (budget greater than $300K).
- Facility Manager of the *Laser structuring facility*, 2013-present;
- Facility Manager of the *Plasma-arc lamp facility* 2009-2018.
- ORNL Laboratory Space Manager since 2013.
- Responsible for Research Safety procedures as Laboratory Space Manager (2009-present).
- Demonstrated project leadership for integrated computational and experimental projects.

PUBLICATIONS (chronological list - pp. 12 -28, topical list - pp. 34-54)

9 patents granted,
73 journal papers (1-st author 38 papers),
11 industry refereed journal papers (1-st author 10 papers),
86 conference papers (1-st author 48 papers).
5 co-edited books.
16 invited talks.

AWARDED PROPOSALS (see attached list)

47 total proposals (as PI and co-PI),
Principal Investigator (PI) of 32 proposals with a total awarded budget of over $7.4 M

HONORS AND AWARDS

ASM International **Fellow** (2022)

UT-BATTELLE **Awards**, Research Accomplishment in Science and Technology
Shyam A., Shin D., Allard L., Yamamoto Y., Haynes J.A.,
Watkins T., Sabau A., Porter W., Hawkins C., McClurg D. (2018)

ORNL **Significant Event Award** (SEA) - Testing of Solar Probe Cup for NASA's Parker Solar Probe Spacecraft using the Plasma-Arc Lamp Oct., 2018 (Team lead by PI A.S. Sabau)

R&D 100 Magazine, **R&D 100 Award**, ACMZ Cast Aluminum Alloys
Shyam A., Haynes J.A., Yamamoto Y., Shin D., Sabau A., Allard L.,
Watkins T., Porter W., Morris J., Roy S., Maziasz P., McClurg D.,
Hawkins C., Shower P., and Milligan B.. (and collaborators from
Fiat Chrysler Automobile USA and Nemak USA) 2017.

ORNL **Significant Event Award** (SEA) - New High Temperature Cast Aluminum Alloys – Dec., 2016 (Team lead by PI Shyam A.)

ASME **Fellow** (2016)

UT-Battelle **Technology Commercialization Award** (2014)

ORNL **Significant Event Award for** Development and Demonstration of a High-Heat Flux Testing Facility based on Plasma-arc Lamps for Neutron-Irradiated Materials, (Team lead by PI A.S. Sabau), 2013.

NFLC **National Federal Laboratory Consortium Award for Excellence in Technology Transfer**, "Pulse Thermal Processing",
Blue C.A., Clemos, A., Dudney, N., Duty, C., Harper D., Ott R.,
Rivard, J., Sabau A., DeTrana, A.G., 2012.

R&D 100 Magazine, **R&D 100 Award in Process Sciences**, CermaClad^{TM}
MesoCoat Inc., (Sherman A.J., Engleman G.,)
ORNL (Blue C., Clemos, A., Dudney N., Duty, C., Harper D., Ott R.,
Rivard, J., Sabau A., Sikka V.), EMTEC (Martin M.), 2011.

R&D 100 Magazine, **R&D 100 Award in Process Sciences**, PulseForge^{TM} 3100
with Pulse Thermal Processing, NovaCentrix, Inc. (Schroder K., Jackson D.,
McCool S., Pope D., Kierzyk T., Lind D., Rawson I., Sommers R.) and
ORNL (Blue C., Clemos, A., Dudney, N., Duty, C., Harper D., Ott R.,

Rivard, J., Sabau A.), 2009.

Southern Methodist University, **The Frederick E. Terman Award**, 1994-1995
(for *academic achievement* in Mechanical Engineering, 3.96/4 GPA)

University of Craiova, **Valedictorian**-equivalent,
Highest ranking; 1992 graduating class in Mechanical Engineering Dept.

University of Craiova, **National Merit Scholarship** (9.92/10 GPA), 1989-1992

Issued Patents, Pending Patent Applications, and Software Copyrights

1. A.S. Sabau, C.D. Warren, C. Daniel, J. Chen, D.L. III Erdman, Laser nanostructured surface preparation for joining materials, U.S. Patent No. 11,493,070 B2 issued on 11/08/2022.
2. A.S. Sabau, J.W. Klett, and Y. Polsky, Multi-zone Shell and Tube Heat Exchanger, U.S. Patent No. 11,353,266 B2 06/07/2022.
3. A. Shyam, Y. Yamamoto, D. Shin, J.A. Haynes, A.S. Sabau, A.F. Rodriguez-Jasso, J.A. Gonzalez-Villarreal, J. Talamantes-Silva, C.R. Glaspie, S. Mirmiran, Aluminum Alloy Compositions and Methods of Making and Using the Same, Patent No. US 11,242,587 B2, 02/08/2022.
4. A. Shyam, Y. Yamamoto, D. Shin, J.A. Haynes, A.S. Sabau, A.F. Rodriguez-Jasso, J.A. Gonzalez-Villarreal, J. Talamantes-Silva, C.R. Glaspie, S. Mirmiran, Aluminum Alloy Compositions and Methods of Making and Using the Same, Patent No. US 11,220,729, 01/11/2022.
5. A.S. Sabau, J. Li, H. Meyer III, C. Daniel, Laser-Interference Surface Preparation for Enhanced Coating Adhesion, U.S. Patent No. 11,065,719 07/20/2021.
6. A.S. Sabau and I.G. Wright, SpallMap, UT-Battelle Open Source Copyright 80000028, `https://github.com/adisoft17/spallmap`, `https://www.osti.gov/doecode/biblio/45638`, Copyright 2018 UT-Battelle LLC. All rights reserved, Filed 3/22/2018, Approved 4/13/2018.
7. A.S. Sabau, C.D. Warren, C. Daniel, J. Chen, D.L. III Erdman, Laser Nanostructured Surface Preparation for Joining Dissimilar Materials, U.S. Patent No. 10,082,166 B2, 09/25/2018.
8. I.V. Vlassiouk, W.H. Peter, A.S. Sabau, S. Dai, P. Fulvio, I.N. Ivanov, and N.V. Lavrik, "High quality large scale single and multilayer graphene production by chemical vapor deposition," U.S. Patent No. 10,023,468 07/17/2018.
9. D.J. King, S. Babinec, P.L. Hagans, L.C. Maxey, E.A. Payzant, C. Daniel, A.S. Sabau, R.B. Dinwiddie, B.L. Armstrong, J.Y. Howe, D.L. Wood III, N.S. Nembhard, "Characterization of dielectric materials," U.S. Patent No. US9689822 B2 14/602,370 06/27/2017.
10. B.L. Armstrong, C. Daniel, J.Y. Howe, J.O. Kiggans, Jr., A.S. Sabau, D.L. Wood, III, and S. Kalnaus, Method and apparatus for in-situ drying investigation and optimization of slurry drying methodology, U.S. Patent No. 9,337,470 05/10/2016.

Expertise snapshot

Computational Fluid Dynamics and Transport Phenomena (**CFD**),
Development of Solution Algorithm and Source Code (**S**),
Phase-changes (**PC**), Microstructure modeling (**MM**), Commercial codes (**C**),
High-performance computing (**HPC**), Experimental (**E**).

Advanced Manufacturing and Process Electrification

Main Projects	**Expertise**						
Additive Manufacturing (pp. 37-38)	CFD	S	PC	MM	-	HPC	E
Laser Surface Processing (pp. 39-40)	-	-	-	-	-	-	E
Infrared Processing (pp. 41-42)	CFD	S	PC	-	-	-	E
Metal casting (pp. 46-51)	CFD	S	PC	MM	C	HPC	E
Powder Metallurgy (p. 52)	-	S	-	-	C	-	E

Materials Behavior in Extreme Environments

Main Projects	**Expertise**				
High-heat flux testing for Fusion (p. 43)	CFD	-	-	C	E
Heat Exchanger Design/Fabrication (pp. 35-36)	CFD	S	PC	C	E
Supercritical Boiler, Supercritical CO_2, Turbine Cycle (pp. 44-45)	CFD	S	PC	-	E
Materials Development for Batteries (p. 53)	CFD	S	-	-	E

EDITED BOOKS

1. *CFD Modeling and Simulation in Materials Processing 2018*, Editors: Laurentiu Nastac, Koulis Pericleous, Adrian S. Sabau, Lifeng Zhang, and Brian G. Thomas, TMS 2018 Proceedings, Phoenix, AZ, March 11-15, 2018, Springer, ISBN: 978-3-319-72059-3, 241 pages.
2. *CFD Modeling and Simulation in Materials Processing*, Editors: Laurentiu Nastac, Lifeng Zhang, Brian G. Thomas, Miaoyong Zhu, Andreas Ludwig, Adrian S. Sabau, Koulis Pericleous, Herve Combeau, TMS 2016 Proceedings, Nashville, TN, Febr. 14-18, 2016, Wiley, A John Wiley and Sons, Inc., ISBN: 978-1-119-22576-8, 304 pages.
3. *Advances in the Science and Engineering of Casting Solidification: An MPMD Symposium Honoring Doru Michael Stefanescu*, Editors: L. Nastac, B. Liu, H. Fredriksson, J. Lacaze, C-P Hong, A. Catalina, A. Buhrig, D. M. Maijer, C. A. Monroe, A. Sabau, R. Ruxanda, A. A. Luo, S. Sen, A. Diszegi, 2015, TMS 2015 Proceedings, Orlando, FL, March 11-15, 2015, Wiley, A John Wiley and Sons, Inc., ISBN: 978-1-119-08238-5, 448 pages.
4. *Modeling of multi-scale Phenomena in Materials Processing III Symposium*, Editors: A.S. Sabau, L. Nastac and A. Rollett, TMS 2013, San Antonio, TX, March 3-7, 2013, EPD Congress 2013, Wiley, A John Wiley and Sons, Inc., ISBN 978-1-11860-574-5.
5. *CFD Modeling and Simulation in Materials Processing*, Editors: Laurentiu Nastac, Lifeng Zhang, Brian G. Thomas, Adrian Sabau, Nagy El-Kaddah, Adam C. Powell, Herve Combeau, TMS 2012 Proceedings, Orlando, FL, March 11-15, 2012, Wiley, A John Wiley and Sons, Inc., ISBN: 978-1-118-29615-8, 332 pages.

MEDIA

1. Video link to WATE 6 Local TV station: ORNL testing for solar probe, Aug 15, 2018.
2. `https://www.youtube.com/watch?v=-OtmgdCg8EM`,
   ORNL rendering of our contributions to Solar Probe, Aug 15, 2018.
3. Link to ORNL Research highlight on experimental Sun-simulating exposure, May 11, 2018.

4. https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/10-19-2017, Webinar on laser-interference structuring, Oct. 19, 2017.
5. Link to ORNL Research highlight on laser-interference surface treatment, or just video at https://www.youtube.com/watch?v=vBTKG5HS6RU, May 19, 2016.

PROFESSIONAL SOCIETIES MEMBERSHIP

- **ASME** Member since 1992, **Fellow** since 2016.
  - 2017-present, Member of the ASME *Materials Processing Technical Committee*.
  - 2014-2015, ASME *East Tennessee Section* Executive Committee member (2014 - secretary).
- **TMS** Member since 2004.
  - 2022-2025, Member of the TMS *Materials Processing & Manufacturing Division* (MPMD) Council, as representative of the *Professional Development Committee*, appointed position at the national/international level.
  - 2021 - 2023, Secretary of the *Process Modeling and Technology* (PM&T) Committee.
  - 2017-2020, Member of the TMS *Content Development and Dissemination Committee* (CDDC) of TMS, appointed position at the national/international level.
  - 2017-2020, Member of the TMS *Materials Processing & Manufacturing Division* (MPMD) Council, as representative of CDDC.
  - 2009 - present, Member of the *Computational Materials Science and Engineering Committee* (CMSEC) of TMS.
  - 2000 - present, Member of the PM&T of TMS (former *Process Modeling Analysis and Control Committee* -PMAC).
- **ASM** Member since 2009. ASM Fellow since 2022.
  - 2012-2015, ASM Local Chapter Executive Committee member (yearly service as Public Relations representative; Secretary; Chair; and Long-range Planning).

OTHER PROFESSIONAL SERVICE

- **Primary organizer of six international symposiums** (pp. 29-29),
- **Co-organizer of eleven international symposiums** (pp. 29-30)
- Co-organizer and Instructor for TMS Short Course **An Introduction to Computational Modeling in Materials Processing**, S. Wagstaff, A. Powell, P. Vanka, A.S. Sabau, and R. Hyers, 2018 TMS Annual Meeting
- **Journal editorial activity**
  - **Editorial Advisory Board** Member of the Editorial Advisory Board of the "Nuclear Materials and Energy" journal, 2014-2021.
  - *Frontiers in Materials*, Guest Editor for Special Issue *Advances in computational modeling of additive manufacturing processes*, 2021.
  - *Materials*, Guest Editor for for Special Issue *Computational Methods in Advanced Materials Processing, Metal Casting, and Materials for Energy Applications*, 2021.
- **Journal Reviewer** - Optics and Laser Technology, Journal of Nuclear Materials, Oxidation of Metals, JOM, Thin Solid Films, Metallurgical and Materials Transactions, ASME Journal of Fluids in Engineering, Nuclear Materials and Energy, Journal of Engineering Manufacture, International Journal of Advanced Manufacturing Technology, Journal of Numerical Analysis, Industrial and Applied Mathematics, and International Journal of Cast Metals Research.
- **Mentor: Post-Doctoral Fellows and PhD Candidates**
  - *Post-Doctoral Collaborators*
    - John D.K. Rivard (2004-2005, Director of Advanced Concepts, Ultra Electronics Group),
    - Christian Shaffer (2010-2011, Battery Modeling Engineer at Ford),

  - Hebi Yin (2010-2012, Senior Engineer at Pratt & Whitney),
  - Sergiy Kalnaus (2010-2012, ORNL staff),
  - Raghavan Narendran UTK (2017-2021, Scientist at LANL).
- *PhD Candidate Students*
  - John D.K. Rivard (2001-2003),
  - Anoop Samant, UTK (2005-2006, R&D Manager at KTH Parts Industries),
  - William Sames (2013-2013, CEO at HTS International Corporation),
  - Raghavan Narendran UTK (2013-2014),
  - Seth Pemberton (2013, Research Engineer at Illinois Rocstar),
  - Ali Nejad (2015-2018, Lecturer – North Carolina State University, MEA Dept.).

PERSONAL DEVELOPMENT

- *Project Management Fundamentals*, One day training, ORNL, 08/22/2017.
- *Advanced Communicator Bronze*, Toastmaster International, 03/2007.
- Member of *Shaw Speakers Toastmasters Club*, Toastmaster International, 9/2004-10/2009.
- *Exploring Crucial Conversations - Tools for Talking When the Stakes are High*, One day training, ORNL, 04/18/2007.

PROFESSIONAL DEVELOPMENT

- *Verification, Validation, and Uncertainty Quantification in the Computational Modeling of Materials and Structures*, 4 day online course with hands-on live instruction, TMS 2022,
- *2019 OLCF/ECP OpenMP Hackathon*, 4.5 day on-site hands-on GPU code acceleration, Knoxville, TN
- *OpenFOAM On-site Training*, 5 day training offered by CFD Direct, 2017
- *Multiphysics Materials Simulations using the Open Source MOOSE Framework*, 1 day Workshop, TMS, 2015
- *CUBIT*, one day training offered by SNL, 2001
- *Resolving Nonconvergence Problems in ABAQUS/Standard*, HKS, 2001.

Selected Experience/Accomplishments

- Twenty six years of experience in development/implementation of solution algorithms for non-linear partial differential equations (PDE) in Computational Fluid Dynamics, Heat Transfer, Thermal Radiation, and Phase Changes.
- Advanced cooling design of high-heat flux nuclear fusion components (MPEX target assembly) and sCO_2 heat exchangers.
- Additive Manufacturing: process simulation, microstructure simulation (cellular-automata), design for fabrication, heat exchangers.
- Conducted high-heat flux testing for Solar Probe Cup for NASA's Parker Solar Probe Spacecraft using Plasma Arc Lamps (PAL). `https://www.youtube.com/watch?v=-OtmgdCg8EM`
- Pioneered the use of laser-interference processing for multi-material joining and coating applications.
- Five years experience with optical setup, operation, and maintenance of a 10Hz Q-switched Nd:YAG nanosecond pulsed laser (Quanta-Ray PRO 230, Spectra Physics).
- Developed a high-heat flux testing facility using water-wall Plasma Arc Lamps (PAL) for neutron-irradiated specimens for the Fusion Program at ORNL.
- Developed non-linear regression models for the analysis of DMA measured data for Viscoelastic materials.

- Developed a comprehensive oxide growth/stress analysis/heat transfer model for prediction of oxide exfoliation in boiler tubes by simulating the stress evolution in oxide layers grown inside steam tubes operating in harsh service conditions of coal-fired steam power plants. Open-source code released.
- Developed radiation transport models for photonic processing of opaque metallic and semi-transparent semiconductor nanostructured films using High-Density Infrared (HDI) Plasma-Arc Lamps and lasers.
- Developed ODE models for DSC and dilatometer instruments to obtain enthalpy and density during phase-changes.
- Developed computational models for thermodynamic turbine cycles with internal cooling.
- Developed experiments, data acquisition, and data processing techniques.
- Developed and implemented solution algorithms for the numerical simulation of interdendritic flows and microporosity formation during casting processes.
- Introduced a cavitation-based concept of the interdendritic liquid metal for the onset of shrinkage microporosity defects during metal casting solidification, which led to the development of the only computational methodology for predicting the shrinkage microporosity.
- Developed an interface reconstruction technique for the Volume of Fluid (VOF) method for free-surface flows (Ph.D.).

DETAILED WORK EXPERIENCE

Oak Ridge National Laboratory (ORNL) is a multiprogram Science and Technology (S&T) institution. Consequently, work responsibilities are often multidisciplinary in scope.

10/18-present	**Computational Materials Scientist** (Senior) Multiscale & Materials Group Computational Sciences & Eng. Division	Oak Ridge National Laboratory (MMG) (CSED)

Duties As an ORNL senior R&D staff member, I was involved in highly complex S&T problems in advanced manufacturing and energy systems for extreme environments, which require the development of original/new solutions. Specifically, my duties included: (1) demonstrating advanced knowledge of a wide range of principles, theories, R&D methods, (2) multidisciplinary integration of ORNL staff in R&D projects, (3) developing new client/sponsor relationships and significant R&D proposals and programs, and (4) leading and managing medium/large R&D projects, determining objectives and scope of work assignments.

Accomplishments My accomplishments are documented in my long CV, through: (a) leading of 6 projects as PI (co-PI on other 2 projects), (b) having been issued 5 patents, and (c) publishing of 23 papers in refereed journals, 7 conference papers, and 9 technical ORNL reports, and (d) co-organizing of 6 international symposia at TMS, MS&T, and ASME meetings. In 2022, I was honored to be elected an ASM Fellow by ASM International "for unique applications of computational fluid dynamics and advanced modeling to materials science and engineering, specifically related to surface treatments, solidification, and other key areas in processing and performance." As project principal investigator (PI), I was involved in all stages of project development and execution, including establishing relationships with sponsors (both DOE and industry), proposing concepts, planning of scope of work, assigning staff responsibilities, assigning budget allocations, and project coordination. As a PI, I led two multidisciplinary teams on supercritical CO2 (sCO2) heat exchanger design and laser-interference processing. Specifically, my accomplishments include:

1. the development of multiphysics simulation models (fluid dynamics, energy transport, phase change, and solid mechanics) in ProCAST for the simulation of the Direct Chill (DC) metal casting process for assess hot cracking propensity of DC ingots,
2. successful ported an MPI cellular-automata (CA) code to the Graphics Processing Unit (GPU) Summit supercomputer, which is housed by the Oak Ridge Leadership Computing Facility (OLCF). The CA code is used for the numerical simulation of grain microstructure and sub-grain microstructure in metal casting and additive manufacturing. This team effort was a task in the ExaAM project, sponsored by the Exascale Computing Project (ECP).
3. the design of internal cooling passages for the high-heat flux and high-temperature target assembly Material Plasma Exposure eXperiment (MPEX) facility, which is a next-generation linear plasma device that will be used for materials testing in extreme nuclear fusion environments. I evaluated the thermo-hydraulic performance of the target assembly using Computational Fluid Dynamics (CFD) CFX/ANSYS code.
4. the development of novel recuperator concepts for supercritical CO2 (sCO2) thermodynamic cycles, including design adaptations for additive manufacturing (AM). Demonstrate thermo-hydraulic performance of the novel recuperators based on components fabricated by additive manufacturing. The multidisciplinary team I led included power plant engineers, CAD technicians, and AM machine operators.
5. developed complex experimental procedures for coating application, spray painting, adhesive joining of aluminum alloys. This led to the successful demonstration of the laser-interference structuring technique as a non-chemical surface treatment for coating and joining applications, eliminating the use of toxic solvents and other environmental hazardous chemicals in

these applications. The multidisciplinary team I led included physical chemists, lab technicians, materials scientists, and mechanical testing engineers. Results were documented in 10 publications.

6. mentoring of young staff.

01/08-09/18	**Senior Research Staff Member**	Oak Ridge National Laboratory
	Materials Processing and Joining	(Materials Processing Group, MPG)
	Materials Science & Techn. Division	(MSTD)

Accomplishments My accomplishments are documented in my long CV, through: (a) leading of 14 projects as PI (co-PI on other 2 projects), (b) having been issued 4 patents, (c) releasing an open-source code for simulation of oxide exfoliation propensity in utility boiler tubes, (d) publishing of 5 co-edited conference proceeding books, 31 papers in refereed journals, 35 conference papers, 16 technical ORNL reports. In 2016 I was honored as an ASME fellow for my "significant accomplishments in advancing materials processing and materials development for energy applications based on integrated computational materials science and engineering." The honors and awards I received in this ten-year position include three R&D 100 awards in process science, three ORNL Significant Event Awards, and one ORNL team "Research Accomplishment in Science and Technology" Award. As a PI, I established relationships with sponsors (DOE, NASA, SERDP, EPRI, and industry), planned scope of work, led multidisciplinary teams on heat exchanger design, and laser-interference processing, high-heat flux testing of neutron-irradiated materials of plasma-facing materials, and high-heat flux testing for NASA's Parker Solar Probe spacecraft. Specifically, my accomplishments include:

1. the development of an evaporation module in the multiphysics LANL Truchas code for the simulation of additive manufacturing by taking into account fluid dynamics effects; effort as part of a High Performance Computing for Manufacturing (HPC4Mfg) project with GE. `https://github.com/adisoft17/spallmap`;
2. pioneered the use of laser-interference processing for multi-material joining and coating applications (2 patents granted). Developed experimental procedures for joining and mechanical testing of aluminum and composites.
3. developed a high-heat flux testing (HHFT) facility using water-wall Plasma Arc Lamps (PAL) for exposing neutron-irradiated specimens to harsh service conditions specific to nuclear fusion devices. The multidisciplinary effort I led and contributed directly included novel cooling geometry designs for the specimen assembly, specimen mounting, instrumentation with thermocouples, pyrometer instrumentation for top surface temperature measurement, and new Infrared (IR) PAL reflector that increased the incident heat flux from 2.4 to 11 MW/m^2 (reflector developed in collaboration with Mattson Technologies, Inc.). This effort provided the U.S. Fusion Energy Sciences (FES) program with a versatile, unique, cost-effective way to conduct HHFT of irradiated materials, enabling a science-based materials research and development program. Our team successfully conducted HHFT of neutron-irradiated tungsten specimens at ITER-relevant conditions, resulting in the publication of 9 journal refereed papers and an ORNL Significant Event Award.
4. developed complex experimental procedures, including facility operation and data acquisition, for HHFT of irradiated materials in the PAL facility,
5. developed experimental procedures for IR temperature measurements, validating the use of a pyrometer; selected a pyrometer based on conflicting requirements (small spot size, large focal distance, wavelength operation transparent to quartz, temperature range 350-1700 C).
6. conducted high-heat flux testing (HHFT) of key components for the NASA's Parker Solar Probe Spacecraft using Plasma Arc Lamps (PAL). https://www.youtube.com/watch?v=-OtmgdCg8EM. We validated NASA's design and simulation data for a shield assembly, which

protects an instrument measuring ion and electron fluxes. We successfully tested for survivability at the expected perihelion solar exposure of Solar Probe Cup, an instrument on the Parker Solar Probe. HHFT at ORNL validated that key components of the spacecraft could withstand the extreme heat and irradiance near the Sun at its perihelion position within Mercury's orbit. The team I led included experts in high-vacuum, IR temperature measurement, and fabrication. Due to its national significance, my team was rewarded a Significant Event Award at ORNL in 2018.

7. management of the Plasma-arc Lamp facility from 2009 until 2018, which included significant interactions with sponsors from DOE, NASA, and Mattson Technologies, Inc., (the original equipment manufacturer - OEM) to secure funding and maintain the facility operational. Responsible for Research Safety procedures as Laboratory Space Manager. Conducted R&D without any safety incidents.
8. designed new heat exchanger architectures (1 granted patent), designed for additive manufacturing, additive manufacturing of heat exchangers, test loop design, and tested of novel heat exchangers (11 journal publications).
9. the development of a comprehensive oxide growth/stress analysis/heat transfer model for the prediction of oxide exfoliation in boiler tubes by simulating the harsh service conditions of modern supercritical coal-fired steam power plants. Implemented the model as the single source-code developer and released it as an open-source code
10. mentoring of two doctoral students and young staff.

10/99-12/07 **Research Staff Member** Oak Ridge National Laboratory, MPG

Duties As an ORNL R&D staff member, I was involved in complex and diverse S&T problems in advanced manufacturing, which required the development of original and non-routine solutions. Specifically, my duties included: (1) demonstrating significant knowledge in my discipline: computational modeling and simulation of materials processing processes, (2) independently find solutions to complex R&D projects, working across disciplines and collaborate with other R&D staff, and (3) developing new R&D proposals.

Accomplishments My accomplishments are well documented in my long CV, through: (a) leading of 5 projects as PI (co-PI on other 10 projects), (b) granting of 3 patents, and (c) publishing of 15 papers in refereed journals, 44 conference papers, and 12 technical ORNL reports. Specifically, my accomplishments include:

1. development of multiphysics simulation models for metal casting simulations (fluid dynamics, energy transport, phase change, and solid mechanics) in ABAQUS and ProCAST for predicting the cracking propensity of Direct Chill (DC) cast ingots; Validation led to the implementation in ProCAST commercial software of a module for the DC casting process.
2. designed of complex metal casting experiments including thermocouple instrumentation their placement for model validation. This led to the successful: (a) casting of an experimental 5 ton DC casting ingot, (b) wax temperature measurement during high-pressure wax injection, and (c) shell mold temperature measurement for the investment casting process.
3. development and implementation of experimental and computational techniques for the measurement and/or estimation of thermophysical materials properties, such as phase fractions during phase transformations, density in the semi-solid (mushy zone), and viscoelastic properties of waxes. Wrote a new source code for modeling a differential scanning calorimetry (DSC) instrument, designed sample holder for a dual-push rod dilatometer for density measurements, and developed experimental procedures and data analysis for the measurement of viscoelastic properties of waxes from the paste to the solid state;
4. development of wax injection experiments, including instrumentation with pressure transducers and thermocouples; validation of viscoelastic models in ABAQUS for wax pattern deformation to predict shrinkage factors (i.e., dimensional changes) in the investment casting

process; validation led to the implementation in ProCAST commercial software of a viscoelastic module;
5. validation of ProCAST thermal and stress analysis modules during metal solidification in shell molds for the investment casting process;
6. experimental demonstration of using heat flux sensors to estimate the heat transfer coefficients at metal-mold interface during solidification metal casting;
7. development and implementation in LANL Telluride code of a comprehensive energy transport model for infrared (IR) processing and laser irradiation (both electrified processes), for heating, annealing, flash annealing, sintering, melting/solidification, of semi-transparent materials using 1D Radiation Transport Equations (RTE);
8. development and implementation of a computational model in a new source code for thermodynamic turbine cycles with internal cooling. The code was used to numerically simulate the effects of changing the fuel, from methane to syngas, on land-based turbine systems including blade cooling to maintain peak temperatures.

05/97-10/99 **Post-Doctoral Fellow** Oak Ridge National Laboratory, MPG

Duties As a post-doctoral fellow at ORNL, I was tasked to develop a 3D computational model for predicting microporosity defects during metal casting of aluminum alloys.

Accomplishments Specifically, my accomplishments include:
1. derivation of constitutive equations of physical phenomena related to microporosity, numerical discretization of non-linear equations, development of a new solution algorithm for solving non-linear coupled systems of equations, and development of source-code implementation in the LANL Telluride code of the model. The code was used for predicting microporosity fraction and morphology during solidification in 3D complex casting components. The comprehensive model included conjugate heat transfer, interdendritic flow in permeable media due to solidification shrinkage, cavitation onset of the molten metal, mass transport, and phase changes, onset of microporosity formation, and microporosity growth.
2. conjectured and demonstrated the existence of cavitation during metal casting solidification, introducing the concept of onset of shrinkage (irregular) interdendritic porosity defects when the pressure in the interdendritic liquid falls below the cavitation pressure. This work led to the publication of one of my highest cited papers (Sabau and Viswanathan, 2002), offering the only published computational methodology for predicting the growth and amount of shrinkage (irregular) interdendritic porosity defects.

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INVITED TALKS

1. Adrian S. Sabau and Jiheon Jun, (invited) Coating adhesion for a nano-structuring laser-interference surface treatment, **International Conference on Processing & Manufacturing of Advanced Materials - Processing, Fabrication, Properties, Applications; THERMEC 2021**, Virtual, May 10-14, 2021.
2. Adrian S. Sabau, Harry M. Meyer III, Donovan N. Leonard, and Jian Chen, (invited) Sub-Surface Microstructure of Aluminum Alloys after Laser-Interference Structuring, **International Conference on Processing & Manufacturing of Advanced Materials - Processing, Fabrication, Properties, Applications; THERMEC 2018**, Paris, France, July 9-13, 2018.
3. Sabau A.S., (keynote talk), How constructal theory can help the science and technology of heat exchangers? NSF Workshop **Constructal Theory after 20 Years of Exploration and What the Future Holds**, `http://elearning.engineering.villanova.edu/Mediasite/Catalog/Full/9ac28dfb1182486ab6964a5f49381db521`, Villanova, PA, April 17-18, 2018.
4. T. Naguy and A.S. Sabau, (invited) "Laser De-Paint and Surface Preparation Mechanism Technologies." Sabau presented the 2-nd part "Laser-Interference Surface Preparation for Enhanced Coating Adhesion and Adhesive Joining of Multi-Materials." Presentation was part of the **SERDP & ESTCP Webinar Series**, `https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/10-19-2017`. Webinar presented on October 19, 2017.
5. A.S. Sabau, E. Popov, and D. Pointer, "Computational Fluid Dynamics Study of a New Cooling Technology for High-pressure Die Casting," panel presentation at **HPC User Forum**, Milwaukee, Wi, September 5-7, 2017.
6. A.S. Sabau, C. Daniel, J. Busby, "Science and Technology of Laser interference," International Conference on Frontiers in Materials Processing, Applications, Research and Technology (FiMPART), Bordeaux, France, July 9-12, 2017.
7. A.S. Sabau "Laser Interference-Based Surface Treatments of Carbon Fiber Polymer Composites and Aluminum for Enhanced Bonding," **Adhesive and Sealant Council (ASC) 2017 Spring Convention & EXPO**, Atlanta, GA, April 4-5, 2017.
8. A.S. Sabau, "Laser interference-based surface treatments of carbon fiber polymer composites and aluminum for enhanced bonding," **5-th annual Global Automotive Lightweight Materials**, Detroit, 23-25 Aug., 2016.
9. Sabau A.S., Chen J., Warren C.D., Erdman D.L. III, Daniel C., Skszek T., and Caruso Dailey M., A Laser Interference-Based Surface Treatment of Al and Carbon Fiber Polymer Composites for Enhanced Bonding, paper LB15–0070, **SAMPE Conference and Exhibition**, Long Beach, CA, May 23-26, 2016.
10. A.S. Sabau, "Modeling of Casting Defects in an Integrated Computational Materials Engineering Approach," in **Advances in the Science and Engineering of Casting Solidification: An MPMD Symposium Honoring Doru Michael Stefanescu** (eds L. Nastac, et al.), John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781119093367.ch28.
11. A.S. Sabau, J. Chen, J. F. Jones, A. Hackett, G. D. Jellison, C. Daniel, D. Warren, J. D. Rehkopf, "Surface Modification of Carbon Fiber Polymer Composites after Laser Structuring," 2015 **TMS Annual Meeting & Exhibition, Proceedings: Advanced Composites for Aerospace, Marine, and Land Applications II**, Orlando, FL.
12. A.S. Sabau, W.D. Porter, S. Roy, and A. Shyam, "Process Simulation Role in the Development of New Alloys Based on an Integrated Computational Materials Engineering Approach," paper IMECE2014-37982, Proceedings of the **ASME 2014 Int. Mech. Eng. Congress & Exposition IMECE2014**, Nov. 14-20, 2014, Montreal, Quebec, Canada.

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14. A.S. Sabau, I.G, Wright, and Shingledecker J.P., "Growth and regrowth of multiple layered oxide films in a non-uniform temperature field," **2-nd EPRI-NPL Workshop on Scale Exfoliation from Steam-Touched Surfaces**, National Physical Laboratory, Teddington, London, UK, January 17-18, 2012.
15. Sabau A.S., Dinwiddie R.B., Xu J., Angelini J.A., Harper D.C., "Thermal Annealing of ZnO films using high-density plasma arc lamps," (invited) **Symposium Surfaces and Heterostructures at Nano- or Micro-Scale and Their Characterization, Properties, and Applications, 2011 TMS Annual Meeting & Exhibition**, Febr. 27 - March 3, 2011, San Diego, CA.
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CONFERENCE PUBLICATIONS

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2. Panicker, N.S., Delchini, M.O.G., Sambor, T., Sabau, A.S. and Jain, P., Advanced thermal-hydraulic model of heat recovery steam generators, Paper TFEC-2020-36547, 5-6th Thermal and Fluids Engineering Conference, May 26-28, 2021.
3. J. Chitale, A. Abdoli, G.S. Dulikravich, A.S. Sabau, J.B. Black, Conjugate Heat Transfer Analysis of the Supercritical CO2 Based Counter Flow Compact 3D Heat Exchangers, ITHERM 2020, Orlando, FL. July 21-23, 2020.
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14. A.S. Sabau, J. Chen, J. F. Jones, A. Hackett, G. D. Jellison, C. Daniel, D. Warren, J. D. Rehkopf, "Surface Modification of Carbon Fiber Polymer Composites after Laser Structuring," 2015 **TMS Annual Meeting & Exhibition, Proceedings: Advanced Composites for Aerospace, Marine, and Land Applications II**, Orlando, FL.
15. J. Chen, A.S. Sabau, J. F. Jones, A. Hackett, G. D. Jellison, C. Daniel, and D. Warren, "Aluminum Surface Texturing by Means of Laser Interference Metallurgy," 2015 **TMS Annual Meeting & Exhibition, Proceedings: Light Metals 2015: Aluminium Processing**, Orlando, FL.
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21. Vidhi R., Kuravi S., Besarati S., E.K. Stefanakos, D. Yogi Goswami, and A.S. Sabau, "Performance of working fluids for power generation in a supercritical organic Rankine cycle," Proceedings of the **ASME 2012 6th International Conference on Energy Sustainability & 10th Fuel Cell Science**, Engineering and Technology Conference, Paper 91473, ESFuelCell2012, July 23-26, 2012, San Diego, CA.
22. Sabau, A.S., Gorti S.B., Peter W.H., Chen W., and Yamamoto Y., "Numerical Simulation of Cold Pressing of Armstrong CP-Ti Powders," **2012 TMS Annual Meeting**, Vol. 1, pp. 521-528, TMS 2012 – 141st Annual Meeting and Exhibition, Supplemental Proceedings, March 11- 15, Orlando, FL.
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25. Sabau A.S, Yin H., Qualls L.A., and McFarlane J., "Investigations of supercritical CO2 Rankine cycles for geothermal power plants," **2011 Supercritical CO2 Power Cycle Symposium**, Boulder, CO, May 24-25, 2011.

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27. Sabau A.S., Dinwiddie R.B., Xu J., Angelini J.A., Harper D.C., "Thermal Annealing of ZnO films using high-density plasma arc lamps," (invited) **Symposium Surfaces and Heterostructures at Nano- or Micro-Scale and Their Characterization, Properties, and Applications, 2011 TMS Annual Meeting & Exhibition**, Febr. 27 - March 3, 2011, San Diego, CA.
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29. Sabau A.S., Shingledecker J.P., and Wright I.G., "Steam-Side Oxide Scale Exfoliation Behavior in Superheaters And Reheaters: Differences in the Behavior of Alloys T22, T91, And TP347 Based on Computer Simulation Results," **6th International Conference on Advances in Materials and Technology for Fossil Power Plants**, Santa Fe, NM, Aug. 31-Sept. 3, 2010.
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31. Sabau A.S., Sarma B. Gorti, Kiggans J.O., Peter W.H., Erdman D.L., "Material Properties for the Simulation of Cold Pressing of Armstrong CP-Ti Powders," **International Conference on Powder Metallurgy & Particulate Materials**, Hollywood, FL, June 27-30, 2010.
32. Yamamoto Y., Peter W.H., Sabau A.S., Sarma B. Gorti, Kiggans J.O., Nunn S.D., Blue C.A., Barnes J.E., Henry C., Capone J.A., Paliwal M., Fuller B., Akhtar K., "Low-Cost Titanium Near-Net-Shape Manufacturing Using Armstrong and/or Hydride-Dehydride CP-Ti/Ti-6Al-4V Powders," **International Conference on Powder Metallurgy & Particulate Materials**, Hollywood, FL, June 27-30, 2010.
33. Sabau A.S., Wright I.G., Zhang W., Pint B.A., Unocic K.A., and Mathews J., "Temperature Evolution and Oxide Growth in Waterwall Tubes of Supercritical Units," **Boiler Tube and HRSG Tube Failures and Inspections International Conference**, Baltimore, MD, April 19-22, 2010.
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54. Sabau, A. S. and Porter, W. D., "Analytical Models for the Systematic Errors of Differential Scanning Calorimetry Instruments," **ASME Heat Transfer/Fluids Engineering Summer Conference**, Charlotte, NC, July 11-18, 2004, paper HT-FED2004-56745.
55. Osborne, G.E., Frankel, J.I., Sabau, A.S., and Porter, W.D. "Characterization of Thermal Lags and Resistances in a Heat-Flux DSC," in Proceedings of **Materials Processing Fundamentals**, TMS Annual Meeting, March 14-18, 2004, Charlotte, NC, pp. 527-536.
56. Sabau, A.S., Kuwana, K., Viswanathan, S., Saito, K., and Davis, L.J. "Heat Transfer Boundary Conditions for the Numerical Simulation of the DC Casting Process," in Proceedings of **Light Metals 2004**, TMS Annual Meeting, March 14-18, 2004, Charlotte, NC, Ed. RD Peterson, pp. 597-602.
57. Sabau, A.S., Porter, W.D., and Frankel, J.I. "Conduction and Radiation Parameters for Analytical Models of Differential Scanning Calorimetry Instruments," in Proceedings of **Solidification of Aluminum Alloys**, TMS Annual Meeting, March 14-18, 2004, Charlotte, NC, Ed. Chu, M.G, Granger, D.A., and Han, Q., pp. 19-28.
58. Rivard, J.K.D., Blue C.A., Sabau, A.S., Ohriner, E.K., and Harper, D.C. "High Density Infrared Processing of Thin Gage Gamma-TiAl," **JANNAF 39th Combustion Subcommittee/27th Airbreathing Propulsion Subcommittee/21st Propulsion Systems Hazards Subcommittee/3rd Modeling and Simulation Subcommittee Joint Meeting**, Colorado Springs, CO, December 1-5, 2003.
59. Sabau, A.S., Rivard, J.K.D., Blue C.A., Ohriner, E.K., and Harper, D.C. "A Sintering Model for the Evolution of Thermal Conductivity during High Density Infrared Processing of Powder Compacts," **International Thermal Conductivity Conference 27**, Knoxville, TN, October 29, 2003.
60. Rivard, J.K.D., Blue C.A., Ott R.D., Sabau A., Santella M., Tsung-Yu Pan and Joaquin A., 2003, "Advanced Manufacturing Technologies Utilizing High Density Infrared (HDI) Radiant Heating," Proceedings of **Advanced Manufacturing Processes and Systems**, Global Powertrain Congress, September 23-25, 2003, Ann Arbor, MI.
61. Ohriner, E.K.; Blue, C.A.; Sabau, A.; Rivard, J.D.K., "Energy efficient production of sheet material using radiant arc-lamp heating," Proceedings of the **TMS Materials Processing and Manufacturing Division**, Mar 2-6 2003, San Diego, CA, 2003, pp. 147-158.
62. Osborne G.E., Frankel J.I. , Sabau A.S., "A New Parameter Estimation Method for DSC Thermodynamic Property Evaluation - Part I: Analytic Development," pp. 51-58, Proceedings of the **22nd IASTED International Conference on Modelling, Identification, and Control** (MIC 2003), M.H. Hamza (Ed.), February 10-13, 2003, Innsbruck, Austria.
63. Osborne G.E., Frankel J.I. , Sabau A.S., "A New Parameter Estimation Method for DSC Thermodynamic Property Evaluation - Part II: Runge-Kutta Implementation and Numerical Results," pp. 59-66, Proceedings of the **22nd IASTED International Conference on Modelling, Identification, and Control** (MIC 2003), M.H. Hamza (Ed.), February 10-13, 2003, Innsbruck, Austria.
64. Rivard, J.K.D., Blue C.A., Ohriner E.K., Sabau A.S., Harper D.C, and N. Jayaraman, "Direct Sheet Fabrication of Advanced Materials," World Congress on Powder Metallurgy & Particulate Materials, Proceedings of **Advances in Powder Metallurgy and Particulate Materials, 2002**, MPIF, Princeton, NJ (2002), 11-81-11-91, June 16-21, Orlando, FL.
65. Ott, D.R., Craig A. Blue, Adrian S. Sabau, Tsung-Yu Pan, Armando M. Joaquin, "Preferential Softening of 6063-T6 Aluminum Alloy Utilizing a High Density Infrared (HDI) Plasma Arc Lamp," 2002 TMS Fall Meeting, Proceedings of **Forming and Shaping of Light Weight Automotive Structures**, Columbus, OH, October 6-10, 2002.

66. Temmel, C., Liu, K.C., Agnew, S.R., Sabau, A.S., Han, Q., and Viswanathan, S., 2001, "Experimental and Computational Study of Bolt Retention Behavior of Magnesium Alloy AM60B," in Proceedings of **Magnesium Technology 2001**, pp. 201, TMS Annual Meeting, New Orleans, Louisiana, February 11-15.
67. Sabau, A.S., and Viswanathan, S., "Microporosity evolution and interdendritic fluid flows during solidification," 2001 Annual Fall TMS Meeting, Proceedings of **Computational Modeling of Materials, Minerals, and Metals Processing**, pp. 725-734, San Diego, CA, Sept. 23-26.
68. Sabau, A.S., and Viswanathan, S., "Numerical Simulation of Wax Pattern Dimensions in Investment Casting," 2001 Annual Fall TMS Meeting, Proceedings of **Computational Modeling of Materials, Minerals, and Metals Processing**, pp. 431-440, San Diego, CA, Sept. 23-26.
69. Sabau, A.S., and Viswanathan, S., "Determining Wax Pattern Dimensions in Investment Casting Using Viscoelastic Models," **Investment Casting Institute 49-th Annual Meeting**, Orlando, FL, October 7-10, 2001, Paper no. 3.
70. Viswanathan, S., Sabau, A.S., Han, Q., and Duncan, A.J., "Prediction of Microporosity Distributions in Aluminum Alloy Castings," in Proceedings of **TMS Merton C. Flemings Symposium on Solidification and Materials Processing**, 2001, pp. 379-384, Cambridge,MA, June 28-30, 2000.
71. Sabau, A.S., and Viswanathan, S., 'Material Properties for Predicting Wax Pattern Dimensions in Investment Casting," **Investment Casting Institute 48-th Annual Meeting**, Dallas, TX, October 15-18, 2000, Paper no. 4.
72. Sabau, A.S. and Viswanathan, S., "Porosity Prediction in Aluminum A356 Alloy Castings," in Proceedings of **Light Metals 2000**, TMS Annual Meeting, Nasville, TN, March 12-16, Ed. R.D. Peterson, pp. 597-602.
73. Sabau, A.S., Han, Q., and Viswanathan, S., "Projection Methods for Interdendritic Flows," in Proceedings of **Fluid Flow Phenomena in Metals Processing**, TMS Annual Meeting, San Diego, February 28-March 4, 1999, pp. 403-413.
74. Viswanathan, S., Duncan, A.J., Sabau, A.S., and Han, Q., "Prediction of Microporosity in Aluminum Alloy Castings," **Modeling of Casting, Welding, and Advanced Solidification Processes VIII**, 1998, Eds. B.G.Thomas and C. Beckermann, San Diego, CA, pp. 849-856.
75. Viswanathan, S., Sabau, A.S., Han, Q., and Duncan, A.J., "Next generation casting process models predicting porosity and microstructure," **SAE Transactions: Journal of Materials & Manufacturing**, Vol. 107, pp. 1174-1177, 1998.
76. Viswanathan S., Sabau A.S., Han Q., and Duncan A.J., "Modeling of Porosity in Aluminum Alloy Castings," Proceed. of **Materials Solutions Conference '98 on Aluminum Casting Technology**, Oct. 12-15, 1998, Rosemont, IL, pp. 135-138.
77. Sabau, A. S. and Raad, P. E., "On Boundary Conditions for Free-surface Flows," **ASME Fluids Engineering Division Annual Summer Meeting**, San Francisco, CA, July 18-23, 1999, paper FEDSM99-7098.
78. Sabau, A. S. and Raad, P. E., "Numerical Modeling of Impact between Fluid and Solid Structures with One-fluid VOF Methods," **ASME Fluids Engineering Division Annual Summer Meeting**, Washington, D.C., June 21-25, 1998, paper FEDSM98-5221.
79. Sabau, A. S. and Tao, Y-X, " On Mathematical Modeling of Convective Melt of a Granular Porous Medium," **ASME National Heat Transfer Conference**, Washington, D.C., August 10-12, 1997, HTD-Vol349, vol. 11, pp. 197-204.
80. Sabau, A. S., Tao, Y-X, Liu, G. and Vidhuvalavan, G., "Effective Thermal Conductivity of Granular Porous Media using Fractal Concepts," **ASME National Heat Transfer Conference**, Washington, D.C., August 10-12, 1997, HTD-Vol349, vol. 11, pp. 121-128.

81. Sabau, A. S. and Tao, Y-X, 1997, "Parallel Implementation of the Projection Method for Solving Free-surface Flows," **ASME Fluid Engineering Division Summer Meeting**, Numerical Developments in CFD Proceedings, FEDSM'97. Part 20 (of 24), Vancouver, British Columbia, Canada, June 22-261997.
82. Sabau, A. S. and Raad, P. E., "Flow Over a Cylindrical Containment Dike," **ASME Fluids Engineering Division Annual Summer Meeting**, San Diego, CA, July 7-11, 1996, ASME FED-Vol238, Vol. 3, pp. 369-374.
83. Sabau, A. S. and Raad, P. E.,"A Study of Multidomain Compact Finite Difference Schemes for Stiff Problems," **ASME Fluid Engineering Division Summer Meeting**, San Diego, CA, July 7-11, 1996, ASME FED-Vol238, Vol. 3, pp. 217-224.
84. Sabau, A. S. and Raad, P. E.,"On Two-Dimensional Water-Solid Impact with VOF Methods," **ASME Winter Annual Meeting**, San Francisco, CA, November 12-17, 1995, ASME, FED-Vol. 234, pp. 113-123.
85. Sabau, A. S. and Raad, P. E., "On Numerical Oscillations in High-Order Finite Difference Solutions of Boundary Layer Problems on Nonuniform Grids," **ASME Fluids Engineering Division Annual Summer Meeting**, Hilton Head Island, SC, Aug. 13-18, 1995, FED-Vol. 215, pp. 89-96.
86. Raad, P. E. and Sabau, A. S., "Permeable Contact Lens Motion During Blinking," **Advances in Bioengineering**, ASME International Mechanical Engineering Congress and Exposition, Chicago, Il, 1994, Nov. 6-11, ASME BED-Vol. 28, pp. 75-76.

PUBLICATIONS IN ROMANIAN

1. Sabau, A. S. "An Algorithm for Computing the Inertia Torques using Second Order Transfer Matrices in Kinematic Links of Industrial Robots," **Symposium on Design, Technology, and Management in Mechanical Engineering**, Iasi, Romania, May 22-23, 1992, 111-116.

2. Iordachita, I. and Sabau, A. S., "Computation of the RD5NT Robot Workspace using the Monte Carlo Method," **Symposium on Design, Technology, and Management in Mechanical Engineering**, Iasi, Romania, May 22-23, 1992, 123-128.
3. Sabau, A. S., "On Computing the Joint Torques using Second Order Transfer Matrices for Industrial Robots," **Symposium on Design, Technology, and Management in Mechanical Engineering**, Iasi, Romania, May 22-23, 1992, 117-122.

TOTAL PUBLICATION COUNTS (see attached list)

73 journal papers (1-st author 38 papers),
11 industry refereed journal papers (1-st author 10 papers),
86 conference papers (1-st author 48 papers).
16 invited talks.

SYMPOSIUM ORGANIZER

Primary organizer of six international symposiums

- Computational Techniques for Multi-Scale Modeling in Advanced Manufacturing (A.S. Sabau, A.D. Rollett, L. Nastac, M. Li, and A. Anderson and S. Rokkam), 150-th TMS Annual Meeting, March 15-18, 2021.
- Modeling of Multi-Scale Phenomena in Materials Processing and Advanced Manufacturing (A.S. Sabau, A.D. Rollett, L. Nastac, M. Li, and A. Spear), MST 2016 Meeting, Salt Lake City, Oct. 23-27, 2016.
- Modeling of Multi-Scale Phenomena in Materials Processing - III (A.S. Sabau, A.D. Rollett, L. Nastac, J. Madison, and M. Li), 142-nd TMS Annual Meeting, San Antonio, TX, March 3-7, 2013.
- Modeling of Multi-Scale Phenomena for Batteries (A.S. Sabau, P. Balbuena and V. Subramanian), 2010 TMS Annual Meeting, Seattle, WA, Febr. 14-18, 2010.
- Modeling of Multi-Scale Phenomena in Materials Processing (A.S. Sabau, A.D. Rollett, A.V. Catalina), MST 2008 Meeting, Pittsburgh, PA, Oct. 5-9, 2008.
- Modeling of Multi-Scale Phenomena in Materials Processing (A.S. Sabau, A.D. Rollett and B. Mueller), 2002 TMS Annual Meeting, Seattle, WA, Febr. 17-21, 2002.

Co-organizer of eleven international symposiums

- Materials Processing Fundamentals (S. Wagstaff; A. Anderson; J. Lee; A.S. Sabau; F. Tesfaye), 2022 TMS Annual Meeting, Anaheim, CA, Febr. 27-March 3, 2022.
- Algorithm Development in Materials Science and Engineering (M.A. Zaeem, M. Mendelev, G. Tucker, E. Asadi, B. Wong, S. Reeve, E.M., Saez, A.S. Sabau), 2022 TMS Annual Meeting, Anaheim, CA, Febr. 27-March 3, 2022.
- Computational Approaches for Big Data, Artificial Intelligence and Uncertainty Quantification in Computational Materials Science (Q. Liang; F. Tavazza; C. Woodward; A. Sabau; H. Zhuang; S. Chowdhury) 2019 TMS Annual Meeting, San Antonio, TX, March 10-14, 2019
- Multi-scale Simulation and experimental validation of Additive Manufacturing Technologies: A Status Update by Academia, Solution Providers and Industry on its Intake, Market Opportunities Now and Going Forward (D. Pal; A. Saharan; A. Rollett; A.S. Sabau), Materials Science & Technology 2018, Pittsburgh, PA, Oct. 14-18, 2018.
- Phase Transformations in Materials Processing, (M.A. Zaeem, M. Mamivand, and A.S. Sabau), 2018 ASME International Mechanical Engineering Congress and Exposition (IMECE), Pittsburgh, PA Nov. 9-15, 2018.
- CFD Modeling and Simulation in Materials Processing 2018, (L. Nastac, K. Pericleous, A.S. Sabau, L. Zhang, and B.G. Thomas), 2018 TMS Annual Meeting, Phoenix, AZ, March 11-15, 2018
- Phase Transformations in Materials Processing and Their Effects on Mechanical Properties (M.A. Zaeem, A.S. Sabau, and W.K. Lui), 2017 ASME International Mechanical Engineering Congress and Exposition (IMECE), Tampa, FL, Nov. 3-9, 2017.
- CFD Modeling and Simulation in Materials Processing (L. Nastac, L. Zhang, B.G. Thomas, M. Zhu, A. Ludwig, A.S. Sabau, K. Pericleous, and H. Combeau), 2016 TMS Annual Meeting, Nashville, TN, Febr. 14-18, 2016.
- CFD Advances in the Science and Engineering of Casting Solidification: An MPMD Symposium Honoring Doru Michael Stefanescu (L. Nastac, B. Liu, H. Fredriksson, J. Lacaze, C-P. Hong, A. Catalina, A. Buhrig-Polaczek, D. Maijer, C. Monroe, A. Sabau, R. Ruxanda, A. Luo, S. Sen, and A. Diszegi), 2015 TMS Annual Meeting, Orlando, FL, March 15-19, 2015.

- Algorithm Development in Computational Materials Science and Engineering (with Jonathan Zimmerman, Douglas Spearot, Adrian Sabau, Mark Tschopp, and Mohan Asle Zaeem), 2014 TMS Annual Meeting, San Diego, CA, Febr. 16-20, 2014.
- CFD Modeling and Simulation in Materials Processing (with L. Nastac, L. Zhang, B.G. Thomas, N. El-Kaddah, A.C. Powel, and H. Combeau), 2012 TMS Annual Meeting, Orlando, FL, March 11-15, 2012.

FUNDED PROPOSALS

1. **Sabau, A.S.**(PI) *Microstructure Prediction during Casting of Al-Ni alloys*, DOE VTO, VTO Tri-Lab Powertrain Materials Core Program (PMCP), Total in FY23 $39K.
2. **Sabau, A.S.**(PI), Fattebert, J-L, and Blackburn B., *HPC Modeling of Rapid Infrared Sintering for Low Cost, Efficient Solid Oxide Electrolyzer Cell Manufacturing*, DOE AMO, HPC4Energy Innovation (collaboration with Redox Power Systems, LLC), Total in FY22 $300K.
3. Rohatgi A. (PI) and Sabau, A.S. *Metal casting simulations of Al alloys*, DOE VTO, VTO Lightweight Materials Core Program (LMCP) support thrust, Total FY22 $30K.
4. Delchini, M. (PI), Pointer W.D., Sabau, A.S. and Jain, P.K., *Advanced Thermal-Hydraulic Model of Heat Recovery Steam Generator*, DOE AMO, HPC4 Manufacturing with EPRI, Total in FY20 $300K.
5. **Sabau, A.S.**(PI), and Kato Y., *High-heat flux testing of low-level irradiated materials using plasma-arc lamps*, 2018, Total $350K for two years.
6. Pooran Joshi (PI), A.S. Sabau (co-PI), *Pulse Strengthened and Laser Edge Sealed Vacuum Insulation Glazing*, (WinBuild, Inc. – partner), total $1,500 (total for 3 years), 2019.
7. **Sabau, A.S.**(PI), *Computational Modeling of Multi-Strand Aluminum DC Vertical Casting Processes Incorporating Cast Structure and Thermal Treatment Effects Contributing to Rework Energy Losses*, DOE AMO, HPC4 Manufacturing, 2018, Total $150K.
8. **Sabau, A.S.**(PI), Love, L.J., Dehoff R.R., *Novel Recuperator Concepts for Supercritical CO2 based on Additive Manufacturing*, AOP to Fossil DOE program, ORNL Program manager Yarom Polsky, DOE HQ Program manager Robie Lewis, $250K/FY18.
9. **Sabau, A.S.**(PI), *Heat Flux Testing of Carbon Foam Materials Using Plasma-Arc Lamps for a Thermal Protection System*, SPP (WFO) project sponsored by Johns Hopkins University Applied Physics Laboratory, 2017-2018, Total $354K for one year.
10. **Sabau, A.S.**(PI) *Laser-Interference Surface Preparation for Enhanced Coating Adhesion and Adhesive Joining of Multi-Materials*, DOD SERDP, proposal no. 17 WP03-024, 2017, Total $1,735K for 3 years.
11. **Sabau, A.S.**(PI), *Development of a Transformational Micro-cooling Technology for High-pressure Die Casting using High-performance Computing*, DOE AMO, HPC4 Manufacturing solicitation, Total $300K for 1 year, FY17.
12. Yuan L. (GE) and Sabau, A.S., *Process Map for Tailoring Microstructure in Laser Powder Bed Fusion Manufacturing Process*, DOE AMO, HPC4 Manufacturing solicitation, 2016, Total $300K for 1 year.
13. P. Geoghegan (PI), A.S. Sabau (co-PI), *Adhesive Bonding of Aluminum in HVAC&R applications*, Proposal 1383-1696 to DOE BTO solicitation BENEFIT, $1,500K for 3 years, selected for award in FY17.
14. **Sabau, A.S.**(PI), *Heat Flux Testing of Carbon Foam Materials Using Plasma-Arc Lamps for a Thermal Protection System*, SPP (WFO) project sponsored by Johns Hopkins University Applied Physics Laboratory, 2015, Total $45K for one year.
15. **Sabau, A.S.**(PI), *Heat Flux Testing Using Plasma-Arc Lamps of a Solar Probe*, SPP (WFO) project sponsored by Johns Hopkins University Applied Physics Laboratory, 2015, $35K for one year.
16. Snead L. and Sabau, A.S., *High-heat flux testing of irradiated materials*, 2014, $500K/year per one year.
17. **Sabau, A.S.**(PI) *Predicting the Oxidation/Corrosion Performance of Structural Alloys in Supercritical CO2*, ORNL FWP for EPRI project, 2014, $80K for two years.
18. S. S. Babu, C. Duty, R. DeHoff, T. Watkins, A. Sabau, Z. Feng; S. Pannala, S. Simunovic, J. Turner, E. A. Payzant, *Residual Stress Modeling and Neutron Characterization of Additive Manufactured Components*, LDRD, $800K for two years, 2014.

19. **Sabau, A.S.**(PI) and Polsky, Y., *Freeform Heat Exchangers for Binary Geothermal Power Plants*, AOP GTO, 2013-2018 $790K (BA for FYs: $335K, $310K, and $145K).
20. **Sabau, A.S.**(PI), Warren, D., Daniel, C., Skszek, T. (Vehma, Inc.,), Caruso, M.M.(3M), Rehkopf J.D. (Plasan, Inc.), Erdman D., and Watkins T.R., *Laser-Assisted Joining Process of Aluminum and Carbon Fiber Components*, 2014, $300K/year for 2 years.
21. **Sabau, A.S.**(PI), *Development of an Integrated Model to Predict and Control Oxide Scale Exfoliation-cont.*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2014, $60K for one year.
22. Snead L. and Sabau, A.S., High-heat flux testing of irradiated materials, 2013, $200K for one year.
23. **Sabau, A.S.**(PI), *Development of an Integrated Model to Predict and Control Oxide Scale Exfoliation*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2013, $100K/year per one year.
24. **Sabau, A.S.**(PI), and MesoCoat, Inc., *Validation Data for Numerical Simulation of Meso-Coat Infrared (IR) Processing*, 2013, $20K/year per one year.
25. Shyam A., Yamamoto, Y., Shin, D., Sabau, A.S., Maziasz P., Watkins T., and Haynes A., *High performance cast aluminum alloys for next generation passenger vehicle engines*, 2012, $3,500K total
26. Palmer, B., Sabau, A.S., Gruszkiewicz M., Mcfarlane J., *A Revolutionary Hybrid Thermodynamic Cycle For Binary Geothermal Power Plants*$200K/year per one year, 2012.
27. A.S. Sabau and I. G. Wright, *Development of an Integrated Model to Predict and Control Oxide Scale Exfoliation*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2011, $70K/year per one year.
28. I. G. Wright (PI) and A.S. Sabau, *Development of an Integrated Model to Predict and Control Oxide Scale Exfoliation*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2010, $150K/year per one year.
29. T. R. Watkins, A.S. Sabau, D. Erdman III, T. W. Skszek, *IR Heat Treatment of Hybrid Cast Bi-Metallic Joints and Residual Stress Characterization*, $450K (funding for FYs: $455K, $580K, and $350K), CRADA No. NFE-10-02839, Vehma International of America, Inc.
30. I. G. Wright (PI) and A.S. Sabau, *Oxide Growth Characteristics in Waterwall Tubes of Supercritical Units*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2009, $150K/year per one year.
31. **Sabau, A.S.**(PI), Mcfarlane J., Gruszkiewicz M., Pawel, S.J., and , Qualls L.A, it Working Fluids and their Effect on Geothermal Turbines, 2009, $945K total for 2 year project.
32. I. G. Wright (PI) and A.S. Sabau, *Development of an Integrated Model to Predict and Control Oxide Scale Exfoliation*, Electric Power Research Institute (EPRI), DOE Proposal No. NFE-06-00257, 2008, $150K/year per one year.
33. Daniel, C., Babinec S. (A123Systems), Sabau, A.S., Armstrong, B.L., Howe, J., Dinwiddie, R.B., and Dudney, N., *Development and application of processing and process control for nano-composite materials for lithium ion batteries*, DOE Solicitation on Nanomanufacturing for Energy Efficiency 2008, $682K, $594K, $476K for FY09, FY10, and FY11, respectively.
34. **Sabau, A.S.**(PI), Ott, R.D., Dinwiddie, R.B, Jellison, G.E, *Transformational, Large Area Fabrication of Nanostructured Materials using Plasma Arc Lamps*, DOE Proposal Number 2427-T622-08, $180K for FY09.
35. Duty C., Allison, S., Das B. (UNLV), Leonard K., Maxey C., Moustakas T. (Boston U.), Ott R.D., and Sabau A.S, *Revolutionary Method for Increasing Efficiency of White Light Quantum Dot LEDs*, ORNL 2007 LDRD $K350/year per two years.
36. **Sabau, A.S.**(PI) and Radhakrishnan, B., *Nuclear Fuel Processing Design*, GNEP Fuels Campain, Project on Fuel Modeling and Simulation, 2007 2007, $K 70/year one year.

37. Sabau A.S., *Measurement of thermophysical properties of Magnesium alloys*, 2007, for USCAR-Mississippi Project, $K 25/year one year.
38. Craig Blue, Art Clemons, Chad Duty, Ron Ott, Adrian Sabau, and Greg Engleman, *Thermally Induced Chemical Volatilization from Vehicle-Type Surfaces Using a Short Pulse Plasma Arc Lamp*, DARPA, January 2007, $K 250/year per one year.
39. **Sabau, A.S.**(PI) and Blue, C.A. (with UTSI), *Net Shape Rapid Manufacturing using Nano-encapsulated Powders*, DOE Project No. NFE-06-00179, NASA STTR, $K 20/year per two years, 2006.
40. *Materials issues in Coal-Derived Synthesis Gas/Hydrogen-Fired Turbines*, DOE Fossil Energy, Ian G. Wright, Bruce A Pint, Bruce A, Adrian S Sabau, Peter F Tortorelli FY07 $K 480, FY08 $K 650, FY09 $K 790.
41. *Nanocrystalline/Amorphous Silicon Thin-Film Composite for Stable High Efficiency Photovoltaic Applications*, R.D. Ott, A.S. Sabau, R.B. Dinwiddie, M.J. Lance, J.E. Jellison, D.C. Harper, and N.D. Evans, ORNL 2005 LDRD project D06-119, $K275/year for two years
42. **Sabau, A.S.**(PI), *Predicting pattern tooling and casting dimension for investment casting*, U.S. Department of Energy Solicitation No. DE-PS07-03ID14488, Award: DE-FC36-04GO14230, FY 2004: $32K, FY 2005: $164K, FY 2006: $164K.
43. R. D. Ott, C. A. Blue, D. A. Blom, B. Radhakrishnan, A. S. Sabau, T. C. Schulthess, T. R. Watkins, and J. W. Harrell; *A Revolutionary Infrared Nanoscale Processing Approach*, ORNL LDRD project D04-015, FY 2004: $200K.
44. **Sabau, A.S.**(PI) and Vinod Sikka, *Computational Die Design for Producing High Quality Net Shaped Investment Casting Parts to Replace Forged Parts*, State Partnership Program for the States of Tennessee and Ohio, $50K/year for one year.
45. **Sabau, A.S.**(PI), Frankel, J., Keyhani M., , A. J. Baker, Porter W., *Inverse Process Analysis for the Acquisition of Thermophysical Property Data*, Industrial Materials for the Future, 2001, Solicitation DE-PS07-01ID14123, $250K/year for three years.
46. Blue C.A., Ohriner, E., Sabau, A.S., *Growth of Single Crystal Sheet and Foil Using Infrared Arc Lamp Heating*, 2001, Seed Money Fund of the ORNL LDRD, $100K/year for one year.
47. Viswanathan, S., Sabau, A.S., *Predicting Pattern Tooling and Casting Dimensions for Investment Casting - Phase II*, Research Staff, 2001, Metal Casting Industry of the Future, DE-PS07-00ID13862, $160K/year for three years.
48. Radhakrishnan B., and Sabau, A.S., *Mesoscale Modeling of Hot Tearing in Multicomponent Alloys*, ORNL programatic support, 2000, $50K/year per one year.
49. Viswanathan, S., Sabau, A.S., and Han, Q. *Modeling and Optimization of Direct Chill Casting to Reduce Ingot Cracking*, 2000, Aluminum Visions of the Future, DE-PS07-99ID13824, $300K/year for three years.

AWARDED PROPOSALS AND TOTAL AWARDED BUDGET

49 Total proposals (PI and co-PI),
Principal Investigator (PI) for 32 proposals with a total budget of $7429K,
PI and project leader on 14 large multidisciplinary projects (budget greater than $300K).

LIST OF PUBLICATIONS - by topics

Publication Lists for Projects in Advanced Manufacturing and Process Electrification

- Heat Exchanger Design (pp. 35-36),
- Additive Manufacturing (pp. 37-38),
- Laser Surface Processing (pp. 39-40),
- Infrared Processing (pp. 41-42),
- Metal casting (pp. 46-51):
  - High-Temperature Thermophysical Properties (pp. 46-47),
  - Investment Casting and Direct-chill Casting (pp. 48-49),
  - Prediction of Metal Casting Defects (pp. 50-51),
  - Moving Boundary Problems (Ph.D.) (p. 54),
- Powder Metallurgy (p. 52),

Publication Lists for Projects in Materials Behavior in Extreme Environments
(High Temperature, High Pressure, High Heat-Flux)

- High-heat flux testing for Fusion (p. 43),
- Supercritical Boiler, Supercritical CO_2, and Turbine Cycle (pp. 44-45),
- Materials Development for Batteries (p. 53),

Expertise in Advanced Manufacturing and Process Electrification: Computational Fluid Dynamics and Transport Phenomena (**CFD**), Development of Solution Algorithm and Source Code (**S**),
Phase-changes (**PC**), Microstructure modeling (**MM**), Commercial codes (**C**),
High-performance computing (**HPC**), Experimental (**E**).

Projects	**Expertise**
Heat Exchanger Design (pp. 35-36)	CFD - - S - E
Additive Manufacturing (pp. 37-38)	CFD PC MM S HPC E
Laser Surface Processing (pp. 39-40)	- - - - - E
Infrared Processing (pp. 41-42)	CFD PC - S - E
Metal casting (pp. 46-51)	
• High-Temperature Thermophysical Properties (pp. 46-47)	CFD PC - S - E
• Investment Casting and Direct-chill Casting (pp. 48-49)	CFD PC - S - E
• Prediction of Metal Casting Defects (pp. 50-51)	CFD PC MM S - E
• Moving Boundary Problems (Ph.D.) (p. 54)	CFD - - S - -
Powder Metallurgy (p. 52)	- - MM S - E

Expertise in Materials Behavior in Extreme Environments: Computational Fluid Dynamics and Transport Phenomena (**CFD**), Development of Solution Algorithm and Source Code (**S**), Phase-changes (**PC**), Thermodynamics (**T**), Commercial codes (**C**), Experimental (**E**).

Projects	**Expertise**
High-heat flux testing for Fusion (p. 43)	CFD - S E
Supercritical Boiler, Supercritical CO_2, Turbine Cycle (pp. 44-45)	CFD T S E
Materials Development for Batteries (p. 53)	CFD - S E

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