

# Carlo Uberto Segre

Duchossois Leadership Professor, Physics Department  
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## Education

1981	Ph.D., Physics, University of California, San Diego
1977	M.S., Physics, University of California, San Diego
1976	B.S. <i>cum laude</i> , Physics, University of Illinois, Urbana-Champaign B.S. <i>cum laude</i> , Chemistry, University of Illinois, Urbana-Champaign

## Appointments

2021-	Director, Materials Research Collaborative Access Team (MRCAT)
2021-	Professor of Materials Science and Engineering, Illinois Institute of Technology
2014-	Chief Technology Officer & Chief Financial Officer, Influx Energy, LLC
2012-	Director, Center for Synchrotron Radiation Research and Instrumentation, Illinois Institute of Technology
2011-	Duchossois Leadership Professor, Illinois Institute of Technology
2001-	Professor of Physics, Illinois Institute of Technology
2016-2019	Interim Chair, Department of Chemistry, Illinois Institute of Technology
2012-2021	Deputy Director, Biophysics Collaborative Access Team
2009-2011	Associate Dean for Graduate Admissions, Graduate College, Illinois Institute of Technology
2003-2009	Associate Dean for Special Projects, Graduate College, Illinois Institute of Technology
2002-2003	Associate Dean for Research, Armour College of Engineering and Science, Illinois Institute of Technology
1995-1999	Associate Chair, Department of Biological, Chemical and Physical Sciences, Illinois Institute of Technology
1994-2021	Deputy Director, Materials Research Collaborative Access Team (MRCAT)

1993-1995 Executive Chair for Chemistry, Department of Chemical and Biological Sciences, Illinois Institute of Technology

1993-1995 Joint Appointment as Associate Professor of Chemistry, Illinois Institute of Technology

1989-2001 Associate Professor of Physics, Illinois Institute of Technology

1990-1993 Staff Associate, International Centre for Science and High Technology, Trieste, Italy

1989-1990 Visiting Senior Scientist, International Centre for Theoretical Physics, Trieste, Italy

1983-1989 Assistant Professor of Physics, Illinois Institute of Technology

1981-1983 Postdoctoral Research Fellow, Department of Physics, Rutgers, the State University of New Jersey  
Advisor: M.C. Croft

### **Awards and Recognition**

- Illinois Science and Technology Coalition: Researchers to Know (2022)
- Fellow, American Association for the Advancement of Science (2013)
- Fellow of the International Centre for Diffraction Data (2006)
- IIT Sigma Xi Research Award, Senior Faculty Division (2014)
- IIT Faculty Research Fellowship 1985-1986
- Lewis College Junior Faculty Teaching Award 1985-1986
- NATO Postdoctoral Fellowship, 1983 (declined)
- Lyman Award, Department of Physics, University of Illinois, Urbana-Champaign, 1976
- Phi Beta Kappa
- Phi Kappa Phi

### **Society Memberships & Service**

- American Physical Society
- American Association for the Advancement of Science
- American Chemical Society
- International X-ray Absorption Society
- Electrochemical Society
- Materials Research Society
- American Vacuum Society
- Sigma Xi
  - President IIT Chapter (2005-2016)

- Director, North Central Region (2016-2022)
- Executive Committee (2017-2019)
- Member, Nominating Committee (2022-2026)
- Member, Finance Committee (2023-)
- International Center for Diffraction Data
  - Chair Education Subcommittee (2005-2020)
  - Director At-Large (2020-2024)
  - Vice President (2024-)
- Advanced Photon Source
  - Member of the Advanced Photon Source Beamtime Allocation Committee (2007-2023)
  - Member, Steering Committee, APS User Organization (2018-2021)
  - Vice Chair, Steering Committee, APS User Organization (2018-2019)
  - Chair, Steering Committee, APS User Organization (2019-2020)
- Member Stanford Synchrotron Radiation Laboratory Triennial Review Committee (2014, 2017)
- Debian GNU/Linux Developer (2005-)
- Proposal reviewer for NSF, DOE, ARO, NIH, CRDF, Research Corporation, SSRL, CLS
- Reviewer for *Physical Review*, *Journal of Crystal Growth & Design*, *ACS Nano*, *Nanoscience & Nanotechnology Letters*, *Ionics*, *Journal of Physical Chemistry*, *Powder Diffraction*, *Journal of Alloys & Compounds*, *Journal of Synchrotron Radiation*, *Journal of Physics: Condensed Matter*, *Superconductor Science and Technology*, *Physical Chemistry Chemical Physics*, *Journal of Chemical Physics*, *Nano Energy*, *ACS Catalysis*, *Applied Catalysis*, *Applied Crystallography*, *Nuclear Instruments & Methods*, *Materials Research Express*

## Major Accomplishments

- First determination of the crystal structure and oxygen ordering properties of the high temperature superconductor,  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ ;
- Co-founding of the Illinois Tech Center for Synchrotron Radiation Research and Instrumentation;
- Construction of 5 beamlines at the Advanced Photon Source;
- Operation and continuous funding of the Materials Research Collaborative Access Team since 1992;
- Invention of the Nanofluid Flow battery and co-founding Influid Energy which has raised over \$66M to develop a commercial product

## Teaching and Outreach Activities

Over the course of my career at IIT, I have had the opportunity to teach undergraduate courses at all levels and graduate courses specific to my research expertise. These include, Introduction to the Professions, General Physics I, II & III, Computational Physics, Instrumentation Laboratory, Solid State Physics, Modern Optics & Lasers, Introduction to Quantum Computing, Fundamentals of Quantum Theory I & II, Physical Chemistry I & III, Electronics for Analytical Chemists (graduate), Introduction to Synchrotron Radiation (graduate, also offered over Internet to

students outside the United States), Introduction to Quantum Computing (both graduate and undergraduate). I have also been involved in several revisions of the physics curriculum to meet the needs of our majors and engineering students who take our general physics courses.

I have also been an instructor for the APS/IIT EXAFS Summer School since 2009 and I have twice been invited to be an instructor for the NSLS EXAFS Workshop (2006 & 2010). I annually offer an informal short course for IIT graduate students on EXAFS Theory and practice and I have offered the same short course more recently to researchers at the Indian Institute of Science (Bangalore, India), Wright Patterson Air Force Base, and the Nissan Battery Group.

I have served as academic advisor to several hundred undergraduate students, including physics majors (undergraduates as well as professional Masters and first year M.S. and Ph.D. students), and undecided students in their first 2 years. More recently, I have become a mentor for the Duchossois Leadership Scholars program. This includes not only advising current scholars but also recruiting new scholars for the program.

I have mentored 24 Ph.D. students and 5 M.S. students and currently have 6 Ph.D. students in my laboratory. Approximately 30% of my Ph.D. students have from underrepresented groups in physics.

Over my time at IIT, I have been able to successfully establish a number of new degree programs, including Professional Masters programs in Radiation Health Physics, where I served as co-Director and Interim Director at various times; Bachelor of Science programs in Astrophysics and Engineering Physics.

Outside the classroom, I have been faculty advisor to the Society of Physics Students, the IIT students responsible for the Chicago Area Undergraduate Research Symposium and the IIT Undergraduate Research Journal. For the past 30 years I have been webmaster, chair, and member of the International Bridge Building Committee, a competition for high school students.

I was the initiator and primary organizer of the IIT Physics Department's American Physical Society IDEA team which works to increase the number of underrepresented groups in physics and ensures that the climate in the department makes it a welcoming place for all of our Faculty, students and staff.

In my role as a Debian GNU/Linux Developer, I have packaged scientific software for the Debian Linux and Ubuntu operating systems. Making these programs for scientific data analysis freely available to the broader scientific community.

## **Administrative & Fundraising Accomplishments**

I have served as Interim Chair of The Chemistry Department (3 years), Associate Chair of the combined Biological, Chemical and Physical Sciences Department (6 years) and as Associate Dean for nearly 10 years in various positions. My major accomplishment as Associate Dean for Special Projects was the development of a framework and agreement for IIT/FermiLab joint faculty appointments at the Assistant Professor level. These were novel appointment agreements at the time but have proven to be successful and now are used as templates for joint positions with Argonne National Laboratory.

As Associate Dean for Graduate Admissions, I reorganized the Graduate Admissions Office and spearheaded the development of a fully electronic graduate application, evaluation, admission, and award system which integrates with the Banner academic computing system used by IIT and which is as advanced as any in the country.

In addition to developing and recruiting for the Duchossois Leadership Scholars program, I have also put together a framework for the Tang Fellowship program which recruits outstanding Chinese students and fully supports their Ph.D. studies at IIT.

As one of the Duchossois Leadership Professors, I have been involved in fundraising and in donor relationships. I have personally obtained over \$250,000 in funding for new X-ray diffractometers and I have had the opportunity to assist our Institutional Advancement Department in Alumni visits.

## Research Activities

I have been working in the field of materials science for over 40 years and have gained a broad experience in the preparation and characterization of bulk and thin film samples of complex superconducting, magnetic and mixed valence materials. My expertise spans the experimental techniques of x-ray diffraction, neutron diffraction and x-ray absorption spectroscopy as well as the structural analysis tools of total pattern fitting and Rietveld refinement of structural data. I also have experience in electron microscopy, resistivity, magnetic and Mössbauer effect measurements. There are three patent disclosures related to materials I have studied.

Beginning in 1989, I have devoted more of my effort to building IIT's presence in the Synchrotron Radiation community. These activities have resulted in a shift in my scientific interests which is now beginning to be reflected in my publication record.

- I am a founding member of IIT's Center for Synchrotron Radiation Research and Instrumentation (CSRRI);
- I have been on the Local Organizing Committee of the *1<sup>st</sup> International Conference on Synchrotron Radiation in Materials Science* (1996); the *10<sup>th</sup> International Conference on X-ray Absorption Fine Structure* (1998); and the *5<sup>th</sup> International Conference on Synchrotron Radiation in Materials Science* (2006).
- Since 1994, I have served as the IIT representative to the MRCAT Executive Committee, as Deputy Director of MRCAT and as supervisor to all of the MRCAT staff until 2021, and currently as MRCAT Director.

One of my principal areas of interest has been sample preparation of bulk materials, from arc-melting of ternary silicide superconducting and magnetic compounds to the sintering of ceramic superconductors and ferroelectrics. This includes the determination of the optimal synthesis conditions and both ternary and solid solution phase diagram determination. This extended to thin film growth, particularly the determination of ideal growth conditions for highly oriented films of superconducting ceramic materials by pulsed laser deposition and the novel technique of electron spark deposition. An integral part of understanding the conditions for optimal synthesis is the structural characterization of the material. I have worked extensively on the solving of the crystallographic structure of complex oxides by powder neutron and x-ray diffraction using the technique of Rietveld refinement. I was involved in some of the original structural determinations of the high temperature superconducting compound  $\text{YBa}_2\text{Cu}_3\text{O}_7$  and related materials.

More recently, I have been using synchrotron-related structural techniques such as X-ray Absorption Fine Structure (XAFS) and anomalous diffraction to get a better understanding of the local and medium range disorder which is usually an integral part of any ceramic superconductor or ferroelectric solid solution system. These techniques are also being applied to the structural characterization of thin films. My ultimate goal is to develop new ways of combining traditional average structural refinement with local structural probes such as XAFS in order to develop more accurate structural models for disordered systems.

I have been heavily involved in developing instrumentation for use at synchrotron radiation facilities, including the MRCAT beamlines, a bent Laue analyzer for fluorescence XAFS, a beam cleaner for harmonic rejection, and *in-situ* and *operando* electrochemical cells for the study of catalysis, fuel cells and batteries.

My current research projects include *in situ* XAFS on solid state and flow batteries and working fuel cell catalysts, phosphors, dilute magnetic semiconductors, and multiferroics. I have also been applying high energy x-ray diffraction and tomography to study cultural heritage artifacts. A recent ARPA-e award has taken my research in the direction of developing a new format of battery, combining the advantages of solid state and flow batteries, for electric vehicles. This has resulted in founding a startup, Influit Energy, LLC to commercialize this new technology. To date, we have obtained ~\$16M in funding for this activity from SBIR grants and we have recently raised \$50M in Series A funding.

## Recent Invited Presentations

- 2004 “Structural studies of nanoparticle catalysts in a fully operating Direct Methanol Fuel Cell,” Illinois State University, Physics Department.
- 2006 “Structural studies of nanoparticle catalysts in a fully operating Direct Methanol Fuel Cell,” University of North Dakota, Physics Department
- “Structural studies of nanoparticle catalysts in a fully operating Direct Methanol Fuel Cell,” University of Iowa, Physics Department
- “X-ray absorption spectroscopy as in-situ characterization of catalysts in operating fuel cells,” XV International Materials Research Congress, Cancun, Mexico.
- “Fuel cell catalyst structural characterization by in-situ x-ray absorption spectroscopy,” American Chemical Society Meeting, San Francisco.
- “In-situ XAFS studies of fuel cell catalysts,” NSLS Workshop on XAFS studies of nanoparticles and chemical transformations.
- 2007 “In-situ Spectroscopic Studies of Pb Corrosion,” GNEP Advanced Materials Workshop, Oak Ridge National Laboratory.
- 2009 “Using x-ray absorption spectroscopy to probe the local structure of nano-scale systems,” Nanotechnology Colloquium, NanoMaterials Application Center, Texas State University.
- “Removal of oxygen adsorbates on Pt/C and PtNi(1:1)/C alloy nanoparticle catalysts for the oxygen reduction reaction in PEMFCs,” XAFS 14 Conference, Camerino, Italy.
- 2010 “Using experimental and computational x-ray absorption spectroscopy to understand fuel cell catalysts,” University of Delaware, Physics Department
- “Using experimental and computational x-ray absorption spectroscopy to understand fuel cell catalysts,” Daresbury Laboratory, UK.
- 2011 “X-ray Absorption Spectroscopy and applications to fuel cell catalysts,” Wichita State University, Physics Department.
- “X-rays in the Neighborhood: IIT and the Advanced Photon Source,” Illinois Institute of Technology University Lecture.
- 2012 “Using x-ray physics to study catalysis at the MRCAT Beam Line,” University of Illinois, Urbana-Champaign, Physics Department.
- “Using x-ray physics to study catalysis at the MRCAT Beam Line,” Wright-Patterson Air Force Base.
- 2013 “Using x-ray physics to study catalysis at the MRCAT Beam Line,” Università di Padova, Italy, Chemical Engineering Department.
- “Using x-ray physics to study catalysis at the MRCAT Beam Line,” Università di Trento, Italy, Chemical Engineering Department.
- “Surface science using x-ray and neutron sources,” BP Distributed Research Laboratory meeting on surface science, BP Naperville.
- “In situ and operando XAFS studies of fuel cell catalysts,” BP Distributed Research Laboratory meeting on surface science, BP Naperville.

- “In situ and operando XAFS studies of fuel cell catalysts,” Illinois Institute of Technology, Chemistry Department Colloquium.
- 2014 “Using synchrotron radiation to study catalysis,” Villanova University, Chemistry Department Colloquium.
- “Can EXAFS help solve local structural questions in NPD and XRPD?,” International center for Diffraction Data, March 2014 Meeting.
- “The challenges of making flow batteries with nanoelectrofuel,” Wichita State University, Physics Department Colloquium.
- “Making an nanoelectrofuel flow battery,” Illinois Institute of Technology, Mechanical, Materials and Aerospace Engineering Department Colloquium.
- 2015 “X-ray absorption spectroscopy as a structural probe of dynamics in fuel cell and battery systems,” University of Notre Dame, Physics Department Condensed Matter Seminar.
- “Rechargeable nanoelectrofuel flow batteries \ for EV systems,” University of Illinois at Chicago, Invited lecture for LAS 493. *J. Phys. Chem. C*, (in press 2021).
- 2016 “High energy density Nanoelectrofuel flow batteries for transportation and renewables: Development, prospective and challenges,” American Institute of Chemical Engineers, Midwest Research Conference, Keynote Address.
- “Designing improved materials for electrochemical energy applications,” Illinois Insitute of Technology, Chemistry Department Colloquium.
- “The science and engineering of Nanoelectrofuel flow battery development,” Illinois Insitute of Technology, Physics Department Colloquium.
- “The science and engineering of nanoelectrofuel flow battery development,” Illinois State University, Physics Department Colloquium.
- “X-ray absorption spectroscopy as a structural probe of dynamics in fuel cell and battery systems,” University of Illinois at Chicago, Chemical Engineering Department Colloquium.
- “The science and engineering of Nanoelectrofuel flow battery development,” Villanova University, Chemistry Department Colloquium.
- “How do we design improved materials for electrochemical energy applications?” NGenE 2016, University of Illinois at Chicago.
- 2017 “What’s a physicist doing speaking at an analytical chemistry seminar?” University of Iowa, Chemistry Department Analytical Chemistry Seminar.
- 2018 “Nanoelectrofuel flow batteries for transportation: How to start a battery company,” Southern Illinois University, Carbondale, Sigma Xi Lecture.
- “In situ characterization of battery materials using x-ray absorption spectroscopy,” American Physical Society March Meeting, Invited Talk.
- “In situ characterization of battery materials using x-ray absorption spectroscopy,” National Synchrotron Light Source II User Meeting, Invited Talk.
- 2019 “When can’t crystallography be trusted? The case of hexagonal YMO<sub>3</sub>-type chromophores,” Illinois Institute of Technology, Chemistry Department Colloquium.

- 2021 “Enhancing cobalt-free lithium-ion cathode performance through doping, surface coating, and heat treatment,” Illinois Institute of Technology, Chemistry Department Colloquium.
- “The consequences of local structure in hexagonal YMO<sub>3</sub>-type chromophores,” Global EXAFS Colloquium.
- “X-ray absorption spectroscopy probes of energy-related materials,” Boston College, Guest Lecture, Quantum Mechanics course.
- “Probing battery chemistry with x-ray absorption spectroscopy,” NASA Virtual Colloquium.
- 2022 “Effect of initial structure on high entropy oxide Li-ion anode materials,” XAFS18, Virtual contributed talk.
- “2022 Nobel Prize in Physics – Part 1,” Illinois Institute of Technology, Physics Department Colloquium.
- “Tuning Li-ion anode performance with high entropy oxides,” Illinois Institute of Technology, Chemistry Department Colloquium.
- “Spectroscopy at MRCAT after the APS-U,” Advanced Photon Source User Meeting workshop.
- “Tuning Li-ion anode performance with high entropy oxides,” 2022 ESO Telluride Workshop on Entropy-Stabilized Oxides, Invited talk.
- 2023 “40 years of materials science research at Illinois Tech,” Illinois Institute of Technology, Physics Department Colloquium.
- “From basic research to a startup in 40 years,” ICDD Early Career Researchers Networking Group.
- “Doing in situ EXAFS on batteries,” 2023 Denver X-Ray Conference Workshop: *In situ* battery measurements.
- “2023 Nobel Prize in Physics,” Illinois Institute of Technology, Physics Department Colloquium.
- 2024 “Tuning Li-ion anode performance with high entropy oxides,” Illinois Institute of Technology, Physics Department Colloquium.
- “*In situ* studies of high entropy oxides for Li-ion anodes,” 2024 Denver X-Ray Conference, Contributed Talk
- “Tuning Li-ion anode performance with high entropy oxides,” Illinois Institute of Technology, MMAE Department Colloquium.
- 2025 “Batteries for long duration electrical storage: Options and obstacles,” Illinois Institute of Technology, Physics Department Colloquium.
- “Battery research using local structure probes,” Chemours Battery Group Seminar
- “Batteries for long duration electrical storage: Options and obstacles,” American Physical Society GERA Workshop, Invited Talk
- “Opportunities for battery research at APS-U,” 2025 Advanced Photon Source User Meeting: Workshop #5.



## Graduate Students Supervised

### Ph.D.

- 1987 K. Zhang - *Structure and Superconductivity of High Transition Temperature Copper Oxides.*
- 1991 K.J. Akujieze - *Structural and Electronic Studies of Pure and Lead-Doped Phases of the Single Cu-O layer Bi-Sr-Cu-O System.*
- 1991 D.T. Marx - *Structures and Superconductivity in Perovskite Bismuthate Systems.*
- 1992 P.G. Radaelli - *Oxygen Ordering and Superconductivity in Pure and Calcium-Substituted REBa<sub>2</sub>Cu<sub>3</sub>O<sub>6+x</sub> Systems.*
- 1994 Z. Wang - *Flux Dynamics in Type-II Superconductors.*
- 1995 R.K. Zasadzinski - *Studies of Superconductors Using a Low-Temperature Scanning Tunneling Microscope.*
- 1996 B. Ma - *Electrical Transport Properties and Defect Structure in the Sr-Fe-Co-O System.*
- 1999 A. Cansiz - *Force, Stiffness and Hysteresis Losses in High Temperature Superconducting Bearings.*
- 2003 N.E. Leyarovska - *X-ray Spectroscopy of Manganese-Based Single-Molecule Magnets.*
- 2007 S. Stoupin - *Manganese Incorporation into Ferroelectric Lead Titanate.*
- 2009 S. Liu - *X-ray Absorption Studies of Materials for Advanced Nuclear Reactors.*
- 2009 T. Brennan - *On the Variation of Sonoluminescence Flash Timing.*
- 2010 Q. Jia - *In situ XAFS Studies of the Oxygen Reduction Reaction on Carbon Supported Platinum and Platinum Nickel Nano-Scale Alloys as Cathode Catalysts in Fuel Cells.*
- 2012 H. Ganegoda - *Iron Incorporation into Ferroelectric Lead Titanate*
- 2013 M. Wojcik - *Fabrication and Characterization of High Aspect Ratio Hard X-ray Zone Plates with Ultrananocrystalline Diamond Molds*
- 2015 C. Pelliccione - *In Situ X-ray Absorption Spectroscopy Study of Sn and SnO<sub>2</sub> Anode Nanomaterials for Lithium-Ion Batteries*
- 2018 M. Sangroula - *Coupling Impedance Measurement and Analysis of Critical Vacuum Chamber Components for the Advanced Photon Source Upgrade*
- 2018 S. Aryal - *Structural Studies of Degradation Mechanism of Lithium Rich Manganese, Nickel, and Iron Based Cathodes*
- 2019 H. Saglam - *Spin Transport and Spin-Orbit Torques in Antiferromagnets*
- 2019 Y. Ding - *In Situ X-ray Absorption Spectroscopy Study of Tin-Based Graphite Composite Anodes for Lithium-Ion Batteries*
- 2020 E. Moazzen - *Nanomaterials for Advanced Battery Cathodes*
- 2021 K. Kucuk - *Investigation of structure and processing effects on the electrochemical performance of Lithium- and Manganese-rich, layered-oxide cathodes for LIBs*
- 2023 O.J. Marques - *High-entropy stabilization as a designing tool for Li-ion electrodes*
- 2024 N. Su - *In situ EXAFS studies of novel palladium-based anode catalysts for direct ethanol and formic acid fuel cells*

## M.S.

- 1989 M.S. Kleefisch - *The Thermal Decomposition of an Alternative Precursor to  $\text{YBa}_2\text{Cu}_3\text{O}_7$* .
- 1997 T. Bolin - *The Dielectric Constant and Stability of Nafion-Ceramic Composite Thin Films*.
- 2010 L. Melo - *X-Ray Diffraction and Fluorescence Analysis of Ancient Axe Heads*.
- 2017 N. Goldring - *Finite Element Analysis of High Heat Load Deformation and Mechanical Bending Correction of a Beamline Mirror for the APS Upgrade*.
- 2017 N. Beaver - *In situ XAS of Molybdenum Dichalcogenides as Li-Ion Battery Anodes*

## Research Funding

### As PI (since 2016 ordered by end date)

- 05/01/2015–09/30/2016 Synchrotron Studies of Molybdenum-Based Battery Materials, Sandia National Laboratory, \$70,000
- 12/31/2013–12/30/2016 Prototype of Rechargeable Nanofluid Flow Battery for EV Motor with High Energy Density, Low Viscosity and Integrated Thermal Management Function, ARPA-e, \$1,851,996
- 09/01/2016–08/31/2017 Development of nanocomposite 3d printer ink, Argonne National Laboratory, \$51,473
- 08/13/2014–09/30/2017 Student Support for APS-Upgrade Vacuum System Components Impedance and RF Property Testing, Argonne National Laboratory, \$174,000
- 10/01/2017–06/30/2018 Design Guidance to Reduce Impedance Effects and Rf-Induced Heating in APS-U Accelerator Vacuum System Components, Argonne National Laboratory, \$31,460
- 05/16/2015–05/15/2019 Student Support for Hilal Saglam, Argonne National Laboratory, \$172,177
- 05/20/2019–09/30/2020 Analyze X-ray absorption spectroscopy data, Argonne National Laboratory, \$25,000
- 03/01/2020–09/30/2020 Software Development for SER-CAT, University of Georgia, \$24,527
- 01/14/2016–12/19/2020 Optimizing x-ray experimental setups at MRCAT Sector 10 and APS beam lines, Argonne National Laboratory, \$1,675,651
- 03/01/2017–01/09/2022 Synchrotron Analysis of Actinide/Analogues in High Ionic Strength Brines, Los Alamos National Laboratory \$100,000
- 02/01/2021–01/27/2023 Operate the (MRCAT) Sector 10 beam lines at the Advanced Photon Source (APS), Argonne National Laboratory, \$290,000
- 02/01/2021–09/30/2023 Optimizing x-ray experimental setups at MRCAT Sector 10 and APS beam lines, Argonne National Laboratory, \$600,002
- 09/14/2021–10/11/2023 MRCAT Beamtime Support for BP Research,” BP Ventures, \$110,000
- 04/01/2023–03/31/2024 Spectroscopy Group CLS@APS Staff, Argonne National Laboratory, \$225,477
- 06/22/2023–03/31/2024 Provide upgrade of MRCAT Sector 10 beamlines at the Advanced Photon Source in support of the Argonne Chemical Sciences and Engineering Division, Argonne National Laboratory, \$48,000

04/01/2022–03/31/2024 In situ battery studies using synchrotron radiation, Nissan, \$150,000

10/01/2019–09/30/2024 Graduate Training for Frontier Research Using Synchrotron Radiation: 2019, Department of Education, \$906,195

12/11/2018–12/31/2024 Wetlands Hydrobiogeochemistry, Argonne National Laboratory, \$448,771

01/01/2016–03/31/2025 Canadian Light Source Support for APS, Candian Light Source, Inc., \$2,428,716

01/01/2018– MRCAT Beamline Support for Honeywell UOP, Honeywell, \$945,000

10/06/2023– Synchrotron analysis of actinide/analogues in high ionic strength brines, Los Alamos National Laboratory, \$419,996

09/01/2024– Na-ion Cathodes for High-energy EV Batteries, Argonne National Laboratory, \$55,440

09/25/2024– High Purity Entanglement Generation Using Complex Domain Engineering Student Support, University of Southern California, \$64,665

10/01/2024– Graduate Training for Frontier Research Using Synchrotron Radiation: 2024, Department of Education, \$1,344,792

12/11/2024– EXAFS & PDF on Photoreduction Catalysts, Argonne National Laboratory, \$79,297

01/01/2025– Wetlands Hydrobiogeochemistry SFA, Argonne National Laboratory, \$57,639

05/01/2025– Upgrade the Materials Research Collaborative Access Team (MRCAT) Sector 10 beam lines, \$130,000

**As co-PI (since 2016 ordered by end date)**

10/01/2014–09/30/2016 Intermediate Temperature Hybrid Fuel Cell System for the Conversion of Natural Gas to Electricity and Liquid Fuels,” ARPA-e, \$320,000

03/15/2021–02/29/2024 REU Site: Characterization of Materials Using Synchrotron X-ray Based Tools, National Science Foundation, \$404,776

02/01/2022–01/31/2025 Imidazolium Functionalized Transition Metal Phosphide Catalysts for Electrochemical Carbon dioxide Conversion to Ethanol, \$597,868

03/22/2022–03/21/2025 Direct Conversion of Flue Gas to Value-Added Chemicals Using a Carbon - Neutral Process, ARPA-e, \$1,885,932

01/01/2023– Center of All-Solid-State Batteries for a Clean Energy Society, National Science Foundation, \$1,499,867

## Publications - Carlo U. Segre

### Archival Journal Articles

1. "Bound-state wave packets," C.U. Segre and J.D. Sullivan, *Am. J. Phys.* **44**, 729-732 (1976).
2. "Pressure enhanced superconductive and magnetic interactions in the system  $(\text{Er}_{1-x}\text{Ho}_x)\text{Rh}_4\text{B}_4$ ," R.N. Shelton, C.U. Segre, and D.C. Johnston, *Solid State Commun.* **33**, 843-846 (1980).
3. "The superconductivity of  $\text{Sc}_4\text{T}_5\text{Si}_{10}$  ( $\text{T}=\text{Co}, \text{Rh}, \text{Ir}$ ) and isomorphous compounds," H.F. Braun and C.U. Segre, *Solid State Commun.* **35**, 735-738 (1980).
4. "Hydrostatic pressure effects on the superconducting properties of  $\text{Ag}_{1-x}\text{Sn}_{1+x}\text{Se}_2$ ," R.N. Shelton, C.U. Segre, and D.C. Johnston, *Solid State Commun.* **39**, 797-800 (1981).
5. "Susceptibility and Mössbauer studies of magnetic rare earth-iron-silicides," H.F. Braun, C.U. Segre, F. Acker, M. Rosenberg, S. Dey, and P. Deppe, *J. Magn. Magn. Mat.* **25**, 117-123 (1981).
6. "Reentrant superconductivity in  $\text{Tm}_2\text{Fe}_3\text{Si}_5$ ," C.U. Segre and H.F. Braun, *Physics Letters* **85A**, 372-374 (1981).
7. "Configurational crossover for Eu systems: a simple model," M. Croft, E. Kemly, and C.U. Segre, *Solid State Commun.* **44**, 1025-1029 (1982).
8. "Valence instability in  $\text{Eu}(\text{Pd}_{1-x}\text{Au}_x)_2\text{Si}_2$ : the global phase diagram," C.U. Segre, M. Croft, J.A. Hodges, V. Murgai, L.C. Gupta, and R.D. Parks, *Phys. Rev. Lett.* **49**, 1947-1950 (1982).
9. "Neutron-diffraction study of magnetically ordered  $\text{Er}_2\text{Fe}_3\text{Si}_5$ ," A.R. Moodenbaugh, D.E. Cox, C.B. Vining, and C.U. Segre, *Phys. Rev. B* **29**, 271-277 (1984).
10. "Ce valence variation in intermetallic alloys:  $L_{III}$  absorption spectroscopy results," R.A. Neifeld, M.C. Croft, C.U. Segre, and S. Raaen, *Phys. Rev. B* **30**, 4164-4169 (1984).
11. "Specific heat and critical field for some iron containing superconductors," G.R. Stewart, G.P. Meisner, and C.U. Segre, *J. Low Temp. Phys.* **59**, 237-240 (1985).
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