

Science & Technology Enablers of a Domestic Extreme Battery Supply Chain

- The United States depends on unreliable foreign sources for lithium, nickel, cobalt, graphite and manganese.
- Development of a domestic extreme battery supply chain is a national security enabler.
- Discovery of alternative materials can be another national security enabler.



CREB
CENTER FOR RESEARCH IN EXTREME BATTERIES

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CREB Program Administrator



MARYLAND ENERGY
INNOVATION INSTITUTE

ARL NIST



BROOKHAVEN
NATIONAL LABORATORY

Argonne
NATIONAL LABORATORY



M
MSU



COLUMBIA UNIVERS
IN THE CITY OF NEW YORK

BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK

[dstl]

ion
Storage
Systems

SAFT
a company of
TOTAL

Bren-Tronics, Inc.
Intelligent Military Batteries & Charging Systems



CREB
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Goal: To foster and accelerate collaborative research in advanced battery materials, technologies, and characterization techniques.

Focus: CREB is the only battery center in the US focused on the development of batteries with extreme performance, extreme safety, and extreme environmental capabilities for the defense, aerospace, and biomedical industries.

History: Started as a UMD / ARL research collaboration between Chunsheng Wang and Kang Xu, and a programmatic focus of the Maryland Energy Innovation Institute and the ARL Open-Campus Initiative.



Bi-annual meeting: Convenes academic, industry, and governmental agencies as part of CREB Consortium in major topical biannual meetings at UMD and ARL

**UMD-ARL-NIST
Award Innovation
First Seed Grants**

**Bylaws and Articles of
Collaboration for CREB
Consortium Signed**

**ARL invested
\$1.0M for
Conformal
Wearable
Batteries**

**NIST joined
CREB
Congress
appropriated
\$10M for CREB**

**Congress
appropriated
\$10M for CREB
Research**



2014 Fall (ARL) <i>Inaugural Meeting</i>	2015 Spring (UMD) <i>Steering Committee Formed</i>	2016 Spring (UMD) <i>Aerospace & Biomedical Batteries</i>	2016 Fall (ARL) <i>Future of Munitions Batteries</i>	2017 Spring (UMD) <i>Engineering Sustainability</i>	2017 Fall (UMD) <i>Biomedical Batteries</i>	2018 Spring (ARL) <i>Fast Charging Batteries</i>	2018 Fall (UMD) <i>Safe and Wearable Batteries</i>	2019 Spring (UMD) <i>Electric Flight Batteries</i>	2019 Fall (UMD) <i>Aerospace Batteries</i>	2020 Fall (virtual) <i>Transformational Army Batteries</i>	2021 Spring (virtual) <i>Intelligence Batteries</i>	2021 Fall (virtual) <i>Low Temperature Batteries</i>
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CREB Steering Committee

UMD: Chunsheng Wang (*UMD CREB Director*) & Eric Wachsman

ARL: Wesley Henderson (*ARL CREB Lead*) & Kang Xu

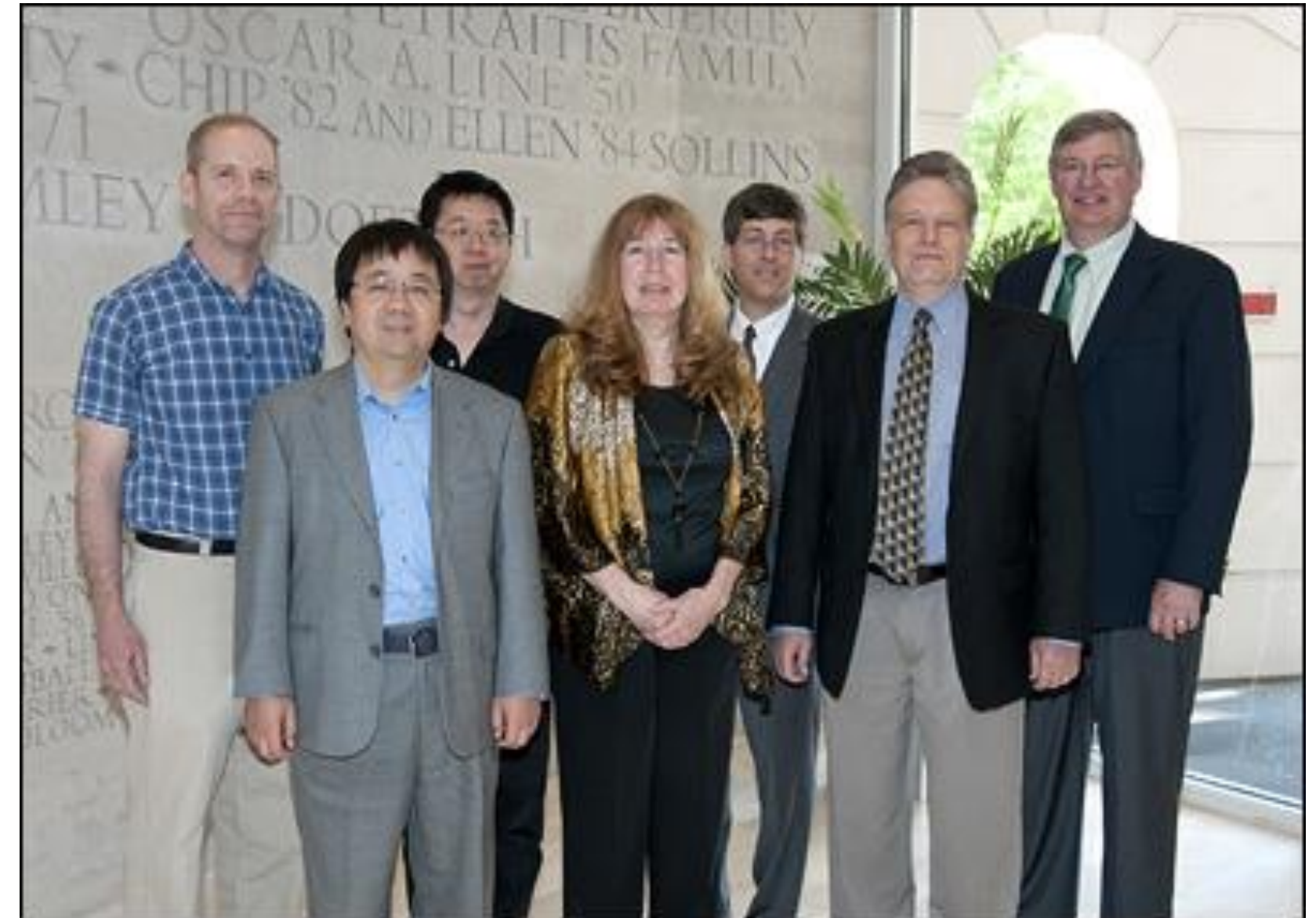
NIST: Joseph Dura & David Jacobson

NYBEST: William Acker

BNL/Stony Brook U: Esther Takeuchi

ANL: Kahlil Amine

SUNY: Stanley Whittingham (Nobel Laureate in Chemistry, 2019)



Wesley Henderson



Kahlil Amine



Esther Takeuchi



Stanley Whittingham

CREB Consortium

CREB Consortium is comprised of individual, organizational, and industrial members



Jim Short

Program Administrator

Former Senior Technical advisor to the Assistant Secretary of Defense for Operational Energy; Weapons Staff Specialist for Director, Defense Research & Engineering; Scientific Officer at ONR; Scientific Advisor to the Principal Deputy Director, Defense Research & Engineering; Senior Executive Service appointment as Director of DoD Laboratory Programs in Office of the Secretary of Defense

FY20 Department of Defense Appropriations Act “Center for Research in Extreme Batteries” \$10M

Universities



National Labs



FY21 Department of Defense Appropriations Act “Center for Research in Extreme Batteries” \$10M

Industry



NEW YORK BATTERY AND ENERGY STORAGE TECHNOLOGY CONSORTIUM

