CANFSA

Center for Advanced Non-Ferrous Structural Alloys

An Industry/University Cooperative Research Center

CANFSA Overview

Spring 2022 IAB Meeting

April 12-14, 2022

canfsa.org

Internet: Table Mountain Inn
Pwd: TACOS

COLORADO SCHOOL OF MINES

NSF

IOWA STATE UNIVERSITY

- Introductions
- New NSF CANFSA I/UCRC Evaluator: Jeff Ares
  - Phase 3!
- NSF Welcome: Crystal Leach, Program Director, Industry/University Research Centers

National Science Foundation Industry/University Cooperative Research Center (IUCRC)

CANFSA
CENTER FOR ADVANCED NON-FERROUS STRUCTURAL ALLOYS

- Established in 2011
- Multi-Site
  - Colorado School of Mines
  - Iowa State University
- Funding Sources
  - National Science Foundation
    - Phase 2 (no-cost extension)
    - Phase 3 (awarded, Feb 2022)
  - Industry membership dues
  - Leveraged projects
  - University overhead, facilities

COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

Orediggers™

- 6,754 students
  - 5,187 undergraduate and 1,522 graduate
  - 50 states, 80 countries (55.8% CO residents)
  - 30.9% female, 8.7% international
  - Largest collegiate section of SWE in the US
- >325 tenured and tenure-track, research and teaching faculty
  - **Student/faculty ratio of 16:1**
  - **Average class size 34**
- **>$95M in research, ~40% funded by non-federal sources (R1, Jan 2022!)**

IOWA STATE UNIVERSITY

- University: 30,708 students
  - 25,808 undergraduate and 4,264 graduate & professional
  - 50 states, 112 countries (56.1% IA residents)
  - 45% female, 8.1% international
  - Average GPA: 3.7/4.0
- College of Engineering: 8,098
- >500 tenured and tenure-track, research and teaching faculty
  - 85% first year students in learning communities
- **>$105M in research (R1)**

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CENTER FOR ADVANCED NON-FERROUS STRUCTURAL ALLOYS

Current Members

Novelis

Not just aluminum, Novelis Aluminum.™

ATI

Los Alamos NATIONAL LABORATORY

Thermo-Calc Software

Lawrence Livermore National Laboratory

Honeywell

ELEMENTUM

AIR FORCE RESEARCH LABORATORY

mag specialties

Sandia National Laboratories

QUEEN CITY FORGING CO.

NADCA

NORTH AMERICAN DIE CASTING ASSOCIATION

DePuy Synthes

PART OF THE Johnson & Johnson FAMILY OF COMPANIES

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Membership

- Full members $54K/year
  - Sit on Industrial Advisory Board (IAB)
  - Propose and vote on new projects
  - Entitled to a non-exclusive, royalty-free license
  - Reduced overhead
- Associate members $27K/year ***(Phase 3)***
  - Small business as defined by SBIR (www.sbir.gov)
  - Sit on IAB
  - Propose and vote on new projects (1/2 votes of full members)
  - Reduced overhead

Benefits of Membership

CANFSA
CENTER FOR ADVANCED NON-FERROUS STRUCTURAL ALLOYS

The premier industry-university center for non-ferrous physical metallurgy

Train the next generation of non-ferrous physical metallurgists

Perform industrially-relevant and scientifically impactful research

Connect academia, government, and industry

Contact us!

canfsa@mines.edu

canfsa.mines.edu

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Benefits of Membership

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”A glimpse into the future” – canfsa.mines.edu

Communication and Deliverables

- Semi-annual IAB meetings (Golden, CO and/or Ames, IA)
  - Students present research results
    - Technical report
    - Executive summary
    - Technical presentation
  - New project ideas are reviewed and ranked
- Summer videoconferences
  - Students present research updates
  - Broader attendance by industrial members
- Project mentoring by IAB members
  - Opportunity to interact closely with students
  - Provide industrial perspective and project guidance
- Conferences, peer-reviewed publications, and theses
- CANFSA website, canfsa.mines.edu

Center Directors, Staff, and IAB Chairs

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Co-Directors

Amy Clarke, Pete Collins, Mike Kaufman



Center Administrator

Debbie Haywood

Industrial Advisory Board (IAB) Chairs

Current: Eric Payton (AFRL), Past: Paul Wilson (Boeing), Rob Mayer, (Queen City Forging Co.)



Center Faculty from Mines and ISU

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Amy Clarke: Physical metallurgy, phase transformations, microstructural evolution, in-situ characterization

Pete Collins: Practical and theoretical treatments of microstructure-property relationships

Mike Kaufman: Physical metallurgy, electron microscopy

Sid Pathak: Nano-mechanics, physical metallurgy

Jonah Klemm-Toole: Physical metallurgy, high temperature performance

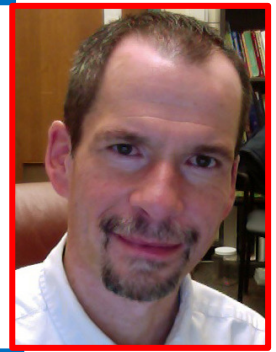
Kester Clarke: Physical metallurgy, deformation processing, heat treatment

Mohsen Asle Zaeem: Multiscale modeling, microstructure development, phase field

Richard LeSar: Materials plasticity theory and modeling

Martin Thuo: Surfaces and interfaces, low-cost diagnostics

Ralph Napolitano: Alloy solidification and physical metallurgy



Shraddha Vachhani: Small-scale mechanical testing and mechanics

Suveen Mathaudhu: Materials Properties and Processing

Garritt Tucker: Modeling of structure-property relationships in materials; DFT, MD

Terry Lowe: Severe plastic deformation, physical metallurgy

Steve Midson: Die casting and coatings

Current Students & Postdocs

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Undergraduates

- Laura Blau (Mines)
- Nathan Brown (Mines)
- Natalie Compton (Mines)
- Zane Fisher (Mines)
- Darrien Hammond (Mines)
- Alexander Hatton (Mines
- Matt Dolde (ISU)
- Torin Hopkins-Arnold (Mines)
- Charlee Johnson (Mines)
- Luke Weston (ISU)
- Nazim Kargar (Mines)
- Willian Lansing (Mines)
- Laura Liao (Mines)
- Ricardo Ortega (ISU)
- Beau Nannnie (Mines)

Undergraduates

- Evan Penczek (Mines)
- Lennard Poliakov (Mines)
- Shashi Krishnan (ISU)
- Gabriel Thompson (Mines)
- Melanie Torres (Mines)
- Madeline Rivera (Mines)
- Karagan Shiu (Mines)
- William Stoghill (Mines)
- Mason Weems (Mines)

Postdocs / Res. Scientists

- Thomas Ales (ISU)
- Benjamin Ellyson (Mines)
- Yuan Ji (ISU)
- Maria Quintana-Hernandez (ISU)
- Adriana Eres Castellano (Mines)

Graduate Students

- Adira Balzac (Mines)
- Scott Blazanin (ISU)*
- Chandler “Gus” Becker (Mines)
- Summer Camerlo (Mines)
- Nelson Delfino de Campos Neto (Mines)
- Adam Freund (Mines)*
- James Frishkoff (Mines)
- Henry Geerlings (Mines)
- Juan Gonzales (Mines)
- Oliver Hesmondhalgh (Mines)
- Spencer Hunt (Mines)
- Amamchukwu Ilogebe (ISU)
- Chris Jasien (Mines)
- Chloe Johnson (Mines)*
- Megan Le Corre (Mines)

Graduate Students

- David Loyola (Mines)
- Brady McBride (Mines)*
- Byron McArthur (Mines)*
- David McDevitt (Mines)*
- Abigail Miklas (Mines)
- Brian Milligan (Mines)
- Ruben Ochoa (Mines)
- Katie O’Donnell (ISU)
- Alana Pauls (ISU)
- Bobby Puerling (Mines)
- Lionel Promel (Mines)
- Brian Rogers (Mines)
- Alec Saville (Mines)
- Jeremy Shin (Mines)
- Stuart Shirley (Mines)*
- Charles Smith (Mines)
- Gillian Storey (Mines)*

Graduate Students

- Nadira Surghani (Mines)
- Andrew Temple (ISU)
- Jesus Vazquez (Mines)
- Will Waliser (Mines)*
- Max Wallace (Mines)
- Noah Welch (ISU)*

*CANFSA

Project Proposal and Selection Process

- Annual project priority list
- 2022-2023 proposal and selection
  - Submit 1-page proposals by March 15, 2022 (kclarke@mines.edu)
    - MS and PhD projects (~2 and 4 years)
  - Center leadership will review and help submitters refine proposals
  - Discussion of proposals with IAB and Center leadership at April 12-14 IAB Meeting
  - Final voting and downselection of projects in May 2022
  - Projects will be considered for Fall 2022 and Spring 2023 student starts

CANFSA Spring 2021 Project Proposal

Proposal should be ~1 page total and is intended to communicate project ideas among CANFSA faculty and sponsor representatives. Replace/delete red text.

Title: Project title
Proposer: Name, affiliation (can be more than one person or company)
Faculty: Name, affiliation (can be a proposal for faculty that might be interested and capable)
Other Sponsors: Sponsor company 1, sponsor company 2 (others who may be interested)
Proposed Scope:

- 2-4 bullet points briefly describing the overall scope

Industrial Relevance:
A sentence or two to describe industrial relevance (~50 words)
Brief Statement of Suggested Research Program:
A paragraph on the overall research program (~200 words)
Identification of Materials and Suggested Source:
A sentence or two to describe materials and source (~50 words)
Identification of Equipment Requirements:
A sentence or two on the required equipment (~50 words)
Selected References:
A few key references (articles or reports) that might help frame the work.

2021 Spring IAB Project List

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2021 IAB Project List				
Rank	Title	Proposer	Votes	Number of Companies
1	**High Strength Aluminum Alloys for Mix-gas Environments**	Novelis	50	7
2	**Fundamentals of Recrystallization Temperature Increases in Nb-Alloys**	ATI	47	6
3	Competition between grain rotation and recrystallization during hot work of Ti 64	ATI	38	4
4	Controlling ω-phase Stability in Metastable β-Ti Alloys for Thermal and Long-Term Stability of TRIP Titanium Alloys	AFRL, Mines	32	4
5	Scrap to Structural Alloys – Recycling of Aluminum through High Scrap Content Wire-Based Additive Manufacturing for Improved Sustainability	Novelis	31	7
6	Microstructural influences on creep behavior in fine grain Ni superalloys	ATI	30	4
7	Higher temperature capable alloys for use in future Aero engines	Honeywell	27	4
8	Assessment of structural to functional graded transitions of additively manufactured shape memory alloys for actuation	Boeing	16	3
9	Characterization of Friction Stir Additive Alloys	Queen City Forging	12	3
10	Predictive Modeling of Extrusion Weld Seam Forming and Failure	Mag Specialties	7	1
	Characterization of Microstructural Stability in ATI 642™ Corrosion-Resistant Nickel Alloy (start as summer project)	ATI	N/A	N/A
	Kinetics of Natural Aging in Al-Mg-Si Alloys (withdrawn by Novelis)	Novelis	N/A	N/A

New Capabilities (Mines)

- ArcCast Arc 200 Cold Crucible (alloying, casting, atomization)
- US DoD ONR DURIP (Clarke, Diercks, Klemm-Toole): ASTAR by NanoMEGAS, Kammrath Weiss GmbH in-situ heating/cooling/straining stage, ancillary TEM/SEM sample preparation equipment
- Zwick Roell Electromechanical High Temperature Test Frame
  - High temperature tests up to 1150 °C
  - Tension, compression, bending
  - Creep, stress relaxation, fatigue (R>0)
- Collaborative Robot Controlled Fronius Cold Metal Transfer (CMT)
  - Automated gas metal arc welding (GMAW)
  - Wire arc additive manufacturing (WAAM)
  - Can use wire made from Mines' wire mill
- FLOW-3D AM and CAST

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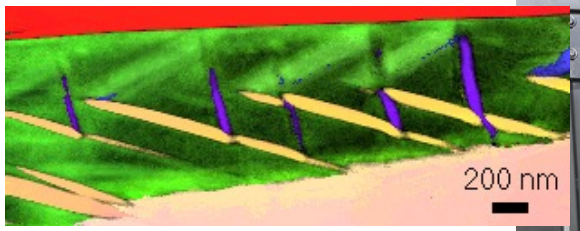


Orientation Map

Martensite
β Phase

Phase Map

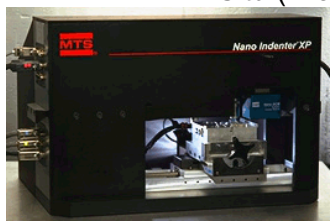
*ASTAR, courtesy of Jing at NanoMEGAS

FLOW Science®

New Capabilities (ISU)

- RoboMet SRAS system: collecting data, building second SRAS system
- Nano-mechanical Testing Laboratory (S. Pathak)
  In-situ nanomechanical systems
  - Alemnis Indenter
    - True displacement mode.
    - Ultra high strain rate capability (10^{-4} to 10^{4}/s)
    - Extreme temperature capability: cryo- (down to -150 °C) to elevated (1000 °C) temperatures.
    - Covering a wide load range from 4 µN up to 1.5 N
  - Hysitron PI 85 SEM PicoIndenter
    - Multiple modes of mechanical testing include indentation, compression, bend, tensile, and fatigue.
    - nanoDynamic™ Mode with sinusoidal loading at frequencies up to 300 Hz
- Ex-situ (in air) nanoindentation systems
  - Nanoindenter® XP (10N load, > 500 µm maximum indentation depth, continuous stiffness measurement)
  - Hysitron TI 950 TriboIndenter (Low load system 12 mN, in-situ imaging, nanoscale dynamic mechanical analysis (nanoDMA® III)
- Upgrades to our X-ray CT system
- Instrumented Microhardness Indentation System

Ex-Situ (in air) indenters



Nanoindenter® XP
LANL Laboratory Education Equipment Gift (LEEG) Program 2017

Hysitron TI 950 TriboIndenter

In-Situ indenters

Hysitron PI 85 SEM PicoIndenter

Alemnis Indenter system
(testing under extremes of temperature and strain-rate)
DURIP 2021,
DOE 2018 NEUP Infrastructure Support

Selected Highlights & Tech Transfer

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- Scott Blazanin: defending in May, joining Boeing
- Summer Camerlo: U.S. DOE NNSA PSAAP; Internship: ***Los Alamos National Laboratory*** (12 weeks)
- Christopher Finfrock: Completed PhD (February 2022), ***now at Sandia National Laboratory***
- Chris Jasien: U.S. DOE Stewardship Science Graduate Fellowship (SSGF); practicum at ***Sandia National Laboratory***
- Chloe Johnson: Completed PhD (December 2021), ***now at Elementum 3D***
- Byron McArthur: Completed PhD (August 2021), now at Y-12 National Security Complex
- Brady McBride: Completed PhD (December 2021), ***now at ATI***
- Abby Miklas: ARL Internship (Fall 2021)
- Brian Milligan: Completed PhD (May 2021), now a postdoc at PNNL
- Connor Rietema: Completed PhD (July 2021), ***now a postdoc at LLNL***
- Brian Rodgers: U.S. DOE NNSA Laboratory Residency Graduate Fellowship (LRGF); Internships: ***Los Alamos National Laboratory*** (4 months), ***Lawrence Livermore National Laboratory*** (4 months)
- Stuart Shirley: Completed MS (January 2022), now at Emerson Automation Solutions
- Neil Stockmal: Co-op at ***Novelis*** (May-Dec 2022)
- Gillian Storey: Completed MS (August 2021), now at Intel
- Andrew Temple: defending in April, ***joining ATI***

Spring 2022 Semi-Annual Meeting: April 12-14, 2022

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All presentation materials uploaded to: canfsa.mines.edu

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

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Tuesday Afternoon:

12:00 PM	CANFSA Overview
12:30 PM	4 student updates
2:30 PM	***Flash talks + Posters***
3:30 PM	4 student updates
5:00 PM	Adjourn
5:30 PM	**Hors d'oeuvres & bar @ Buffalo Rose**

Wednesday:

7:55 AM	**Continental breakfast**
8:00 AM	3 student updates
9:30 AM	***Flash talks + Posters***
10:30 AM	4 student updates
12:00 PM	**Lunch**
12:50 PM	4 student updates
2:30 PM	Break
2:45 PM	3 student updates
3:00 PM	Break
3:15 PM	3 student updates
5:00 PM	Adjourn
5:30 PM	**Dinner @ Table Mountain Inn**

Thursday Morning (IAB ONLY):

7:55 AM	Continental breakfast
8:00 AM	New Projects
9:00 AM	Break
9:15 AM	IAB Workshop
10:15 AM	Break
10:30 AM	NSF + IAB
11;15 AM	Report to Directors
12:00 PM	Adjourn

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

IN PERSON		
Eric Payton	Air Force Research Laboratory	eric.payton@afrl.af.mil
Brady McBride	ATI Specialty Materials	brady.mcbride@atimetals.com
Bruce Antolovich	ATI Specialty Materials	bruce.antolovich@atimetals.com
Steven Sparkowich (Guest)	CBMM	steven.sparkowich@cbmm.com
Ana Araujo (Guest)	CBMM	ana.araujo@cbmm.com
Daniel Wright (Guest)	CBMM	daniel.wright@cbmm.com
Chloe Johnson	Elementum 3D	chloe@elementum3d.com
Adam Polizzi	Elementum 3D	adam@elementum3d.com
Connor Rietema	Lawrence Livermore Nat'l Laboratory	rietema1@llnl.gov
Zachary Levin	Los Alamos National Laboratory	zlevin@lanl.gov
Clarissa Yablinsky	Los Alamos National Laboratory	rizz@lanl.gov
Ben Eftink	Los Alamos National Laboratory	eftink@lanl.gov
Suzanne Tkach	Queen City Forging Co.	suzanne@tkachconsulting.com
Rob Mayer	Queen City Forging Co.	rob@qcforge.com
Andrew Kustas	Sandia National Laboratories	akustas@sandia.gov
Jeffrey Ares (Center Evaluator)	NSF (Venturewell)	jeffreyares4@gmail.com
VIRTUAL		
Matt Krug	Air Force Research Laboratory	matthew.krug.3@us.af.mil
Albert Ostlind (Potential Student)	Army Research Laboratory	albert.ostlind@gmail.com
Zach Schlittenhart	ATI Metals	zachary.schlittenhart@atimetals.com
Kathryn Weyeneth	ATI Metals	kathryn.weyeneth@atimetals.com
Dan Hartman	Mag Specialties	dhartman@magspecialtiesinc.com
Scott Sutton	Mag Specialties	ssutton@magspecialtiesinc.com
Scott Bingham	DePuy Synthes	sbingha@its.jnj.com
Luke Collier	Elementum 3D	luke@elementum3d.com
Daira Legzdina	Honeywell	daira.legzdina@honeywell.com
Robin Pacheco	Los Alamos National Laboratory	rob crleach@nsf.gov inm@lanl.gov
Crystal Leach (Program Manager)	NSF	crleach@nsf.gov
Paul Brancaleon	NADCA	brancaleon@diecasting.org
John Carsley	Novelis	john.carsley@novelis.com
Shawn Yu	Novelis	shawn.yu@novelis.com
Don Susan	Sandia National Laboratories	dfsusan@sandia.gov
Christopher Finfrock	Sandia National Laboratories	cfinfro@sandia.gov
Paul Mason	ThermoCalc	paul@thermocalc.com
Taiwu Yu	ThermoCalc	taiwu@thermocalc.com
Byron McArthur (Guest)	Y-12 National Security Complex	byron.mcarthur@pxy12.doe.gov
Camillo Archuleta (Center Evaluator)	NSF (Venturewell)	carchuleta@venturewell.org

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Current Members

- *Representatives from all 13 sponsor companies.*
- *Two guest companies:*
  - *CBMM*
  - *Y-12 National Security Complex*

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

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Internet:
Table Mountain Inn

CANFSA Spring IAB Meeting, April 12-14, 2022
All times Mountain
In person: Table Mountain Inn,
Kokopelli Combo Room, Golden, CO
Remote access: Zoom, details below
Join from PC, Mac, Linux, iOS or Android:
https://mines.zoom.us/j/91683817866
Or Telephone:
Dial: +1 253 215 8782 (US Toll) or +1 346 248 7799 (US Toll), Meeting ID: 916 8381 7866

Level of Interest and Feedback/Evaluation (L.I.F.E.) Forms:
Provide feedback and receive student responses.
https://iucrclife.chass.ncsu.edu/lifeforms/
Click on April 12th, 2022 CANFSA meeting link
Password: ***CANFSA2022!***

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

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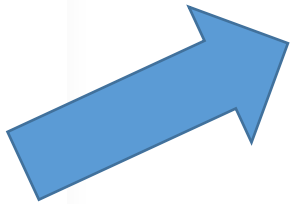
L.I.F.E. Level of Interest and Feedback Evaluation Forms

Admin Login Admin Register Tutorial (PPT) Tutorial (PDF)

Recent & Upcoming Meetings

The following listing of meetings is within a ±3 day range

Date	Center Name
April 12th, 2022	CANFSA



Open Meetings

The following listing of meetings is within a ±30 day range

Date	Center Name
March 14th, 2022	Center for Advanced Subsurface Earth Resource
March 15th, 2022	NSF-CAVE3 Electronics Research Center

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

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L.I.F.E. Level of Interest and Feedback Evaluation Forms

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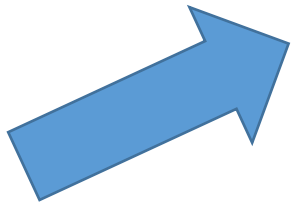
Select Your Role



Industry	University	Admin
Rate and comment on projects, project voting, industry survey.	Respond to feedback, faculty survey, student survey.	View/edit project feedback and responses, project voting results, faculty survey results, industry survey results.

Spring 2022 Semi-Annual Meeting: Hybrid Edition April 12-14, 2022

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L.I.F.E. Level of Interest and Feedback Evaluation Forms

Meeting Summary | PDF Meeting Summary | MS Word Meeting Summary

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CANFSA (Colorado School of Mines) - April 12th, 2022

IAB Feedback

- Index of Projects

Project Phase	Project Title	Project ID	Evaluate Projects	Summaries
Update	Grain Refinement in Laser Powder Bed Fusion of In-Situ Metal Matrix Composite 6061 Aluminum Alloys - Chloe Johnson (Mines)	Tuesday 01	Evaluate Project	Summary
Update	Compositional Variations and Finite Element Simulations of Defects in AM Ti-6Al-4V - Katie O'Donnell (ISU)	Tuesday 02	Evaluate Project	Summary
Update	Accumulative Roll Bonding of Al Sheets Toward Low Temperature Superplasticity - Brady McBride (Mines)	Tuesday 03	Evaluate Project	Summary
Update	Influence of Microstructure on Oxidation Behaviors in Refractory Complex Concentrated Alloys - Noah Welch (ISU)	Tuesday 04	Evaluate Project	Summary

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- Level of interest
- Comments
- Questions
- Suggestions
- Name/Org

L.I.F.E. Level of Interest and Feedback Evaluation Forms

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Level of Interest and Feedback Evaluation (LIFE) Form

Project Update

Project Name: (Tuesday 01) Grain Refinement in Laser Powder Bed Fusion of In-Situ Metal Matrix Composite 6061 Aluminum Alloys
Project PI: Chloe Johnson (Mines)

To facilitate a dialogue between Center Faculty and Member Organizations, each industry representative is asked to indicate his/her organization's level of interest in each project.
Unless the individual organizing LIFE feedback has instructed you otherwise, your identifying information will not be shared during public IAB feedback sessions. It will be shared with the appropriate faculty member to facilitate follow-up on specific suggestions, and with the following groups to facilitate program evaluation and improvement: center director, center assessment coordinator, assessment coordination contractor, and NSF.

Level of Interest

- ○ Very interested
- ○ Interested
- ○ Interested with change
- ○ Not interested

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CENTER FOR ADVANCED NON-FERROUS STRUCTURAL ALLOYS

The premier industry-university center for non-ferrous physical metallurgy

Train the next generation of non-ferrous physical metallurgists

Perform industrially-relevant and scientifically impactful research

Connect academia, government, and industry

canfsa.mines.edu

Amy Clarke, amyclarke@mines.edu
Pete Collins, pcollins@iastate.edu
Mike Kaufman, mkaufman@mines.edu

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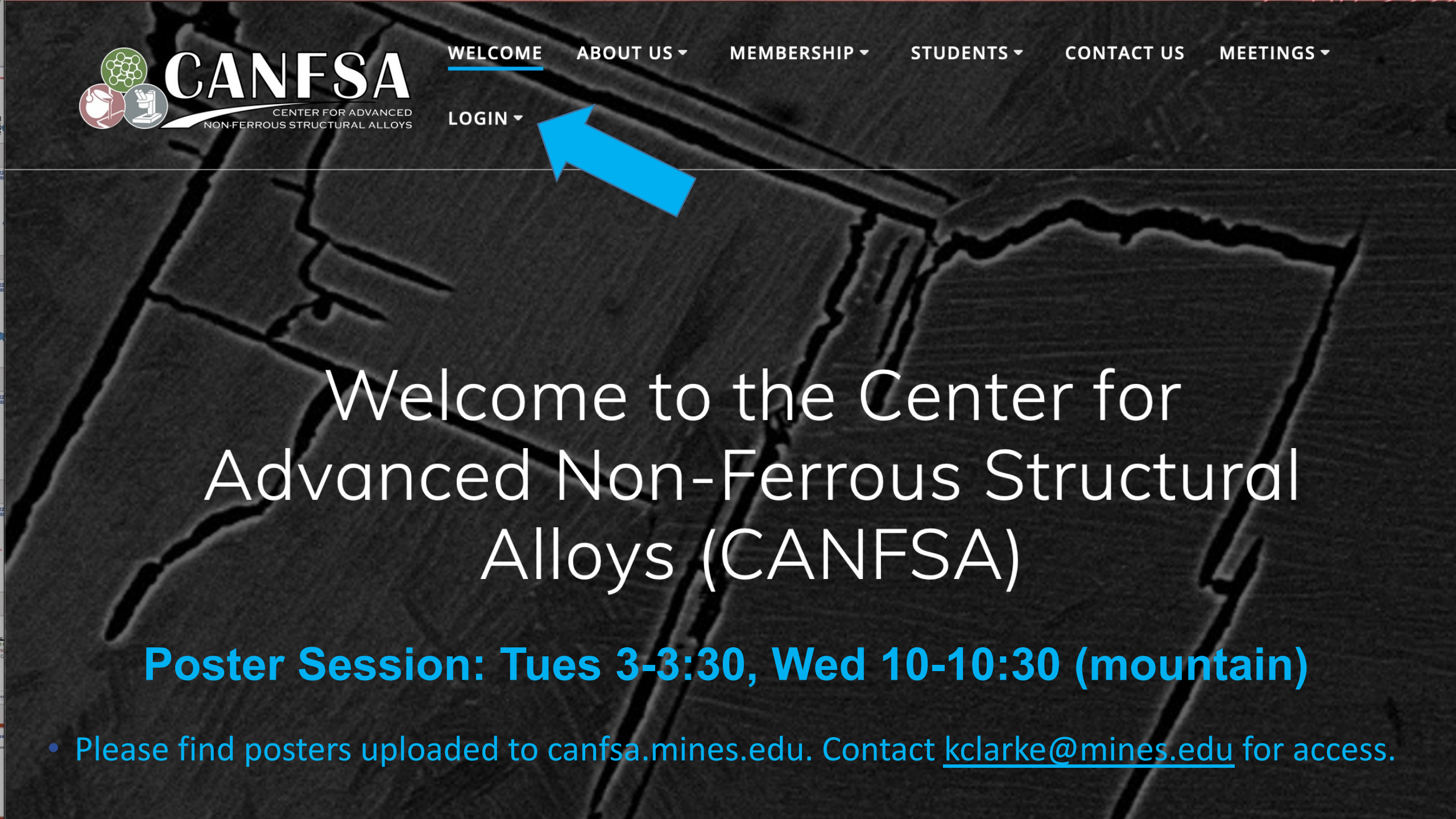
CANFSA
CENTER FOR ADVANCED
NON-FERROUS STRUCTURAL ALLOYS
WELCOME
ABOUT US
MEMBERSHIP
STUDENTS
CONTACT US
MEETINGS
LOGIN
Welcome to the Center for Advanced Non-Ferrous Structural Alloys (CANFSA)
Poster Session: Tues 3-3:30, Wed 10-10:30 (mountain)
Please find posters uploaded to canfsa.mines.edu. Contact kclarke@mines.edu for access.

We’re on break…be right back

Wed: Lunch 12:00-12:50, breaks 2:30-2:45, 3:45-4:00 (mountain)

New Project Proposal Discussion

Project Proposals - Submitted

2022 IAB Project List					
Rank	**Title**	**Proposer**	**Votes**	**Number of Companies**	**Status**
	Consolidation and Processing of 8009 Powder	Honeywell			
	Resolving discrepancies between computational model thermal prediction and microstructural results of deformation processing	QCF			
	Enabling High Strength Al alloys through Grain Boundary Mediated Hardening Mechanisms: Extending the Hall-Petch Strengthening Effect	Sid Pathak, Garritt Tucker			
	Enhancement of Wrought Alloy 718 Fatigue Properties Using Extra Low Nitrogen Master Alloys	CBMM			
	Quenching and partitioning of Ti-6Al-4V and novel heat treatments of b-Ti alloys to design microstructures and properties	A. Clarke			
	Metamorphic Manufacturing Simulator	AFRL			

Project Proposals - 2021

CANFSA
CENTER FOR ADVANCED NON-FERROUS STRUCTURAL ALLOYS

2021 IAB Project List					
Rank	**Title**	**Proposer**	**Votes**	**Number of Companies**	**Status**
1	High Strength Aluminum Alloys for Mix-gas Environments	Novelis	50	7	A. Freund, Mines
2	Fundamentals of Recrystallization Temperature Increases in Nb-Alloys	ATI	47	6	W. Waliser, Mines
3	Competition between grain rotation and recrystallization during hot work of Ti 64	ATI	38	4	ISU
4	Controlling ω-phase Stability in Metastable β-Ti Alloys for Thermal and Long-Term Stability of TRIP Titanium Alloys	AFRL, Mines	32	4	B. Ellyson, Mines (Postdoc partial)
5	Scrap to Structural Alloys – Recycling of Aluminum through High Scrap Content Wire-Based Additive Manufacturing for Improved Sustainability	Novelis	31	7	J. McIntyre, Mines (Fall 2022)
6	Microstructural influences on creep behavior in fine grain Ni superalloys	ATI	30	4	
7	Higher temperature capable alloys for use in future Aero engines	Honeywell	27	4	
8	Assessment of structural to functional graded transitions of additively manufactured shape memory alloys for actuation	Boeing	16	3	
9	Characterization of Friction Stir Additive Alloys	Queen City Forging	12	3	
10	Predictive Modeling of Extrusion Weld Seam Forming and Failure	Mag Specialties	7	1	
	Characterization of Microstructural Stability in ATI 642™ Corrosion-Resistant Nickel Alloy (start as summer project)	ATI	N/A	N/A	Laura Liao, Mines
	Kinetics of Natural Aging in Al-Mg-Si Alloys (withdrawn by Novelis)	Novelis	N/A	N/A	

Project Proposals, 2020

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2020 IAB Project List					
Rank	**Title**	**Proposer**	**Votes**	**Number of Companies**	**Status**
1	Influence of Microstructure on the Oxidation of Refractory Complex Concentrated Alloys (RCCAs)	AFRL	39	6	Noah Welch, ISU
2	Understanding the influence of heat-treatment on serrated yielding in a Ni superalloy	Honeywell	35	3	Nathan Brown, Mines UG
3	Shock Compression and Dynamic Deformation Processes Influencing Cold Spray Bonding Mechanisms, Microstructure, and Defect Evolution	Boeing	34	6	
4	Development of substructure during additive manufacturing of titanium alloys	AFRL	28	5	Alec Saville, Mines Leveraged
5	Control of Complex Cracking Behavior in High-Strength Aluminum Alloys	AFRL	26	4	Scott Blazanin, iSU
6	Microstructural evaluation of additively manufactured AlSi10Mg as a function of thermal gradient	Boeing	26	6	
7	Origins of time dependent springback in aluminum alloys	Novelis	25	4	Dawson Tong, Mines UG
8	Microstructural engineering of high strength aluminum alloys for hydrogen infrastructure	Novelis	25	4	
9	Ti-6Al-4V implant coatings/surface treatments for improved wear performance against UHMWPE	DePuy Synthes	25	1	Dave McDevitt, Nelson Delfino, Mines
10	Role of Grain Boundary Disconnection Dynamics on Microstructure Evolution During Superplastic Forming	AFRL	17	3	

Current CANFSA supported students

- CANFSA supported students
  - Noah Welch (ISU), Influence of Microstructure on Oxidation Behaviors in Refractory Complex Concentrated Alloys (RCCAs)
  - Scott Blazanin (ISU), Grain Boundary Fatigue Fracture Analysis of AA7085 Stuart Shirley (Mines), partial
  - Brady McBride (Mines), Accumulative Roll Bonding of Al Sheets Toward Low Temperature Superplasticity
  - Stuart Shirley (Mines), Evaluation of Processing Path Effects on Microstructure and Properties of Powder Al TM Alloy
  - Gillian Storey (Mines), Solute and Precipitate Effects on Magnesium Recrystallization
  - Chloe Johnson (Mines), Grain Refinement in Laser Powder Bed Fusion of In-Situ Metal Matrix Composite 6061 Aluminum Alloys
  - Will Waliser (Mines), Fundamentals of Recrystallization Temperature in Binary Nb Alloys
  - Adam Freund (Mines), Aluminum for H_2 Service

CANFSA Hires Fall 2022

- Finn Bamrud, Mines
- Zane Fisher, Mines
- Jamie McIntyre, Mines
- Four additional student offers made at ISU