Northwest Virtual Institute for Cybersecurity Education & Research (CySER) A VICEROY Project

A Five-institution Virtual Institute Consortium

Building an Enhanced Center for Academic Excellence in Cybersecurity Knowledge, Skills & Abilities for a Military & Defense-aligned Civilian Workforce

Washington State University PI: Prof. Bernie Van Wie
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WSU Co-PIs: Assefaw Gebremedhin, Noel Schulz

External Evaluator: Olusola Adesope
CySER: People

- **Washington State University (WSU)**
  - Bernard Van Wie (VSCBE; Lead PI)
  - Assefaw Gebremedhin (EECS; Co-PI; Research Lead)
  - Noel Schulz (EECS; Co-PI; Seminars/Industry Lead)
  - Venera Arnaoudova (EECS; CS Curriculum)
  - Olusola Adesope (Education; Evaluator)
  - Partha Pande (EECS; SP)
  - Haipeng Cai (EECS; SP)
  - Robert Crossler (MISE; SP)
  - Jana Doppa (EECS; SP)
  - Arda Gozen (MME; SP)
  - Larry Holder (EECS; SP)
  - Chris Hundhausen (EECS; SP)
  - Ananth Jillepalli (EECS; SP)
  - John Miller (EECS; SP)
  - Gabriel Nketah (Project Coordinator)
  - James Crabb (Project Admin)

- **WSU/UI ROTC**
  - Lt. Col. Nicholas Jeffers
  - Major Paul Hyde

- **Montana State University (MSU)**
  - Clemente Izurieta (MSU Site Lead)
  - Lt. Col. Lance Ratterman

- **University of Idaho (UI) – CAE-CD**
  - Terence Soule (UI Site Lead)
  - James Alves-Foss

- **Columbia Basin College – CAE-CD**
  - Mathew Boeingke (CBC Site Lead)
  - T. Lee Williams

- **Central Washington University**
  - Andrew Van Den Hoek, ROTC
  - ITAM David Douglas (Pending)
OVERVIEW

CySER Website: cyser.wsu.edu
CySER Vision

CySER

Cyber-Physical Systems

Projects
- Senior Design
- Thesis
- Class

Internships
- Military Inst.
- National Labs
- Industry

Workshop
- Professional skills
- Real-world examples
- Best practices

Seminars
- Current topics
- Community outreach

High School Outreach

Graduate Mentors

Undergraduate Program (BS in CS)

ROTC CS & Non-CS Majors
• Responsive  respond to **VICEROY call**
  • Training ROTC cadets & DoD-aligned undergraduate civilians in cybersecurity: coursework, mentored research, clubs/competitions, seminars, summer workshop, internships

• Built a strong consortium in the Pacific Northwest for cybersecurity education and research
  • WSU, MSU, UI, CBC, CWU complementary strengths and diverse populations

• Positioning WSU & MSU to attain Centers of Academic Excellence in Cyber Operations (CAE-CO) and Cyber Defense (CAE-CD) respectively
  • Designation conferred by National Security Agency
  • Requirements: 10 Mandatory and 10 (out of 17) Optional Knowledge Units
CySER Program Elements

- **Coursework** – three *new courses* being offered
- **Senior design projects** focused on cybersecurity
- **Internships**
  - GI; Future @ DoD sites
  - PNNL, SEL, INL, Hoplite
- **Two-week summer workshop**
- **Seminars**
- **Research** (graduate student-mentored activities)
- **Competitions** – “Cybersecurity Science Bowl”
- **High school outreach**
  - Pullman High School
## FALL 2021 SEMINAR SERIES

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Title/Media</th>
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<tbody>
<tr>
<td>Nov. 29</td>
<td>Dr. Clemente Izurieta</td>
<td>Hierarchical Software Quality Assurance</td>
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<tr>
<td></td>
<td>Glenfords School of Computing</td>
<td>Approach to Leveraging Existing Technologies and Building Quality Gates</td>
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<td></td>
<td>Montana State University</td>
<td>Recording</td>
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<td>Slides</td>
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<tr>
<td>Nov. 8</td>
<td>Matthew Boehnke</td>
<td>Cyberhawks and Beyond</td>
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<td>Department of Computer Science</td>
<td>Recording</td>
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<td></td>
<td>Columbia Basin College</td>
<td>Slides</td>
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<tr>
<td>Oct. 25</td>
<td>Dr. Jim Alves-Foss</td>
<td>Probabilities, Percentages, and Professions of Performance</td>
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<td></td>
<td>Department of Computer Science</td>
<td>Recording</td>
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<td></td>
<td>University of Idaho</td>
<td>Slides</td>
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<tr>
<td>Oct. 11</td>
<td>Dr. Assefaw H. Gebremedhin</td>
<td>CySER Overview and Machine Learning</td>
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<td>School of EECS</td>
<td>Recording</td>
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<td></td>
<td>Washington State University</td>
<td>Slides</td>
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<tr>
<td>Date</td>
<td>Speaker</td>
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<tr>
<td>May 2</td>
<td>Cory Baker</td>
<td>Cybersecurity for the Operational Technology Environment</td>
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<tr>
<td>Apr. 18</td>
<td>Kevin Brennan</td>
<td>The Cyber Threat Landscape – The FBI's Perspective</td>
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<td>Apr. 4</td>
<td>Karl Scheuerman</td>
<td>Cyber Security Operations on the Front Line</td>
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<tr>
<td>Mar. 21</td>
<td>Elena Peterson</td>
<td>Flexible and Adaptive Malware Identification Using Techniques from Biology</td>
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<tr>
<td>Mar. 7</td>
<td>Charles Carroll</td>
<td>Purposeful Design – Defending Critical Infrastructure</td>
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<tr>
<td>Feb. 7</td>
<td>Bryson Bort</td>
<td>Can you hack it? Starting your own company</td>
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<tr>
<td>Jan. 10</td>
<td>Deborah Wells</td>
<td>Deepfakes and Cybersecurity Concerns</td>
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About CySER:
CySER is a consortium of five institutions in the Northwest led by Washington State University (WSU). Its goal is creating an innovative education and research program in cybersecurity for ROTC and DoD-aligned civilians at the undergraduate and graduate level, with a primary emphasis on undergraduate education. The other four partner institutions are Montana State University (MSU), University of Idaho (UI), Columbia Basin College (CBC), and Central Washington University (CWU).

The CySER program is funded explicitly through the DOD Air Force Military Command's Virtual Institutes for Cyber and Electromagnetic Spectrum Research and Employ (VICEROY) initiative. The Griffiss Institute manages the VICEROY project.

About this seminar:
Our first seminar for the Fall 2022 semester will involve updates from PIs at each of the partner institutions regarding:
- Number of undergraduate and graduate students involved
- Research activities
- Internship activities
- Coursework activities
- Student clubs and cyber competitions

This will be a great opportunity for new and returning CySER students to hear about what is happening at their home institutions and ways to get involved in cyber-related extracurricular activities.
# Seminars – Fall 2023

## FALL 2022 SEMINAR SERIES

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<th>Date</th>
<th>Speaker</th>
<th>Title/Media</th>
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<tbody>
<tr>
<td>Oct. 17</td>
<td>CySER PIs at partner institutions</td>
<td>Fall Seminar Series Kick-off: updates from partner institutions</td>
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<td>Recording</td>
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<td>Oct. 31</td>
<td>TBD</td>
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<td>Nov. 14</td>
<td>Slater Weinstock</td>
<td>TBD</td>
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<td>Nov. 28</td>
<td>Casaba Security</td>
<td>TBD</td>
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<tr>
<td>Nov. 28</td>
<td>James Halvorsen</td>
<td>TBD</td>
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<td>Nov. 28</td>
<td>School of EECS WSU</td>
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<td>Dec. 12</td>
<td>Haipeng Cai</td>
<td>TBD</td>
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<tr>
<td>Dec. 12</td>
<td>School of EECS WSU</td>
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Key Tasks [Detail on Experiential Learning]

- **Experiential Learning**
  - Mentored cybersecurity research
  - Summer workshop: extensive hands-on components
    - Poster session
  - Leadership – Team Building
    - Major Paul Hyde (WSU)
    - Retired Captain Andrew Van Den Hoek (CWU)
    - LTC Lance Ratterman (MSU)
  - Internships
  - Mentored senior design projects
  - Cybersecurity seminars
  - 3 field trips:
    - Schweitzer Engineering Lab (Pullman, WA)
    - Fairchild Air Force Base (Airway Heights, WA, near Spokane)
    - Keyport Undersea Warfare Center (Keyport, WA)
  - participation on a competitive cybersecurity team (CBC)
Key Tasks [Poster Presentations]
**Why Join CySER?**

- $1000 stipend per semester
- $2000 stipend for attending a 2-week summer workshop in May, here on the WSU campus
- Help finding cybersecurity-related summer internships
- Summer workshop involves presentations and discussions with cybersecurity professionals and industry professionals, hands-on activities where participants learn how to use cybersecurity tools and techniques, and field trips to tech and defense sites (the complete agenda from this past summer workshop can be found on the website)
- Bi-weekly seminars from cybersecurity professors and professionals
- Book club with assigned cybersecurity non-fiction reading and bi-weekly discussions
- Participation in mentorship program with graduate student mentors working on cybersecurity-related research, including presentation of that research in a poster session at the summer workshop

**Interested in Cybersecurity?**

- Put your computer science skills to the test.
- Develop a deeper understanding of the tech world and how modern infrastructure and data is protected.
- Cybersecurity professionals are in high demand, and have average starting salaries above those in many other fields.
- WSU offers two certificates that can be earned alongside your Bachelor’s Degree: CySER CAE-CO Fundamentals, and CySER Basics.

**About CySER**

- Funded by DoD through the Griffiss Institute
- Member of the VICEROY program
- For more info, visit cyser.wsu.edu

**Who Can Apply?**

- Undergraduate in any year (freshman through senior)
- Citizenship or green card required by DoD
- Must be able to participate Fall 2022 and Spring 2023 (one academic year)
- Attendance required for seminars, and participation in mentorship program

**Apply at cyser.wsu.edu/apply/**
Student Recruitment

• Recruitment
  o Website (WSU students)
  o WSU Curriculum Advisor (12 years military experience)
  o Communication with ROTC (WSU, MSU, UI, CWU)
  o Faculty in Classrooms (CBC, UI)
  o Poster

• Retention
  o Stipend helps
  o Involvement/Meetings/Research
  o Little attrition (~1/school)
Recruiting for Fall 2022

- **WSU**: 14-15 new, 13 continuing
- **MSU**: 4 new
- **CBC**: 4 continuing; seeking 6 more w/in budget
- **CWU**: 1 new; 3 continuing
- **UI**: 1 new; 1 continuing; seeking 2-4 more w/in budget
The three new courses

- **CptS 327: Introduction to Cybersecurity**
  - Focus: Computer, Web, and Application Security
  - KUs targeted: M7, M8, M9, 04, 013, C4

- **CptS 427: Applied Cybersecurity**
  - Focus: Software, Network, and Cloud Security
  - KUs targeted: M4, M9, 02, 03, 04, 013, C4

- **CptS 428/528: Advanced Cybersecurity**
  - Focus: Reverse Engineering and Forensics
  - KUs targeted: M2, 08, 011, C1, C2, C5, S1, S2, S7
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<tr>
<th>Day</th>
<th>Topic</th>
<th>Session Leader</th>
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<tr>
<td>Monday May 23 AM</td>
<td>Welcome – WSU Deans Office</td>
<td>Registration</td>
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<td>Welcome – Director EECS &amp; WSU’s commitment to Cybersecurity</td>
<td>Welcome &amp; Orientation</td>
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<td>Industry Perspective, Schweitzer Engineering Lab</td>
<td>Nathan Kip</td>
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<td>DoD Perspective</td>
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<tr>
<td>Monday May 23 PM</td>
<td>Digital forensics</td>
<td>Clem Izurieta &amp; Andrew Fallin</td>
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<tr>
<td>Tuesday May 24 AM</td>
<td>Cyber Warfare &amp; International Relations: Citizen Behavior, Perceived Threats</td>
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<td></td>
<td>Legal Issues &amp; Ethics: Intro on Cybersecurity &amp; Privacy, Case Studies, Threats, Laws</td>
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<td>Risk Models &amp; Processes</td>
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<tr>
<td>Tuesday May 24 PM</td>
<td>Graduate Student Posters Research &amp; Networking</td>
<td>CySER PhDs/faculty</td>
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<tr>
<td></td>
<td>Undergraduate Posters Research &amp; Networking</td>
<td>CySER Undergraduates</td>
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<td>Track I: Todd 203 – Instructional Design</td>
<td>Research Discussion Groups</td>
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<td>Wednesday May 25 AM</td>
<td>Track II: Spark 212 – Team Building, Leadership</td>
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<td>9:30 AM Team Building, Leadership</td>
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<td>11:15 AM Sola: Group Work &amp; Facilitating Group Discussions</td>
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<td>Case studies, Threats, Laws; Cybersecurity Competition Teams</td>
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<tr>
<td>Wednesday May 25 AM</td>
<td>Virtualization, Forensics on VM, Dark Web</td>
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<td>Graph Mining for Insider Threat Detection</td>
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<td>Wednesday May 25 PM</td>
<td>Field Trip Industry Perspectives, Relay Protection, etc.</td>
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<tr>
<td>Thursday May 26 AM</td>
<td>Best Practices, Practical Examples</td>
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<tr>
<td>Friday May 27</td>
<td>Cybersecurity in Military Practice: Fairchild Air Force Base – Airway Heights, WA</td>
<td>Karl Scheuerman/Field Trip to Fairchild AFB</td>
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<td>Saturday May 28</td>
<td>NW VI CySER Program Summer Workshop – Week 1</td>
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<td>In WSU’s Todd Hall 203</td>
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<td>8:30 AM – 5:00 PM, unless stated otherwise</td>
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<tr>
<td>Day</td>
<td>Topic</td>
<td>Session Leader</td>
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<td>May 29-30</td>
<td>Optional Picnic</td>
<td>Memorial Day Weekend</td>
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<tr>
<td><strong>Tuesday</strong></td>
<td>Micro-power, Grid security</td>
<td>Noel Schulz</td>
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<td>May 31, AM</td>
<td>Applications of Machine Learning</td>
<td>Assefaw Gebremedhin &amp; James Halverson</td>
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<tr>
<td><strong>Tuesday</strong></td>
<td>Clustering Software Vulnerabilities Using Self-organizing Maps</td>
<td>Khyati Panchal, John Miller, Tim Cain</td>
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<tr>
<td>May 31, PM</td>
<td>Hands-on MATLAB</td>
<td>Jana Doppa</td>
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<tr>
<td><strong>Wednesday</strong></td>
<td>Interconnect Meets Architecture: On-Chip Communication in the Age of Heterogeneity</td>
<td>Partha Pande</td>
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<tr>
<td>June 1, AM</td>
<td>Simulating cyber-attacks to biological systems; detection/mitigation in MATLAB</td>
<td>Arda Gozen &amp; Brenden Fraser Hevlin</td>
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<td>Smart phone technology operating system (Android, iOS,)</td>
<td>Haipeng Cai</td>
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<tr>
<td><strong>Wednesday</strong></td>
<td>Hands-on Linux tools for binary reverse engineering</td>
<td>Jim Alves Foss</td>
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<tr>
<td>June 1, PM</td>
<td>Army Cyber Command, Defending the Network, Cloud, Global Theaters, NSA</td>
<td>Matt Boehnke</td>
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<td>Lifelong learning; Getting the most out of your internship</td>
<td>Sola – Assessment Survey</td>
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<tr>
<td><strong>Thursday</strong></td>
<td>Travel to Keyport Naval Undersea Warfare Center</td>
<td>Keyport</td>
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<td>June 2</td>
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<tr>
<td><strong>Fri June 3</strong></td>
<td>Keyport Naval Undersea Warfare Center</td>
<td>Keyport; Sola – How was Keyport?</td>
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Schedule

• **Summer workshop:** [https://cyser.wsu.edu/summer-workshop/](https://cyser.wsu.edu/summer-workshop/)

• May 23 to June 3, 2022, at WSU in Pullman, WA: presentations, tutorials, and hands-on experiential learning activities

• Field trips: a half-day trip to Schweitzer Engineering Laboratories (SEL, Pullman), full-day Fairchild Air Force Base, 2-day to Keyport Naval Undersea Warfare Center.

• In person, virtual option

• Slides, related material, and recordings of all sessions (excluding the field trips) posted on CySER website

• Topics:
  - Cybersecurity in industrial control systems
  - Digital forensics
  - Cybersecurity and behavioral threats
  - Cyber education
  - Team building and leadership
  - Virtualization
  - Software assurance and trusted software bills
  - Cybersecurity competitions and the National Cyber League
  - Cybersecurity in power systems
  - Adversary emulation, purple teaming, and ICS
  - Applications of machine learning in cybersecurity
  - Human in-the-loop learning for anomaly detection
  - Clustering software vulnerabilities using self-organizing maps
  - On-chip communication in the age of heterogeneity
  - Cybersecurity in biomanufacturing
  - Smartphone technology security
  - Binary analysis
  - US Army Cyber Command
  - Being a Lifelong Learner

• Daily summary emails were sent to workshop participants
Key Tasks/Plans

• A bi-weekly virtual seminar series was established - Fall 2022 & Spring 2023
• CySER Summer Workshop, 2023 - May 22 to June 3, 2023
• Many undergraduates from NW VI did internships last summer
  • GI (Sending Out Link Soon)
  • ACE, PNNL, SEL, RadixIoT, & Hoplite Inc.
• Outreach to High Schoolers
CySER – Cyber Competitions

Cyber Force
Competition Team

- Zachary Werle
- James Minteer
- Kaitlin White
- Kwan Tou To
- Gwyn-Usry Gwyn
- Matthew Kusman
- Gerrit Bruland
- Zane Chalich
- Brian Kirika
- Alexander Hagood
- Guinevere Fish
CySER – Cyber Competitions

NICCD Competition Team

- Zachery Werle – Team Lead
- James Minteer
- Kaitlin White
- Gerrit Bruland