



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Welcome to *PolarConnect*

PolarTREC Expedition with Cristina Solis:

Microorganisms and Greenhouse Gas Emissions in the Thawing Arctic Permafrost

Presented by Elliot Friedman, Cornell University

Kim Miller, San Diego State University

Cristina Solis, Los Angeles Academy Middle School

Friday 27 July 2012

8:05am Alaska Daylight time

Presentation for the Cabrillo Marine Aquarium



Slides will be shown here

Exit the presentation

Click to Talk, Unclick to finish talking

Raise your hand to ask a question

Share with emoticons

List of all participants

Chat with one person or the entire group

The screenshot shows the Blackboard Collaborate interface. On the right, a presentation slide titled "Welcome to Blackboard Collaborate" is displayed, featuring the ARCUS logo and the text "Arctic Research Consortium of the United States". On the left, a control panel is visible with sections for "AUDIO & VIDEO", "PARTICIPANTS", "MAIN ROOM", and "CHAT". The "PARTICIPANTS" list includes Sarah Crowley and Arctic Research Consortium of the US. The "CHAT" section shows a conversation with timestamps. Blue arrows point from text labels on the left to specific UI elements: "Slides will be shown here" points to the presentation area; "Exit the presentation" points to the top-right corner of the window; "Click to Talk, Unclick to finish talking" points to the "Talk" button; "Raise your hand to ask a question" points to the hand icon; "Share with emoticons" points to the emoticon icon; "List of all participants" points to the participant list; and "Chat with one person or the entire group" points to the chat window.

Please Note:

- Participants using the telephone can mute/unmute by **pressing *6** on the phone.
- Today's event will be recorded and archived.



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Participant Introductions

Please type in the chat box:

- ✓ Name
- ✓ Affiliation (School, Institution, Etc.)
- ✓ The number of students and adults participating with you in the same location



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers for 2-6 week research experiences in the polar regions.

From 2010-2013, nearly 50 teachers from around the United States will join scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

Click on the Talk button to speak.

Unclick when you are done.

Research Team



Elliot Friedman – Cornell University



Kim Miller – San Diego State University



Cristina Solis, Los Angeles Academy MS & PolarTREC



Dr. David Lipson – San Diego State University

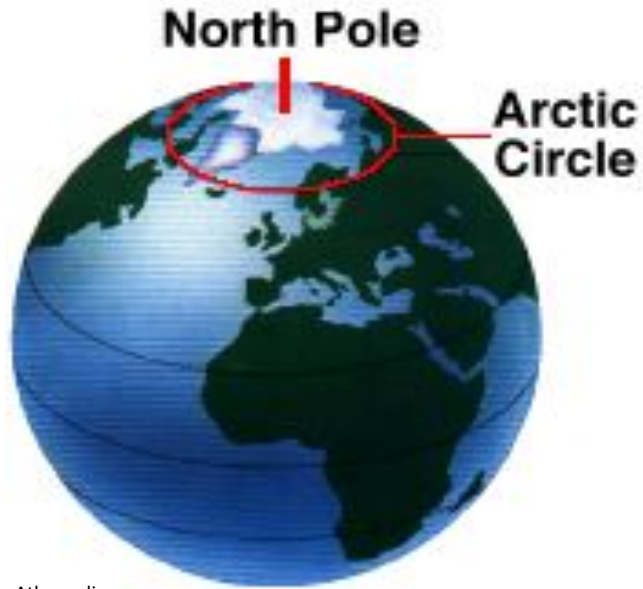


Dr. Lars Angenent – Cornell University



Dr. Ted Raab – Stanford University

Where is Barrow, Alaska?



Source: Athropolis



Source: Geophysical Institute



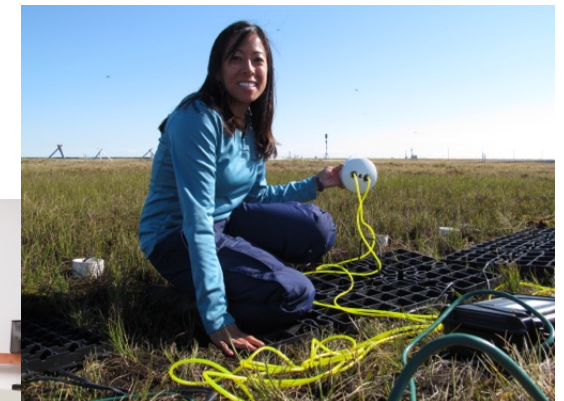
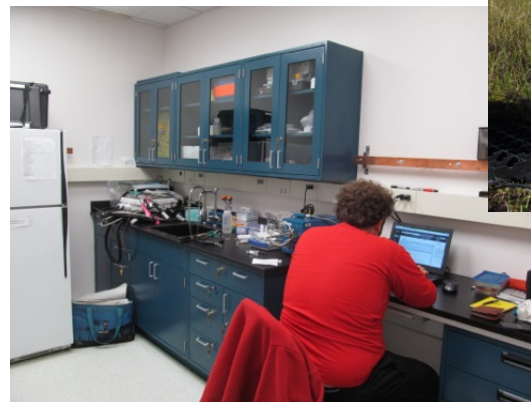
Life in the Arctic Circle



Houses for residents

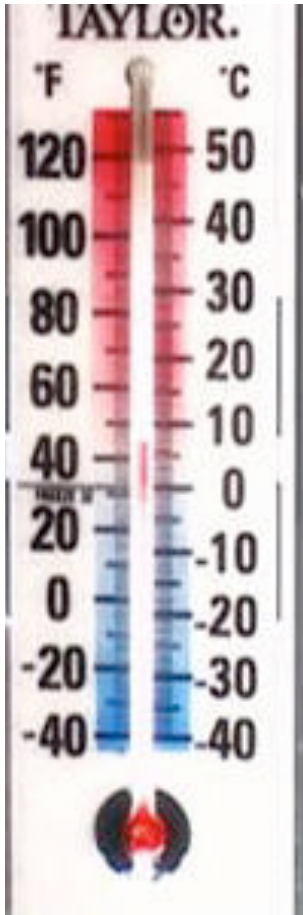


Researchers live in “huts.”

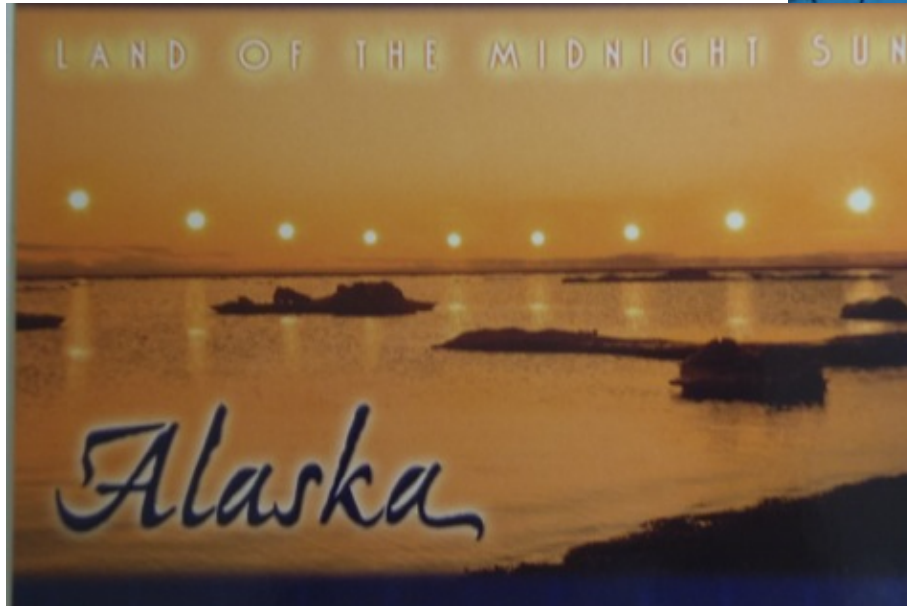


Working in the Arctic

Weather



Source: TM Atlantic



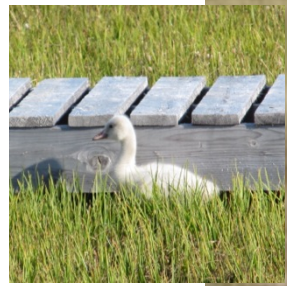
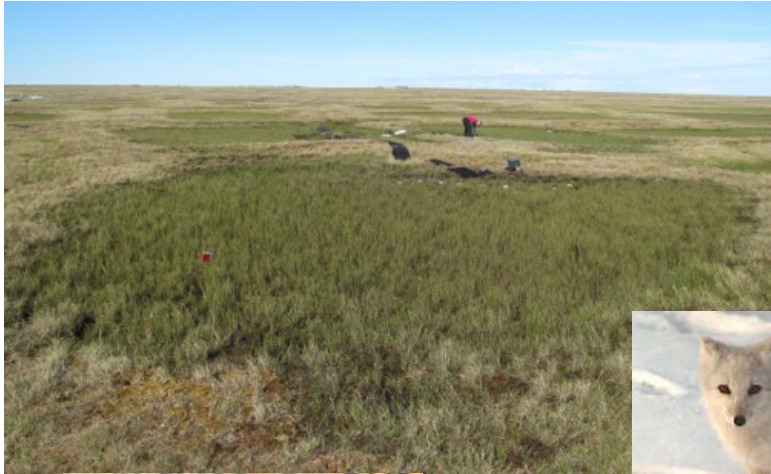
Photographer: Ken Graham & Dicon Joseph



Source: HD Wallpapers



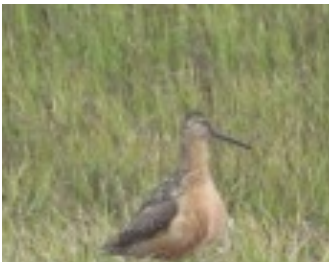
Landscape/Flora/Fauna



Source: Alaska
Community Data base
Photo Index

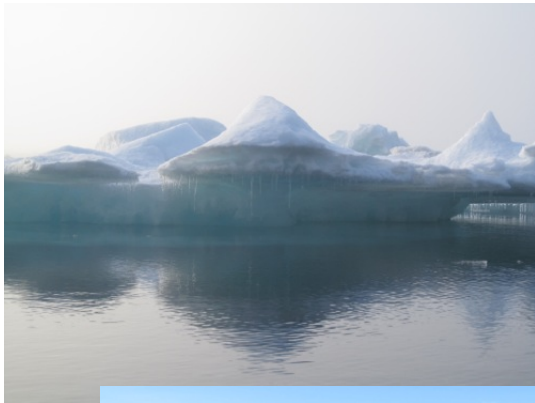


Photographer: Lisa Seff



Photographer: John Tidwell

Interesting Things About Barrow



Inupiat Eskimos



Sea Ice



Bowhead Whales

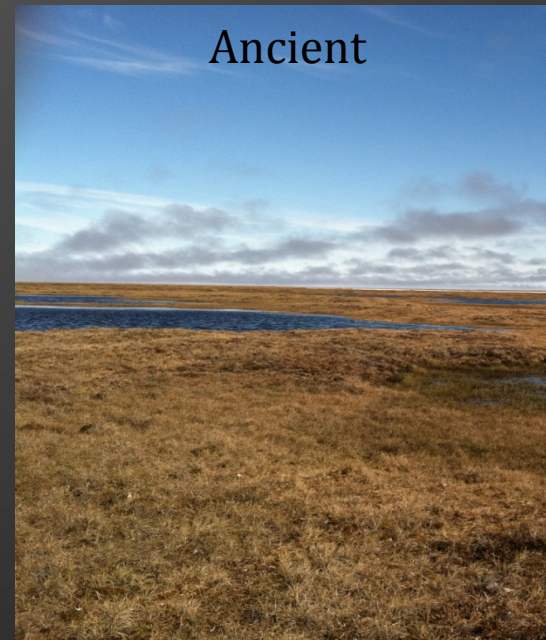
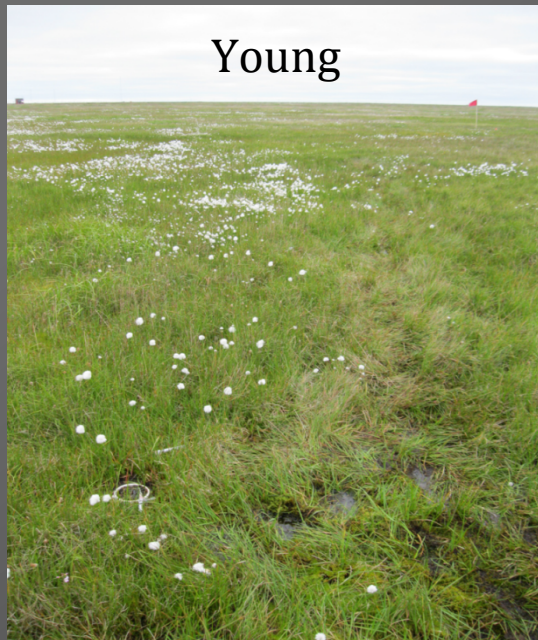


Source: Evolution is True

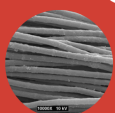


Arctic wetlands

- Drained thaw lake basins formed as a results of climate and freeze-thawing

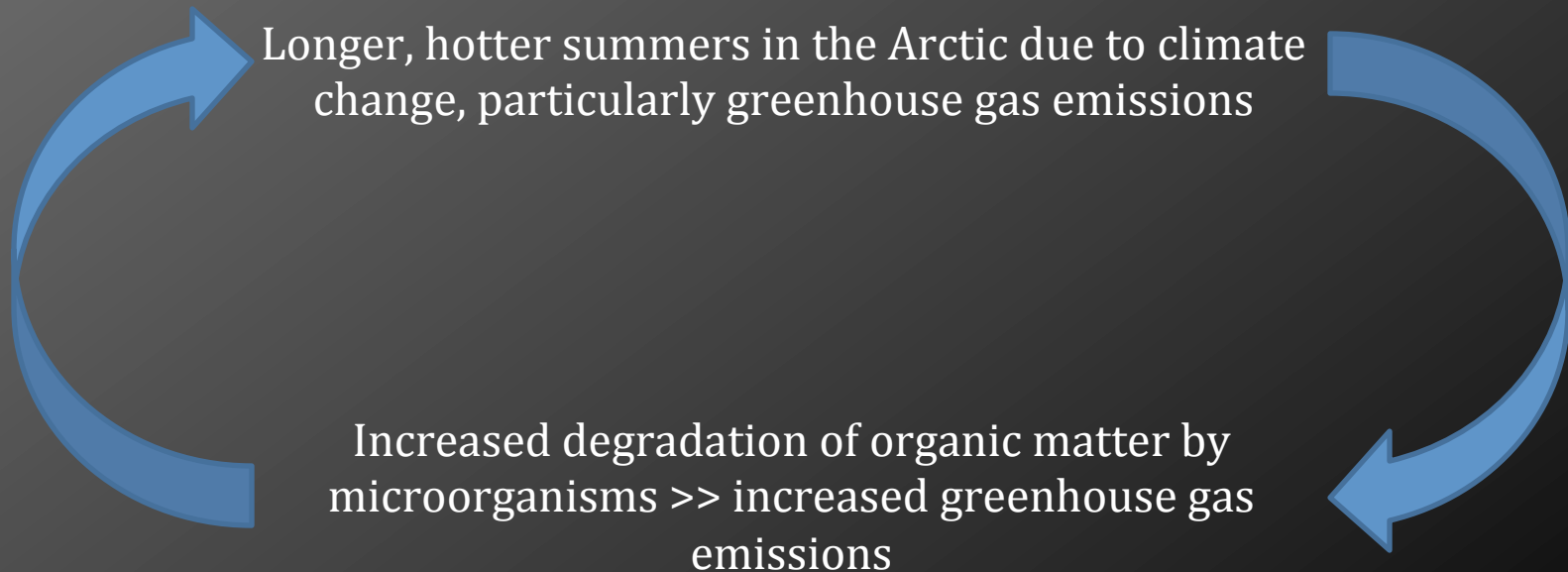


- Anaerobic, lots of carbon – microbial processes are crucial to the carbon balance!
- Different types of **bacteria compete** for food (carbon), vitamins, minerals
- Different bacteria produce different gases as a by-product of their **metabolisms**



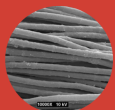
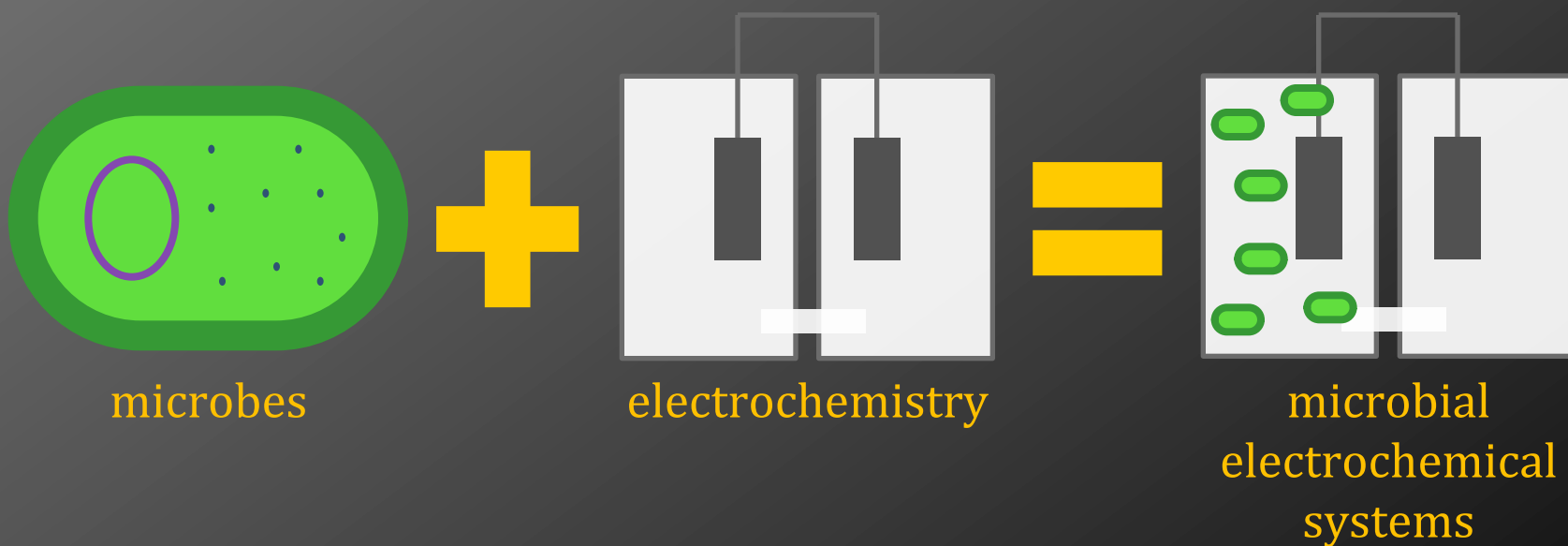
Why is this important?

- Positive feedback loop

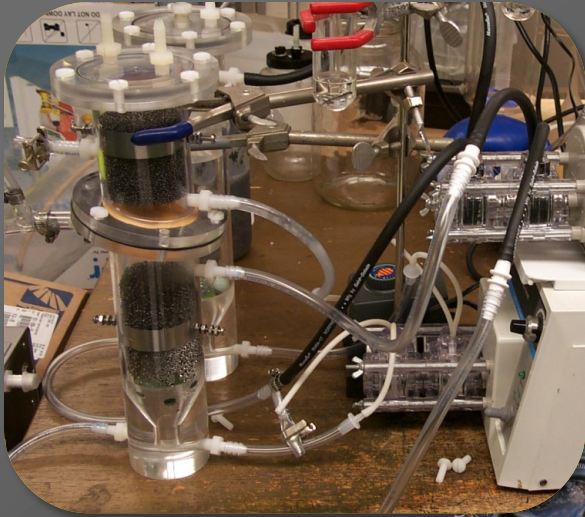


How can we figure out what's happening?

- Microbial electrochemical systems
 - Quantitatively link **microbial metabolism** to **electronic circuitry**



Microbial electrochemical systems: what do they do?



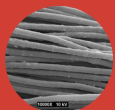
bioenergy



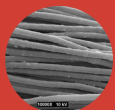
biocomputing



biosensing

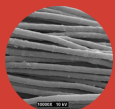


Field Application

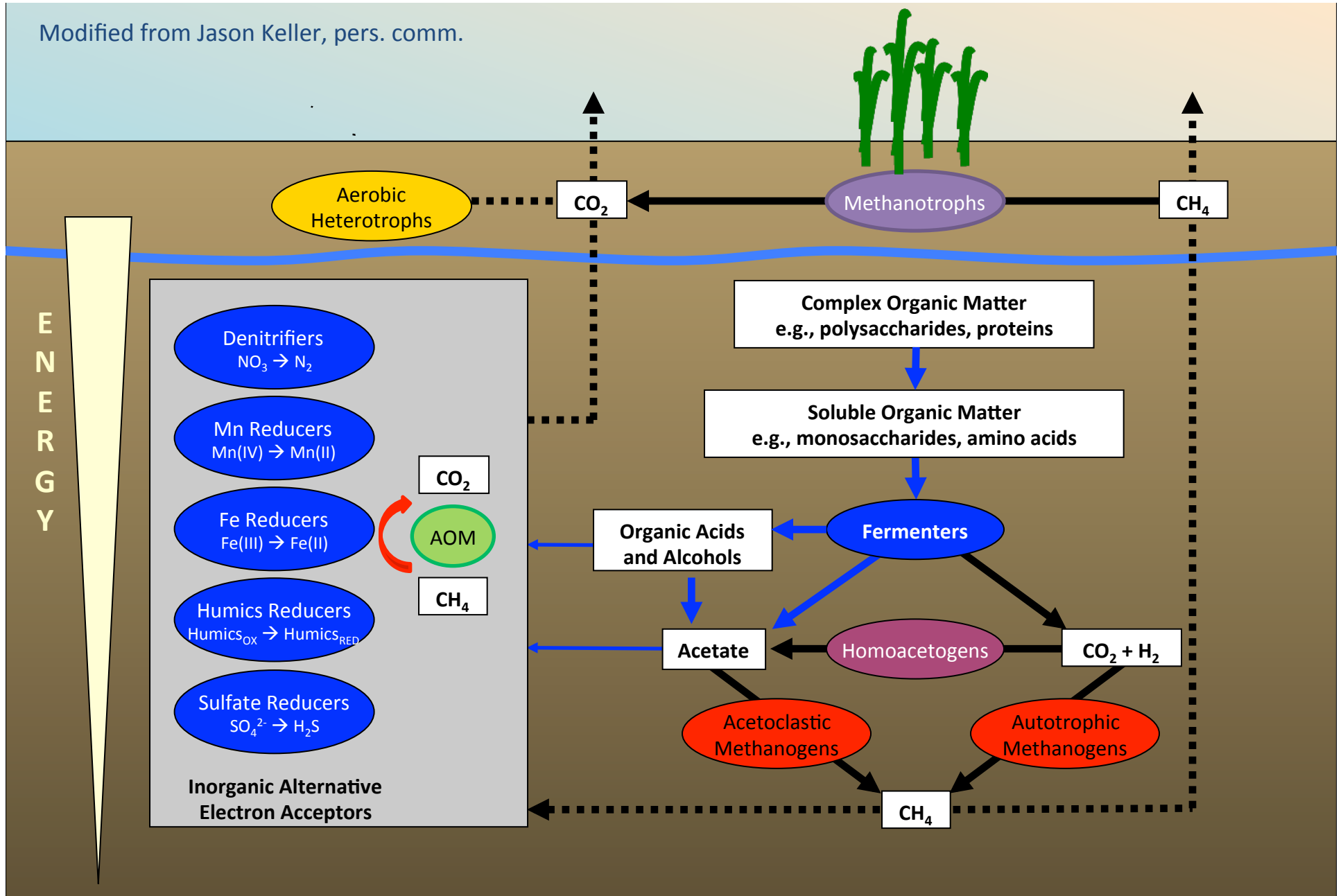


Field Season 2012

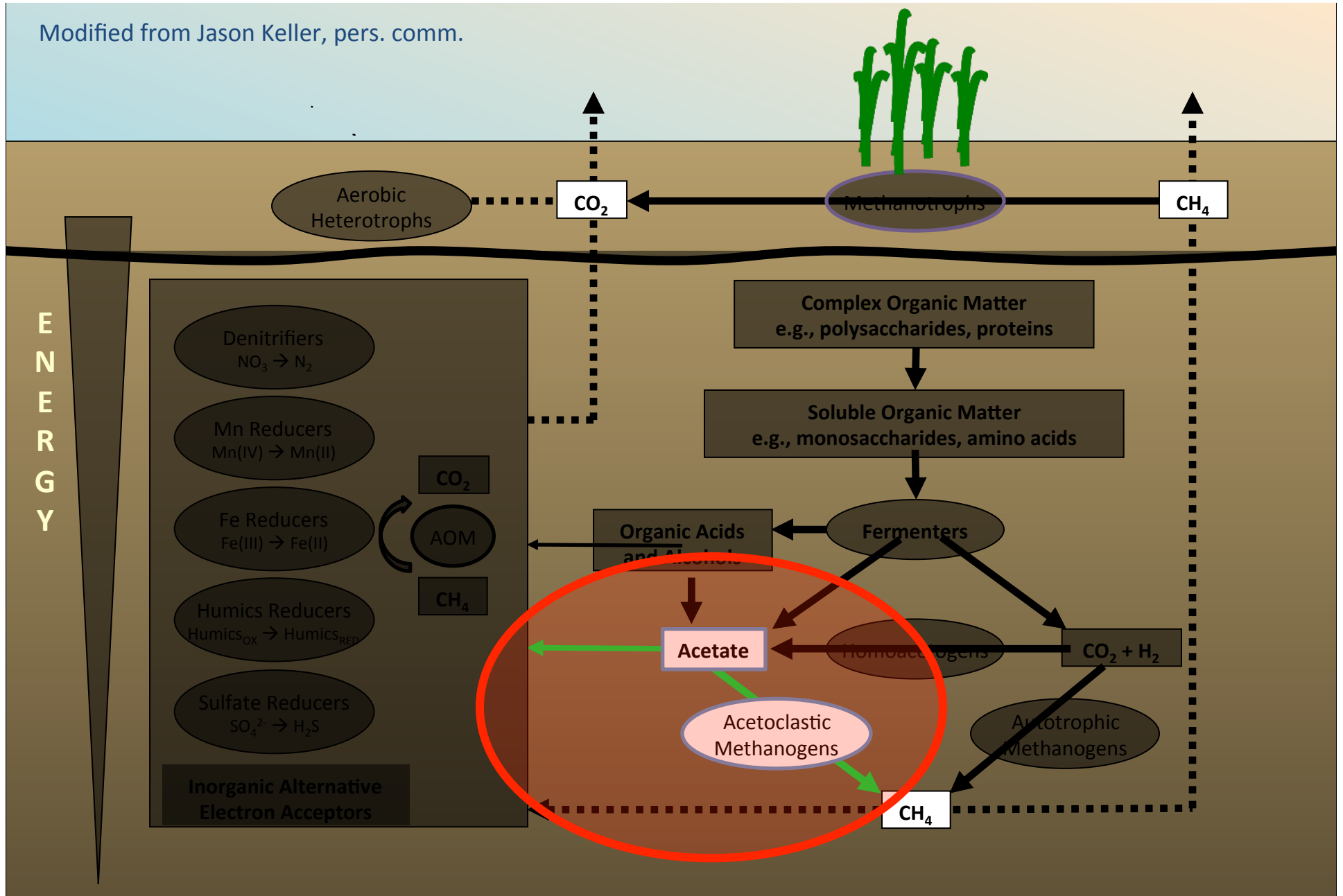
- What is the relationship between **competing microbial processes**, and how do these processes compete and/or coexist?
- What are the major factors responsible for controlling **microbial dominance**?
- How accurately can **current climate models** predict methane emissions from this site?



Modified from Jason Keller, pers. comm.



Modified from Jason Keller, pers. comm.



Use a vacuum tube to draw out the soil water



Gas Chromatography

Amounts of CO_2 and CH_4 trapped in the soil water!



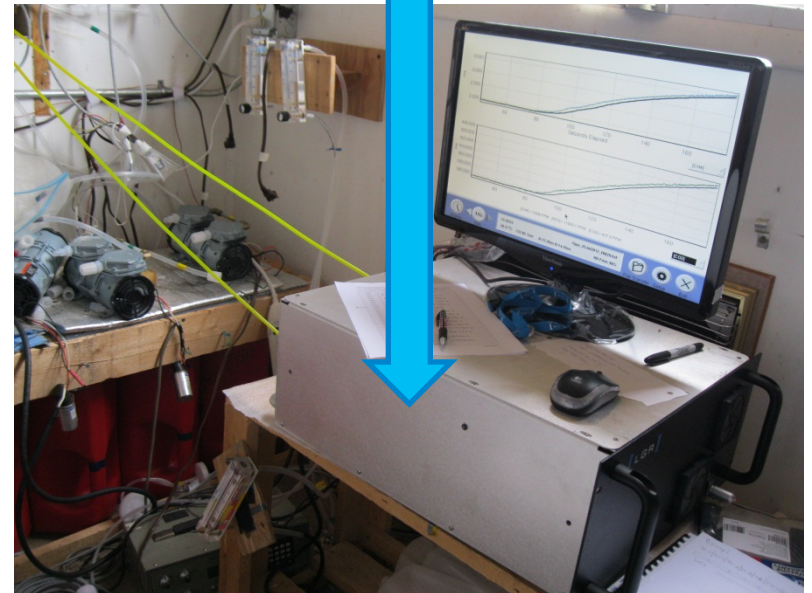
We also use a Laser-based machine determines the amount of CO_2 and CH_4 being ‘burped’ out of the soils

“Cap Off”
(open to
atmospheric
air)

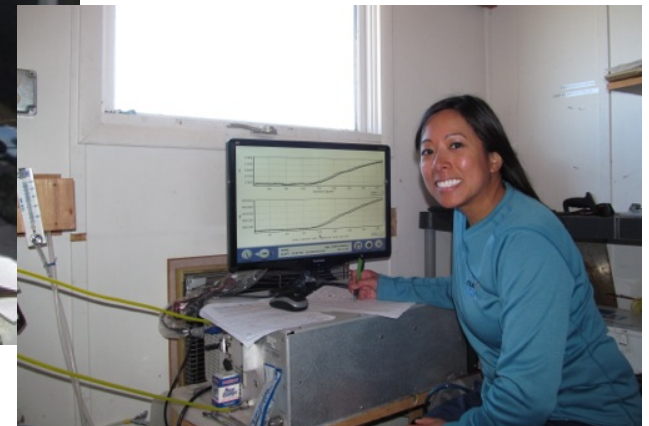
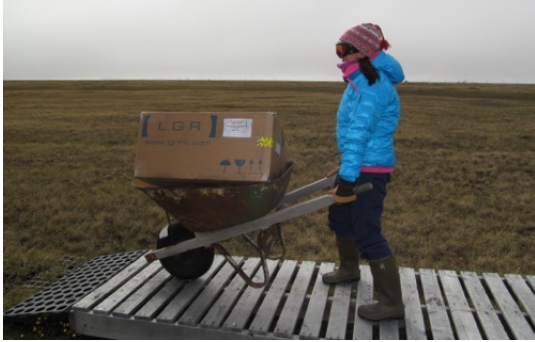
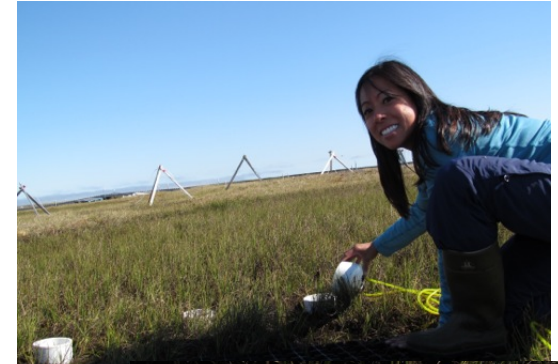
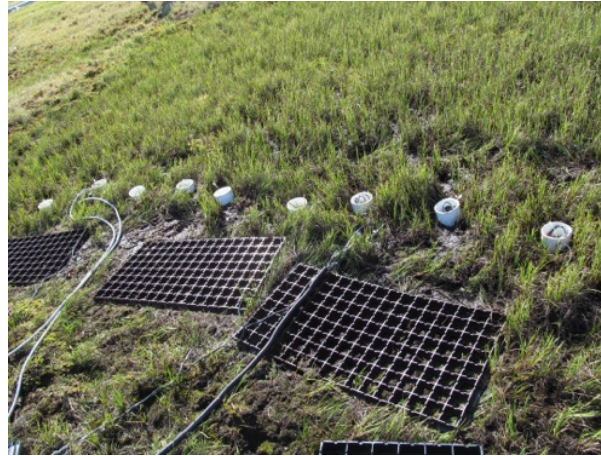


“Cap On”
(only gets air coming out of the dirt
under the cap)

LASER!



Assisting in the Research



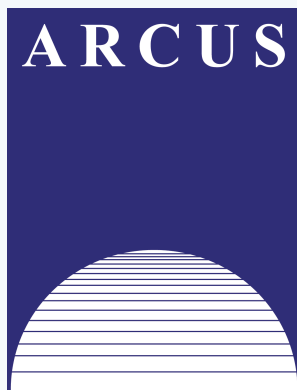


TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING



Thank you!

Acknowledgements





TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Teachers: Join PolarTREC!

www.polartrec.com/about/join

Every teacher can participate in different ways:

- **Following Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Take Online Professional Development Courses**
- **Become a PolarTREC Teacher!**



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Thank You!

An archive of the event will be available shortly.
<http://www.polartrec.com/polar-connect/archive>

