

*Spaceward Bound as a Model of Educator
Professional Development for Astrobiology &
Space Science Education*

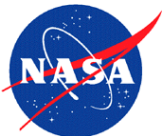
European Mars Society Conference
17-18 October, 2008
Antwerp, Belgium

Liza Coe – NASA Ames Research Center

Christopher McKay – NASA Ames Research Center

Lauren Fletcher – Stanford University/NASA Ames Research Center

Mathew Allner – University of North Dakota



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The Motivation for Spaceward Bound

*Those destined to
lead an expedition
to the Moon and
Mars....*



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*.... are currently in
elementary and
middle school*



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The Motivation for Spaceward Bound

*The cares and
worries of today
dominate....*

*...do they like me? ...do I look
normal? ...science is hard...
why is everything so hard? ...I
can't wait to play X-Box... I
can't do math...*

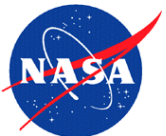
is it time for recess, yet? ...

*will I have food to eat today? ...
will anyone be my friend?*

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*.... over the impossibly
distant (unobtainable?)
future.*

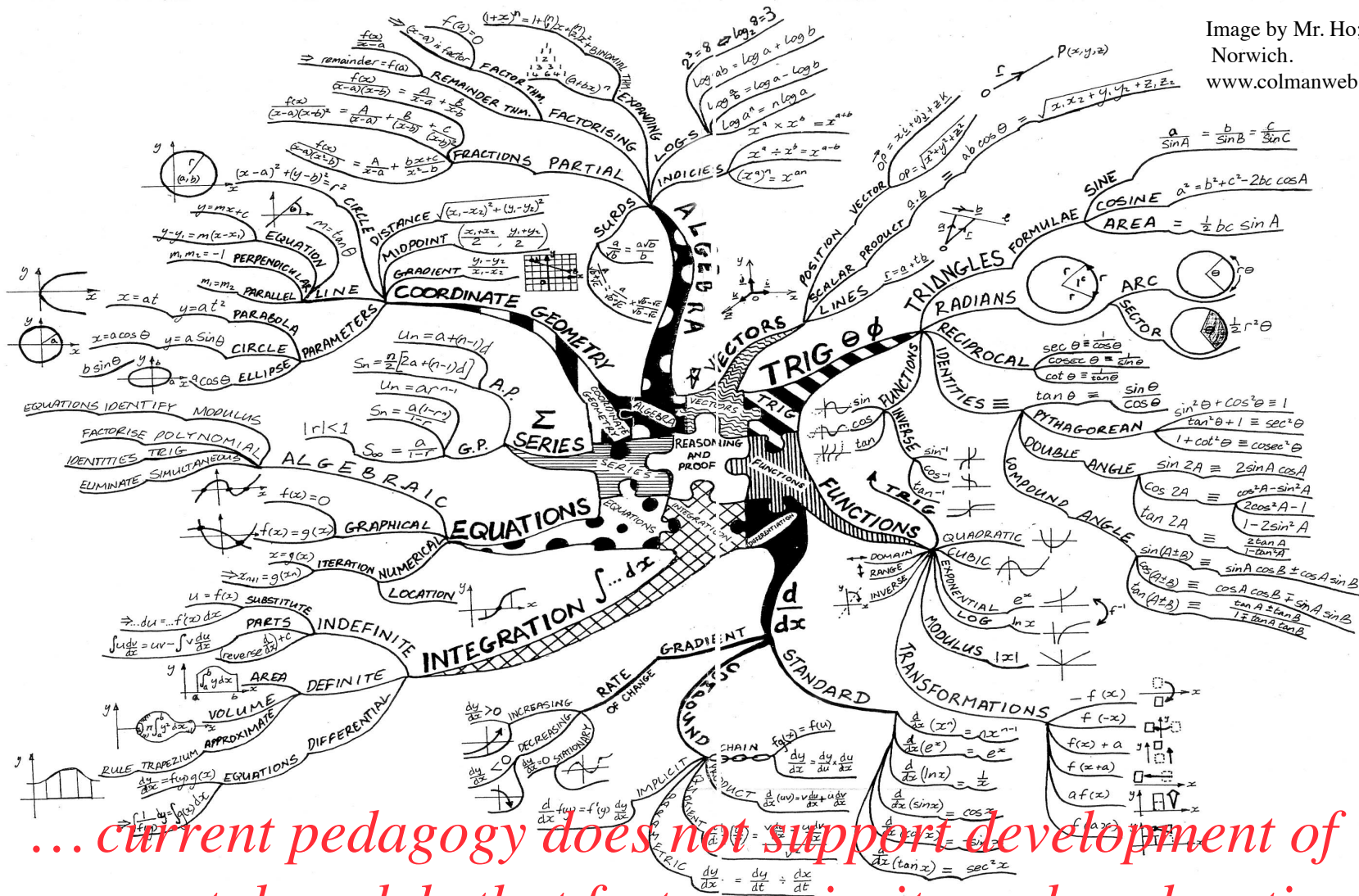


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The Motivation for Spaceward Bound

Image by Mr. Ho; UAE,
Norwich.
www.colmanweb.com



... current pedagogy does not support development of mental models that foster curiosity and exploration



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The Motivation for Spaceward Bound

*We who are explorers
must diligently work
to inspire and
train ...*



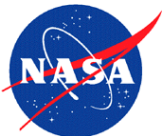
Image: www.annualreport2006.dest.gov.au



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*....someday I will walk on
Mars!!!*

*... those who will
become our future.*



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Spaceward Bound Approach

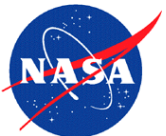
“Tell me and I will forget. Show me and I may remember. Involve me and I will understand.” – Chinese Proverb.

*Those magic, life-defining moments
can be engineered, but:*

- ◆ *They must be *real**
- ◆ *They must be participatory*



Image Credits: M. Allner, 2008



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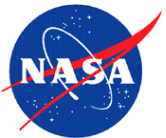
Spaceward Bound Approach

Spaceward Bound was created to inspire and train the next generation by:

- ◆ *Pairing front-line educators with scientists in *real* scientific expeditions*
- ◆ *Train educators and then work with them to translate knowledge and experience into their classrooms*



Image Credit: L. Coe, 2006



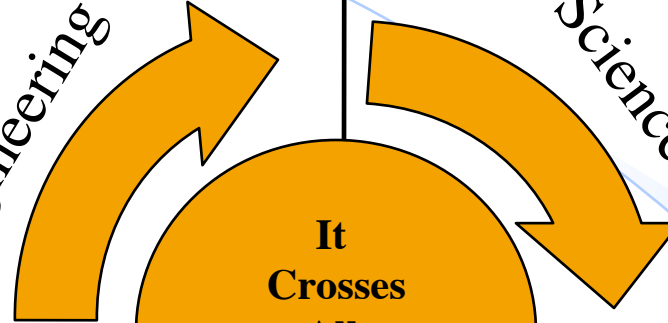
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Why Astrobiology?

- ◆ *New Technology*
- ◆ *Space-craft*
- ◆ *Life-detection instruments*

Engineering



It
Crosses
All
Boundaries

- ◆ *Biology*
- ◆ *Geology*
- ◆ *Bio-geochemistry*
- ◆ *Atmospheric Sciences*
- ◆ *Astronomy*
- ◆ *Extreme Environments*

Science

Society

Business and
Management

- ◆ *Technology spin-offs.*
- ◆ *Business development*
- ◆ *Mission Management*

- ◆ *Cause of Life?*
- ◆ *Are we alone?*
- ◆ *What is the role of humans in the universe?*
- ◆ *What is the future of humans?*

Origin
Of
Life



Destiny
Of
Life

Doesn't (necessarily) require expensive equipment or extensive training!

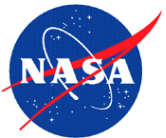


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Where in the World is Spaceward Bound?

- ◆ *Spaceward Bound Expeditions are integrated into science expeditions – not the other way around.*
- ◆ *Expeditions are focused on field-based astrobiology research and technology.*
- ◆ *To date, 14 expeditions have been held in a variety of locations around the world.*
 - ◆ *Atacama Desert (Chile)*
 - ◆ *Mojave National Preserve (California)*
 - ◆ *Pavilion Lake and FMARS (Canada)*
 - ◆ *Mars Desert Research Station (Utah)*
 - ◆ *Flinders Ranges (South Australia)*



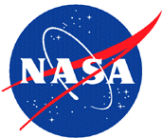
Teacher Recruitment

- ◆ *Teachers respond to an open call and are competitively selected:*
 - *Motivated individuals who want to return as much as possible to their students, colleagues and communities.*
 - *Teachers from under-represented and at risk communities*
 - *Teachers whose faces light up at the prospect of going on an adventure and immediately begin thinking of ways to bring their experiences back to their classrooms.*
- ◆ *International expeditions *always* include local teachers.*



Pre-Expedition Training

- ◆ *Pre-expedition training:*
 - *Background science specific to the expedition.*
 - *Get to know the scientists and their research*
 - *Develop team identity and communication*
 - *Logistics*
- ◆ *Taught via two-way video across the internet.*
- ◆ *Homework assigned which requires collaboration between teachers and consultation with scientists*



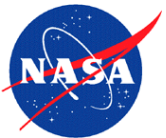
A Day in the Life of Spaceward Bound

- ◆ *Scientists introduce their research activities and discuss their plans for the field*
- ◆ *Teachers self-select into groups to go into the field*
- ◆ *Teachers become field assistants and participate in the research activities*
- ◆ *Evening debriefs and discussion enable teachers to witness and participate in scientific collaboration, collegiality, and debate.*
- ◆ *Teachers work with their colleagues to develop approaches to leveraging their experiences in their classrooms*
- ◆ *Teachers and scientists produce live multi-media events broadcast “back home” and to the world.*

Volcan Lascar crater
S 23 22.009 W 67 43.892

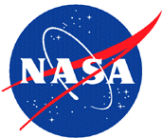
The Teacher Experience: Collaboration with Scientists

- ◆ *Teachers work alongside scientists and contribute to important scientific research.*
 - *The opportunities to continue research beyond the program are unlimited – we're pursuing the teacher/scientist model.*
- ◆ *Bi-directional sharing of knowledge and development of new ideas leads to mutual respect and appreciation for the professional skills of both scientists and teachers*



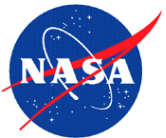
The Teacher Experience: Leveraging in the Classroom

- ◆ *The expected outcome of Spaceward Bound is that teachers will translate and leverage their learning and experience in their classrooms.*
 - *Mini Spaceward Bound expeditions with their students (e.g. exploring local Mars analogs)*
 - *The inclusion of exploration, astrobiology, and planetary science themes in classroom activities*
 - *Development of hands-on, authentic science activities in which the students participate in scientific discovery within their context and the larger scientific community.*



The Future of Spaceward Bound

- ◆ *Continued Expeditions with 3 planned in 2009:*
 - *Return to the Mojave.*
 - *Return to Pavilion Lake*
 - *Expedition to Australia*
- ◆ *Spaceward Bound 2.0:*
 - *Need to push the influence and impact of Spaceward Bound to a larger community.*
 - *Participatory exploration using Web 2.0 tools, e.g. Second Life*
 - *Tele-operation of field robots.*
 - *Development of new technologies, e.g. remote data collection*



Criteria for Spaceward Bound Success

- ◆ *Spaceward Bound expeditions benefit BOTH science and education*
- ◆ *Teachers gain insight into the workings of science*
- ◆ *Teachers develop personal interest and enthusiasm for astrobiology science*
- ◆ *Teachers become part of an alumni cohort that maintains mutually supportive relationships with colleagues – both teachers and scientists*

