2015
Fall National Council of NASA Space Grant Directors' Meeting
Tucson, AZ September 30th – October 3rd

Increasing NASA Research Collaborations with Space Grants and Success of Wearable Technology CLUSTER

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TWO ITEMS TODAY

I. SGs and NASA Technical Alignment Part II

Increasing NASA Research Collaborations with Space Grants

II. Wearable Tech CLUSTER Update

Success Continues/Even Better/Expanding!!!

Increasing NASA Research Collaborations with Space Grants

SGs and NASA Technical Alignment Part II

From Spring 2013 National Space Grant Director's Meeting presentation:

"The common problem I found was that SGs didn't have enough information about what NASA does and what they needed done by the SGs."

From same presentation:

- ✓ *…match the technical areas of JSC/NASA Centers' with the TSGC/All SG Jurisdictions' capabilities*
- ✓ *Defining and **methodically and strategically (vs. ad hoc)** mapping of JSC's (NASA's) technical problems and needs and capabilities against the technical capabilities, ideas, solutions and creativity of the TSGC's (All SGs) members*

SGs and NASA Technical Alignment Part II cont.

NASA needs your help with space systems research. SGs should be "NASA's research arm" – so how do we create more areas of Engagement & Collaboration together?

(Intended to be an interactive discussion/ idea generation discussion – tell NASA what you need to know, suggestions and ideas you may have)

Open Discussion/Idea Generation

How to increase NASA Research Collaborations with Space Grants

SGs and NASA Technical Alignment Part II

- In Spring 2013 presentation we referenced technology roadmaps and biannual reports…
- But perhaps we need a more focused and deliberate way to deliver you our “gaps and needs” content?
- Do we also need more detail than you can find in our online sources, more detail then found on road maps?

SGs and NASA Technical Alignment Part II

How do we increase the number of SG researchers and NASA scientists/engineers connections?

Do the SG researchers know where all the NASA gap and needs content is?

SGs and NASA Technical Alignment Part II

- Can you keep your current Programs/the same Programs but tweak your Programs' content using NASA technical gaps and needs?
- http://humanresearchroadmap.nasa.gov/
- http://www.nasa.gov/offices/oct/home/roadmaps/index.html
- http://techport.nasa.gov/home

SGs and NASA Technical Alignment Part II cont.

SHOULD WE HAVE A WORKING GROUP SATURDAY 10/3?

COME UP WITH A FORWARD PLAN TO INCREASE NASA AND SG JURSIDICTIONS RESEARCH COLLABORATIONS AND JOINT PURSUITS?

MORE CLUSTERS ANYONE?

Success of Wearable Technology CLUSTER

WT CLUSTER FOUR YEAR OVERVIEW

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2012

The Wearable Technology CLUSTER began in spring 2012 as an informal collaboration between the University of Minnesota and JSC with six student projects related to wearable technology in the University of Minnesota Apparel Design program, funded by the Minnesota Space Grant Consortium and mentored by JSC engineers and scientists.

Student teams presented their projects at the first daylong Wearable Technology Symposium on April 29, 2012, at JSC. Students, professors, and mentors all expressed support to continue the collaboration.

- The collaboration and Symposium were a great success, with the students, professors, and JSC mentors benefiting from participation and expressing support to continue and expand the partnership.

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2013 cont.

By spring 2013, the Wearable Technology CLUSTER was now an informal collaboration between the NASA Johnson Space Center (JSC) and three universities: the University of Minnesota, Georgia Institute of Technology, and Virginia Polytechnic Institute and State University.

Courses at Georgia Tech and Virginia Tech were added to the CLUSTER, doubling the number of students

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2013 cont.

A total of 48 graduate and undergraduate students worked on these projects, guided by mentors from across JSC.

Their efforts culminated in the second annual Wearable Technology Symposium at JSC, in which the students presented their final products to mentors, peers, and the JSC community, and were treated to presentations and tours from NASA engineers.

Feedback from student participants, university professors, NASA mentors, and Symposium attendees continued to be overwhelmingly positive. **Students were given the opportunity to engage with NASA engineers on real spaceflight challenges, and mentors gained well-researched, innovative prototypes that advanced their technology development roadmaps.**

The Symposium provided a forum for students to share their experience and for the JSC community to engage in a discussion of shared goals in wearable technology and electronic textiles.

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2013 cont.

The CLUSTER built relationships between JSC and participating universities that have had other tangible outcomes

With JSC support, Dr. Lucy Dunne at the University of Minnesota has received a National Science Foundation CAREER Award that will fund ongoing research and collaboration in wearable technology.

Research publications, design competition awards, student internships, additional projects, and informal exchanges of ideas have also been a direct result of CLUSTER relationships.

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014

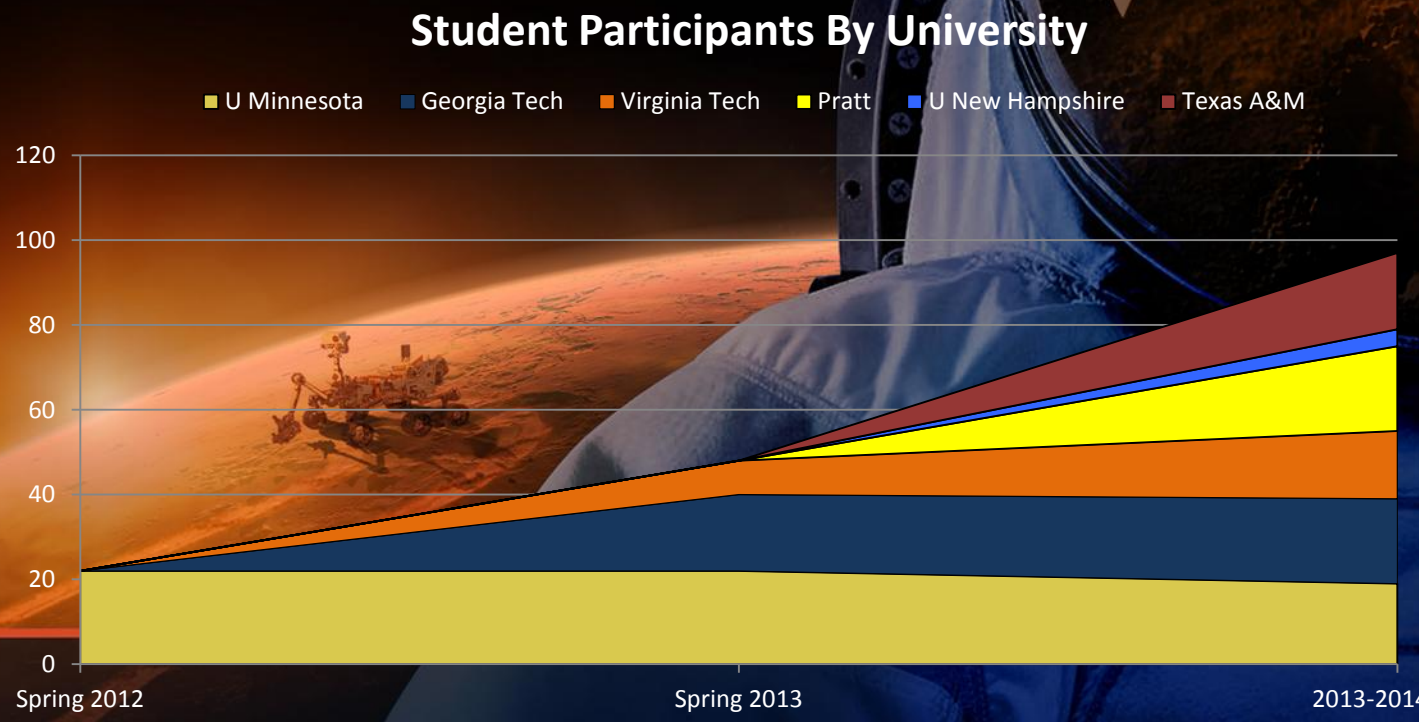
The 2013-2014 academic year was an enormous success for the Wearable Technology CLUSTER.

New universities and NASA mentors were added to the partnership, doubling the number of student participants and significantly increasing attendance at the Wearable Technology Symposium.

Students, professors, and NASA mentors all provided overwhelmingly positive feedback on the value of the partnership

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014 cont.

Universities and Students participating in 2014



Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014 cont.

Universities and Students participating in 2014

Student Participants by University				
			2013-2014	
	Spring 2012	Spring 2013	Fall 2013	Spring 2014
U Minnesota	22	22		19
Georgia Tech		18		20
Virginia Tech		8		16
Pratt			20	
U New Hampshire			4	
Texas A&M			9	9
Semester Total	22	48	33	64
Year Total	22	48		97

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014 cont.

BENEFITS:

Students from many participating universities presented their projects at top academic conference. Past projects had been very successful in design competitions.

Several teams continued their work as senior design and directed research projects. NASA mentors continued to guide these projects.

Three Apparel Design students participated in NASA internships at the Johnson Space Center in the summer of 2014. These students worked on wearable technology projects in the Wearable Electronics Application and Research (WEAR) Lab and in the Habitability Design Center.

20% of the University of Minnesota Apparel Design class of 2014 was accepted to graduate school, up from 0% applying before the CLUSTER began.

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014 cont.

BENEFITS cont.:

A team of five students continued collaborating with their NASA mentor to refine and evaluate their solution to moisture transport challenges in the space suit. This project was accepted to NASA's Reduced Gravity Education Flight Program and tested in microgravity in the summer of 2014. The team was the subject of several university press releases and external media coverage (local TV and newspaper).

One Spring 2013 student continued to serve as a Research Assistant in the UMN Wearable Technology Lab, funded by Dr. Dunne's NSF CAREER Award.

Multiple projects were accepted to the wearable technology juried exhibit and design competition at the International Symposium on Wearable Computing

One project was submitted to the Industrial Fabrics Association International Student Design Competition

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2014 cont.

BENEFITS cont.:

Dr. Lucy Dunne at the University of Minnesota was awarded NASA's prestigious Silver Achievement Medal.

Drs. Tom Martin and Paola Zellner at Virginia Tech received the university's 2014 XCaliber Award for making outstanding contributions to technology-enriched active learning.

A Wearable Technology Design Lab was formed at the Brooklyn Fashion and Design Accelerator. Rebeccah Pailes-Friedman serves as Wearable Technology Research Fellow.

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2015

Attendance and Participants

Next Slides

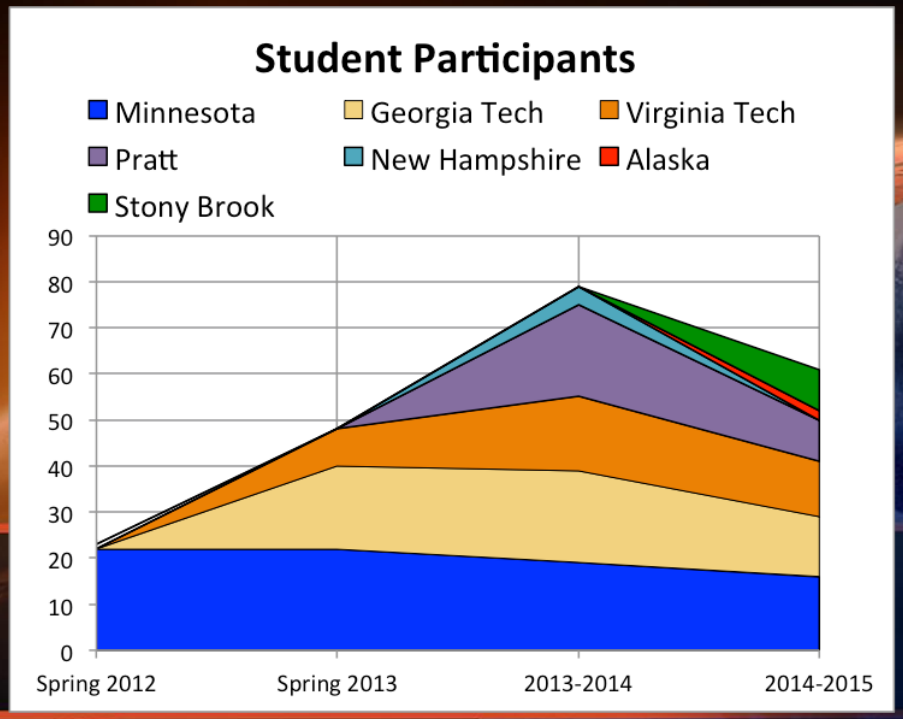
In 2015 CLUSTER members continue to experience the same benefits as in past years and are continuing with collaborating on proposals *(this continues to be a great benefit to all parties)*

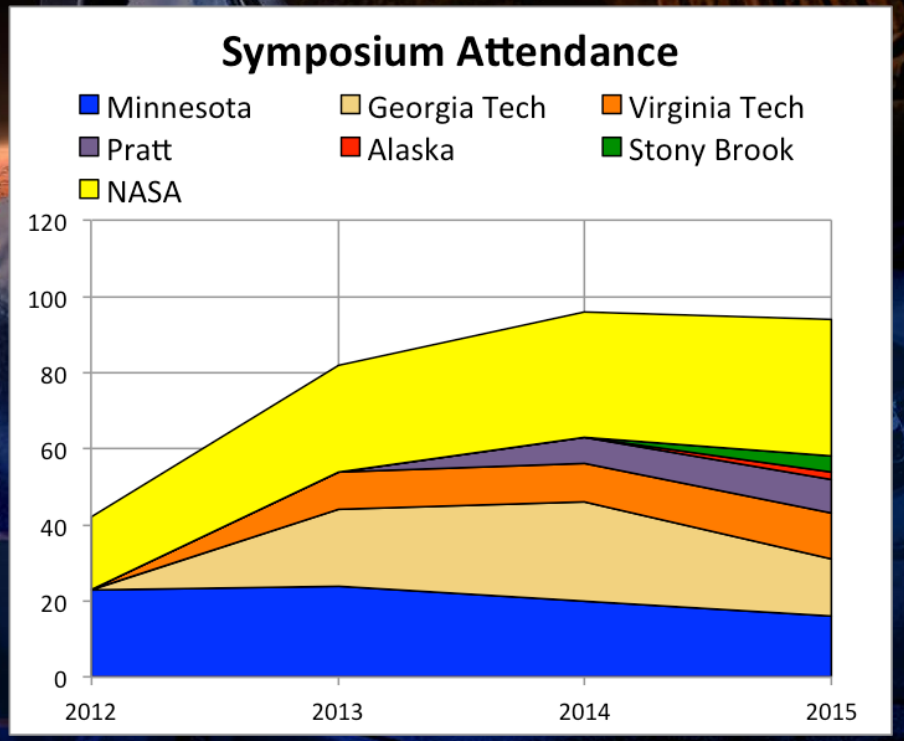
Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) 2015

2015 WT Symposium - While the number of universities participating continues to increase, the 2014-2015 year saw the number of student participants decline as a result of smaller course sizes at several university.

- Figures 1 and 2 show the number of student participants and Wearable Technology Symposium attendees since the beginning of the CLUSTER.

- ects: 73 teams addressed 38 NASA problems
- Students: 226 students from 9 universities





Wearable Technology Symposium

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) Future

The relationships formed via the CLUSTER have led to opportunities for NASA to support researchers through our expertise and facilities, and for universities to align their research direction with the real needs of NASA's like for a Journey to Mars.

http://communications.nasa.gov/content/messaging

Wearable Technology Collaboration for Leveraging with Universities in Space Technology Engineering and Research (CLUSTER) Future

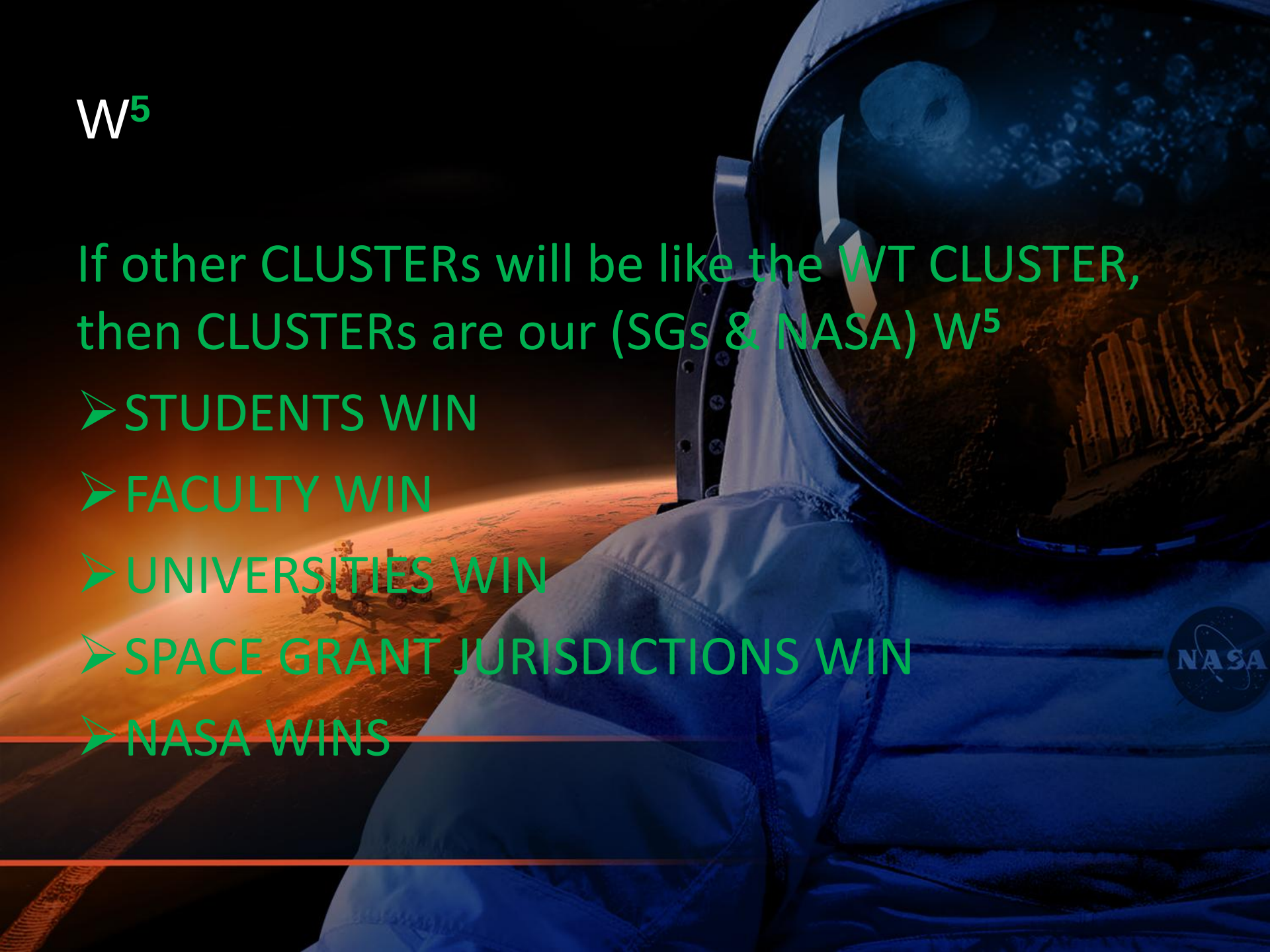
What makes the WT CLUSTER successful? -

PEOPLE WITH COMMON INTEREST WANTING TO WORK COLLABORATIVELY, UNSELFISHLY, AND INFORMALLY TOGETHER!

W^5

If other CLUSTERs will be like the WT CLUSTER, then CLUSTERs are our (SGs & NASA) W^5

- STUDENTS WIN
- FACULTY WIN
- UNIVERSITIES WIN
- SPACE GRANT JURISDICTIONS WIN
- NASA WINS



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