SLSD Open Innovation Results and Plans

62nd IAC Cluster Forum
Collaborative Innovation: Strategy to Results
October 4, 2011

Jeffrey R. Davis, MD
Director, Space Life Sciences, NASA

Space Life Sciences Overview

- Human health and performance in the space environment
  - Space medicine – health care and medical systems
    - Physiological and behavioral effects of spaceflight
  - Research and technology development - weightlessness, isolation
  - Space environmental monitoring and human factors
    - Radiation, air/water, microbiology/toxicology, food systems
    - Human centered design, ergonomics, biomechanics, food systems
- Human-centered risk assessment and risk mitigation
- Space Flight Human System standards and requirements
- Strategy formulation and innovation management

Strategic Initiatives

- Summary
  - Visioning exercise and strategic plan
  - Alliances benchmark 2008-2010
  - ***HBS collaborative innovation models and collaborative projects 2008-2010***
  - ***Open innovation pilot project 2008-2010***
  - Virtual center for collaboration established 2010: NASA Human Health and Performance center
  - ***Pursue collaborative research models 2011***
  - ***Develop Strategic Framework for Innovation 2011***

Portfolio Definition

- ***Human System risks for space flight (our portfolio of work)***
  - Evidence based risk management system
    - 65 human system risks
    - Human System Risk Board formed April 2008 –integrates research and operations—decisions made by one entity

  - Developed Risk Management Analysis Tool (RMAT)
    - Captures vertical "standards to deliverables" process
    - Links risks for common elements

  - Subject matter experts (risk owners) identify gaps in their research and technology portfolio

  - ***Gaps became opportunities for open collaborative solutions***

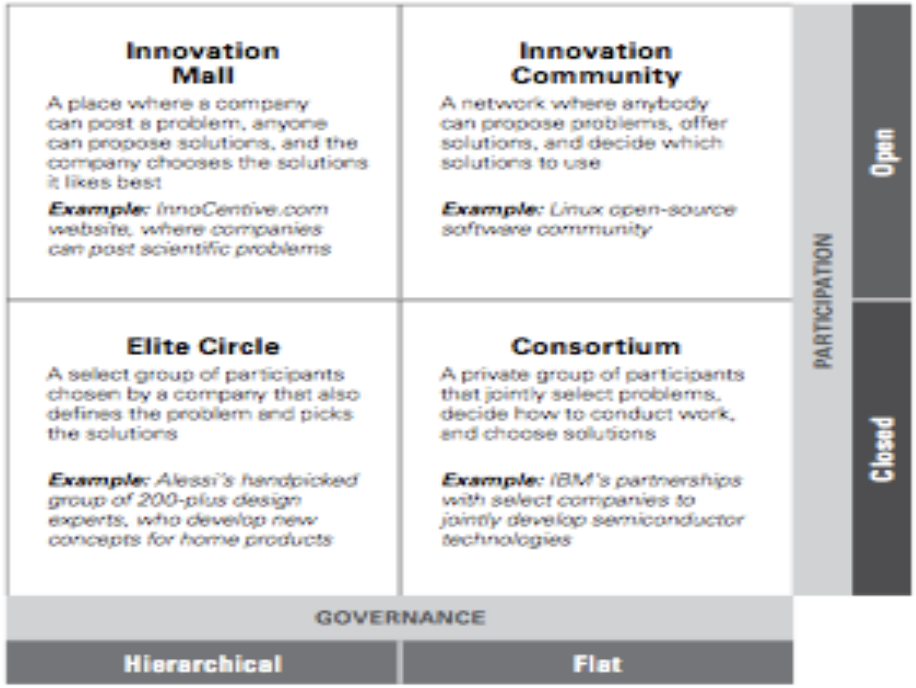
Portfolio Analysis

- Portfolio mapping – Dr. Gary Pisano, Harvard Business School (HBS)
  - "Which Kind of Collaboration is Right for You" – Harvard Business Review, December 2008
  - Workshop conducted by Dr. Pisano with NASA – Wyle leadership team July 2009
    - Analyzed 12 gaps for collaborative opportunity, those that mapped to open innovation quadrant selected for pilot projects

Portfolio Analysis: Mapping - Models of Collaboration

The Four Ways to Collaborate

There are two basic issues that executives should consider when deciding how to collaborate on a given innovation project: Should membership in a network be open or closed? And, should the network's governance structure for selecting problems and solutions be flat or hierarchical? This framework reveals four basic modes of collaboration.



HARVARD BUSINESS REVIEW • DECEMBER 2008

From Gary Pisano, Harvard Business School

Open Innovation – Innovation Mall

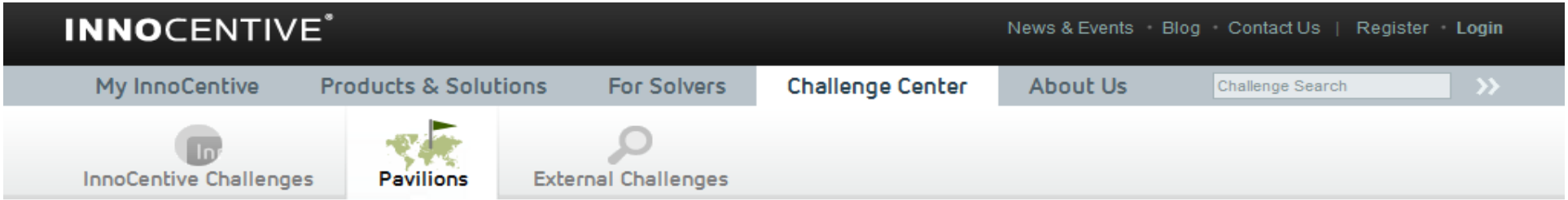
- Why open collaboration/innovation?
  - Joy's Law
    - "No Matter Who You Are, Most of the Smartest People Work for Someone Else"
      - Bill Joy, Cofounder Sun Microsystems
  - The Causal Explanation for Joy's Law
    - Knowledge is unevenly distributed in society - Fredrich von Hayek (1945)
    - Knowledge is sticky - Eric von Hippel (1994)

from Karim Lakhani, PhD Harvard Business School

Open Innovation

- Open innovation and collaboration– four pilot projects
  - **InnoCentive**- posts individual challenges/gaps to their established network of solvers (~300,000)
    - financial award if the solution is found viable by the posting entity
  - **Yet2.com**- acts as an actual technology scout bringing together buyers and sellers of technologies
    - Option to develop partnerships
  - **TopCoder** - open innovation software company with a large network of solvers (~300,000)
    - variety of skill-based software coding competitions
  - **NASA@work**-internal collaboration platform leveraging expertise found across NASA's 10 centers

INNOCENTIVE



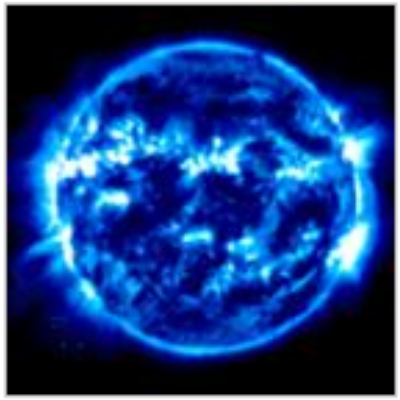
Global Appeal-

2900 solvers

80 Countries

InnoCentive Pilot Results

Challenge Title	Ctr	Posted	Deadline	Proj Rms	Sub	Award Date	Award Amount
Improved Barrier Layers … Keeping Food Fresh in Space	**JSC - SLSD**	**12/18/2009**	**2/28/2010**	**174**	**22**	**5/7/2010**	**$11,000**
Mechanism for a Compact Aerobic Resistive Exercise Device	JSC - SLSD	12/18/2009	2/28/2010	564	95	5/14/2010	$20,000
Data-Driven Forecasting of Solar Events	**JSC - SLSD**	**12/22/2009**	**3/22/2010**	**579**	**11**	**5/13/2010**	**$30,000**
Coordination of Sensor Swarms for Extraterrestrial Research	LRC	2/27/2010	4/26/2010	423	37	6/4/2010	$18,000 (3)
Medical Consumables Tracking	**GRC**	**5/17/2010**	**7/27/2010**	**365**	**56**	**10/28/2010**	**$15,000 (3)**
Augmenting the Exercise Experience	JSC - SLSD	5/27/2010	7/27/2010	229	18	9/20/2010	$10,000
Simple Microgravity Laundry System	**JSC - EA**	**5/27/2010**	**7/27/2010**	**598**	**108**	**9/21/2010**	**$7,500**



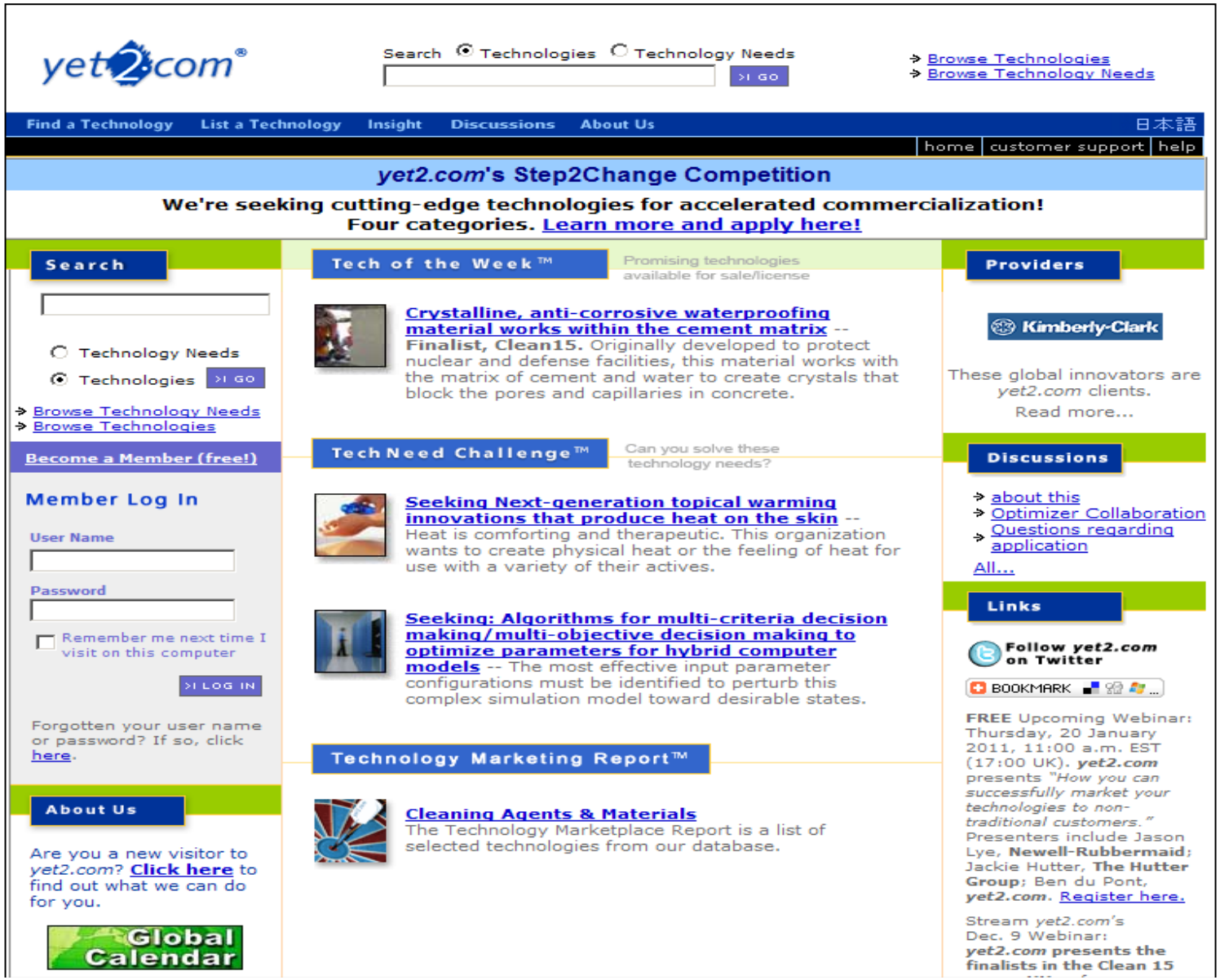
NASA Challenge: Data-Driven Forecasting of Solar Events

TAGS: Engineering/Design, Computer Science/Information Technology, Math/Statistics, NASA, RTP

STATUS: **Awarded** | ACTIVE SOLVERS: 579 | POSTED: 12/22/09

- Important for protecting health in space flight
- Previous work to extend prediction capability beyond 1-2 hours not successful
- Challenge:
  - 4-24 hour prediction
  - 2 sigma confidence interval
- Result:
  - 8 hour prediction
  - 85% accuracy
  - 3 sigma confidence interval
- Solution submitted by retired Radiofrequency engineer

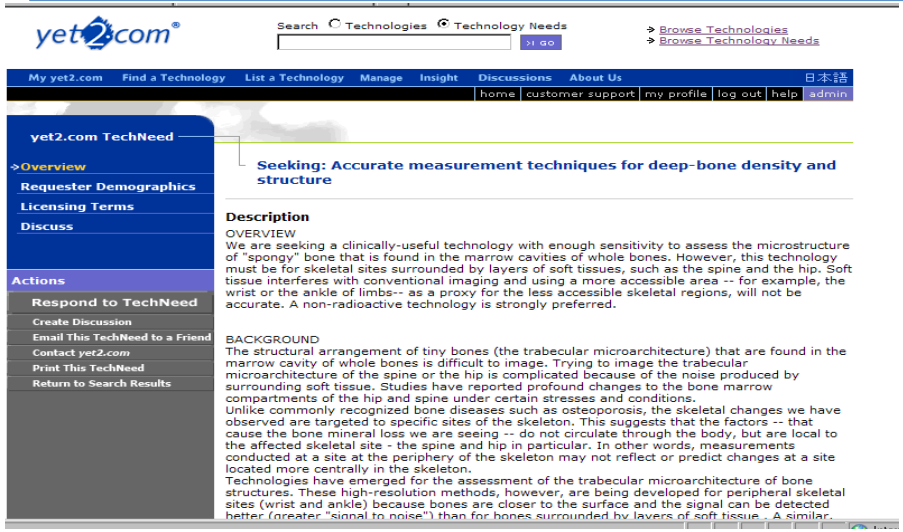
yet2.com


yet2.com
Search Technologies Technology Needs
GO
Browse Technologies
Browse Technology Needs
Find a Technology List a Technology Insight Discussions About Us
日本語
home customer support help
yet2.com's Step2Change Competition
We're seeking cutting-edge technologies for accelerated commercialization!
Four categories. Learn more and apply here!
Search
Technology Needs
Technologies GO
Browse Technology Needs
Browse Technologies
Become a Member (free!)
Member Log In
User Name
Password
Remember me next time I visit on this computer
LOG IN
Forgotten your user name or password? If so, click here.
About Us
Are you a new visitor to yet2.com? Click here to find out what we can do for you.
Global Calendar
Tech of the Week™
Promising technologies available for sale/license
Crystalline, anti-corrosive waterproofing material works within the cement matrix -- Finalist, Clean15. Originally developed to protect nuclear and defense facilities, this material works with the matrix of cement and water to create crystals that block the pores and capillaries in concrete.
Tech Need Challenge™
Can you solve these technology needs?
Seeking Next-generation topical warming innovations that produce heat on the skin -- Heat is comforting and therapeutic. This organization wants to create physical heat or the feeling of heat for use with a variety of their actives.
Seeking: Algorithms for multi-criteria decision making/multi-objective decision making to optimize parameters for hybrid computer models -- The most effective input parameter configurations must be identified to perturb this complex simulation model toward desirable states.
Technology Marketing Report™
Cleaning Agents & Materials
The Technology Marketplace Report is a list of selected technologies from our database.
Providers
Kimberly-Clark
These global innovators are yet2.com clients.
Read more...
Discussions
about this
Optimizer Collaboration
Questions regarding application
All...
Links
Follow yet2.com on Twitter
BOOKMARK
FREE Upcoming Webinar: Thursday, 20 January 2011, 11:00 a.m. EST (17:00 UK). yet2.com presents "How you can successfully market your technologies to non-traditional customers." Presenters include Jason Lye, Newell-Rubbermaid; Jackie Hutter, The Hutter Group; Ben du Pont, yet2.com. Register here.
Stream yet2.com's Dec. 9 Webinar: yet2.com presents the finalists in the Clean 15

yet2.com Pilot Results

Technical Need	*No. of total replies/leads*	*No. of hits (initial interest)*	*Active leads*
Bone Density Measurement	51	793	5
Monitoring of Water and Biocides	61	2003	8
Radioprotectants	28	475	6
Exoterrestrial Life Differentiation	31	1596	1
Food Packaging/Protection	29	173	5
Portable Imaging	34	581	5

Yet2.com example: Bone Imaging



yet2.com

Search ○ Technologies ◉ Technology Needs

» go

» Browse Technologies
» Browse Technology Needs

My yet2.com | Find a Technology | List a Technology | Manage | Insight | Discussions | About Us | 日本語

home | customer support | my profile | log out | help | admin

yet2.com TechNeed

- Overview
- Requester Demographics
- Licensing Terms
- Discuss

Actions

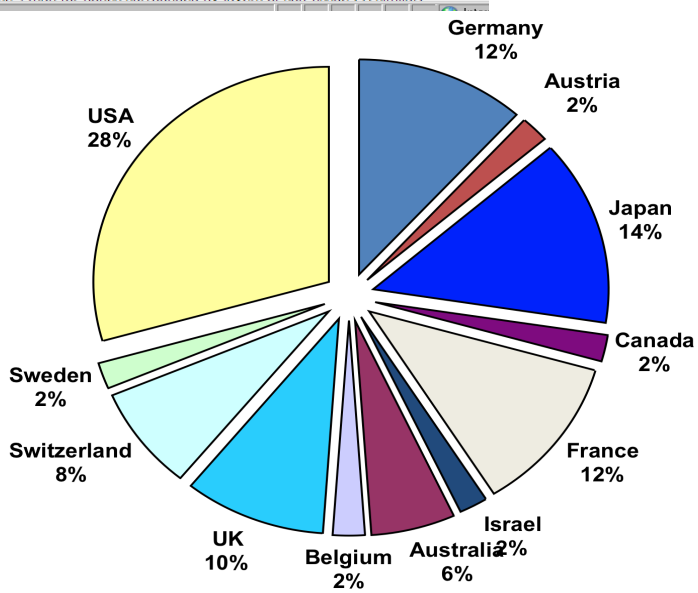
- Respond to TechNeed
- Create Discussion
- Email This TechNeed to a Friend
- Contact yet2.com
- Print This TechNeed
- Return to Search Results

Seeking: Accurate measurement techniques for deep-bone density and structure

Description

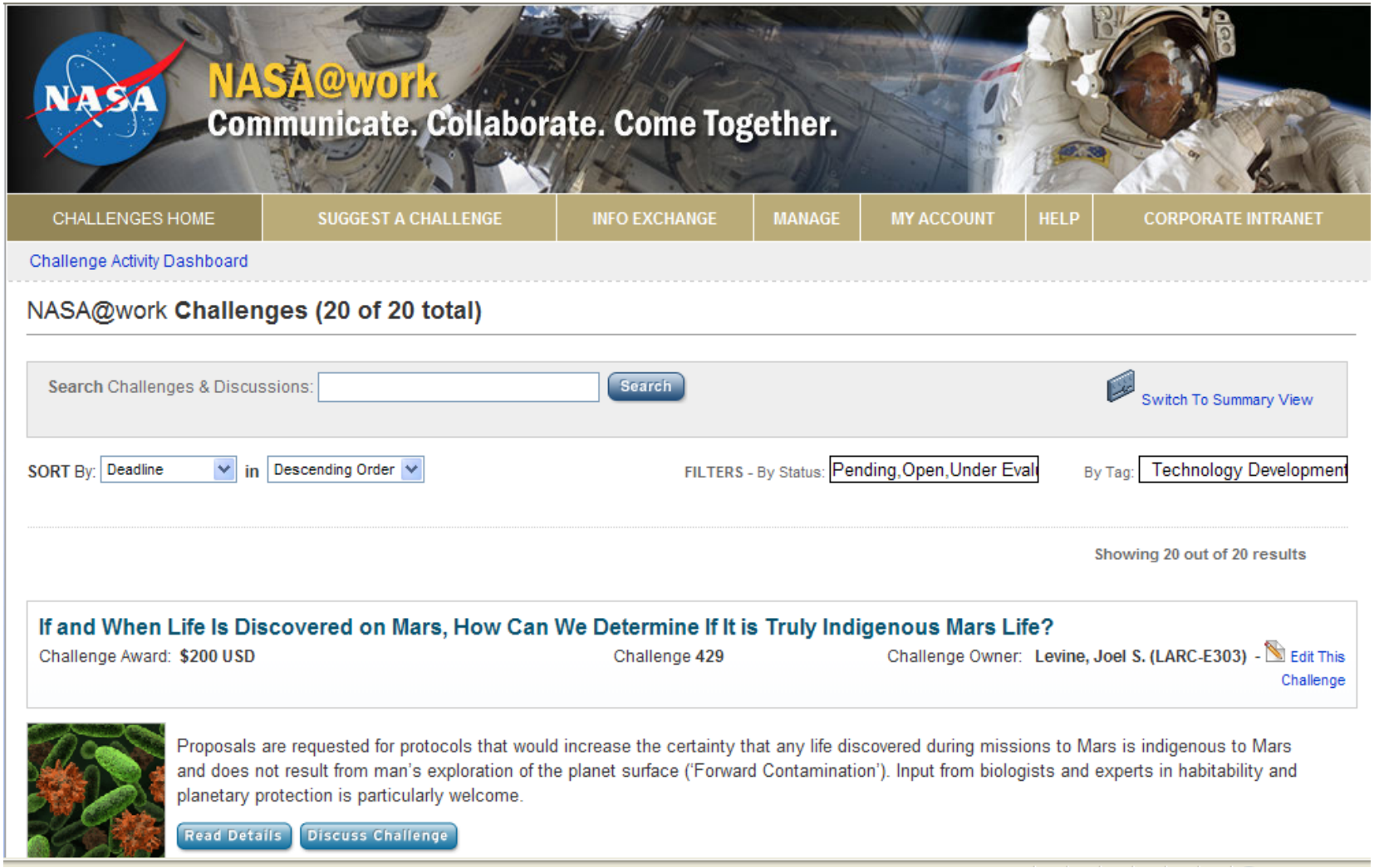
OVERVIEW
We are seeking a clinically-useful technology with enough sensitivity to assess the microstructure of "spongy" bone that is found in the marrow cavities of whole bones. However, this technology must be for skeletal sites surrounded by layers of soft tissues, such as the spine and the hip. Soft tissue interferes with conventional imaging and using a more accessible area -- for example, the wrist or the ankle of limbs-- as a proxy for the less accessible skeletal regions, will not be accurate. A non-radioactive technology is strongly preferred.

BACKGROUND
The structural arrangement of tiny bones (the trabecular microarchitecture) that are found in the marrow cavity of whole bones is difficult to image. Trying to image the trabecular microarchitecture of the spine or the hip is complicated because of the noise produced by surrounding soft tissue. Studies have reported profound changes to the bone marrow compartments of the hip and spine under certain stresses and conditions.
Unlike commonly recognized bone diseases such as osteoporosis, the skeletal changes we have observed are targeted to specific sites of the skeleton. This suggests that the factors -- that cause the bone mineral loss we are seeing -- do not circulate through the body, but are local to the affected skeletal site - the spine and hip in particular. In other words, measurements conducted at a site at the periphery of the skeleton may not reflect or predict changes at a site located more centrally in the skeleton.
Technologies have emerged for the assessment of the trabecular microarchitecture of bone structures. These high-resolution methods, however, are being developed for peripheral skeletal sites (wrist and ankle) because bones are closer to the surface and the signal can be detected better (greater "signal to noise") than for bones surrounded by layers of soft tissue. A similar



Germany	6
Austria	1
Japan	7
Canada	1
France	6
Israel	1
Australia	3
Belgium	1
UK	5
Switzerland	4
Sweden	1
USA	15
Total	51

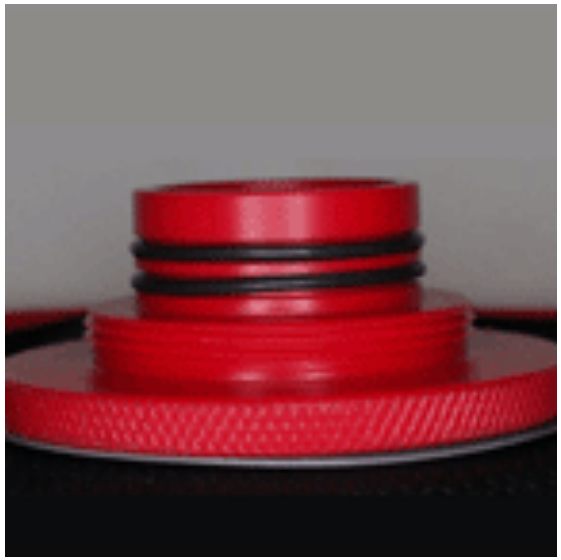
NASA@work


NASA@work
Communicate. Collaborate. Come Together.
CHALLENGES HOME
SUGGEST A CHALLENGE
INFO EXCHANGE
MANAGE
MY ACCOUNT
HELP
CORPORATE INTRANET
Challenge Activity Dashboard
NASA@work Challenges (20 of 20 total)
Search Challenges & Discussions:
Search
Switch To Summary View
SORT By: Deadline in Descending Order
FILTERS - By Status: Pending,Open,Under Eval
By Tag: Technology Development
Showing 20 out of 20 results
If and When Life Is Discovered on Mars, How Can We Determine If It is Truly Indigenous Mars Life?
Challenge Award: $200 USD
Challenge 429
Challenge Owner: Levine, Joel S. (LARC-E303) - Edit This Challenge
Proposals are requested for protocols that would increase the certainty that any life discovered during missions to Mars is indigenous to Mars and does not result from man's exploration of the planet surface ('Forward Contamination'). Input from biologists and experts in habitability and planetary protection is particularly welcome.
Read Details
Discuss Challenge

NASA@work Center Participation

Center	Challenges Posted	Registered Solvers	Discussion Posts	Participants
Ames	3	310	18	11
Dryden	0	146	13	9
Glenn	1	467	12	9
Goddard	2	564	101	13
Jet Propulsion Lab	2	1	0	0
Johnson	3	1380	46	29
Kennedy	2	1067	73	39
Langley	4	425	31	12
Marshall	0	700	23	14
Stennis	2	148	22	5
Headquarters	1	267	15	9

Example: JSC Challenge



The Challenge:

Non-Invasive Means to Detect Internal Leakage

This Challenge asked Solvers to identify technologies and/or concepts which will provide monitoring of the pressure in a small volume between seals (or valves) non-invasively.

The Participation:
17 Participants from 7 Centers
20 Discussion Posts

Non-Invasive Means to Detect Internal Leakage

The Solution:

Marshall applied a Wireless Ceramic Pressure Sensor that they had tested and had experience using in Structural Health Monitoring applications.

Challenge Owner Feedback:

"Half of the Solutions were deemed by the team to be of sufficient quality to consider for an award. My team chose to award the Solvers for their 'Wireless Ceramic Pressure Sensor' concept which holds promise."

"I hope that NASA adopts this platform as an ongoing tool. It provides the opportunity to break down the "silos" that all too often impede the open flow of solutions."

NASA@Work

- Early Findings
  - Connected 10 NASA centers horizontally (peer to peer)
  - Connected areas of expertise previously untapped
  - Enthusiasm for the pilot and willingness to use again
  - Positive comments about NASA trying a new business model
  - Solid solutions for some technical problems

TopCoder

[TOPCODER]
Design
Develop
Press Room
Help
Contact Us
REGISTER
The world's largest competitive software development community
The TopCoder Community is 278,506 strong.
What is TopCoder?
TopCoder is Innovation.
TopCoder is revolutionizing the software design and development process by tapping in to our unlimited global community to work for you.
What can we help you do today?
Get Started
Top News: DARPA-funded project to spark computer science education
RSS
Alcatel·Lucent
Platforms:
Virtual Software Factory / Directed Innovation
Assist internal engineering teams to build various APIs to expose capabilities within PayPal's core products. Provide open innovation contests to use and display the capabilities of those APIs.
TopCoder is the world's largest competitive software development community with 278,506 developers representing more than 200 countries.
Copyright ©2001-2011, TopCoder, Inc. All rights reserved

TopCoder Experience

- Opportunity presented to NASA by Harvard Business School
  - Research project to compare outcomes of collaborative and competitive teams
  - NASA provided the problem statement
    - Optimize algorithm that supports medical kit design
- Competition began on 11/04/2009 and lasted approximately 10 days
  - 2800 solutions were submitted by 480 individuals
  - Useful algorithm developed and incorporated into NASA model
- Team felt this process was more efficient than internal development
- Next steps – NASA Tournament Lab with HBS and TopCoder developed to seek many novel optimization algorithms for ISS

Sign-in to Portal

NASA Tournament Lab

powered by [TopCoder]®

NASA Tournament Lab (NTL)

HOME | ABOUT | HOW TO COMPETE | NASA | FORUMS | RESEARCH PORTAL

WELCOME TO THE NASA TOURNAMENT LAB

NASA, Harvard Business School, and TopCoder have established the NASA Tournament Lab (NTL), which will enable the TopCoder community to compete amongst each other to create the most innovative, most efficient, and most optimized solutions for specific, real-world challenges being faced by NASA researchers.

› read more

HOW TO COMPETE

Where to compete, how to register, and much more!

RESEARCH PORTAL

NASA researchers, sign in here!

Leaderboard

Handle	Points
byronknoll	1
cannab	1
jagdish.vasani	1
parashurama	1
rado42	1
redquark	1
TheKingOfWrong	1
yowa	1

LATEST NEWS

JAN 28

The idea behind the first NTL marathon match challenge

posted by NASA_Terry on January 28, 2011 at 4:19 pm

The first NASA Tournament Lab challenge directly addresses NASA's on-going work to detect and classify features of scientific and humanitarian interest. NASA is interested in automatically processing remote sensing (aerial and satellite) data for a variety of reasons: there is increasingly too much data to deal with manually; there is a need to extract information from data in real-time; and there is an ever growing backlog of archived data waiting to be analyzed.

NASA has collected more scientific information about our planet and solar system than any entity in the history of humanity. The Mars Reconnaissance Orbiter alone

Active NTL Contests

NASA NTL - Marathon Match 1 $10000

More Details | Register | Discuss

News and Announcements

- The idea behind the first NTL marathon match challenge
  by NASA_Terry on 01/28/2011 (4:19 pm)
- Welcome to the NTL
  by mike on 01/26/2011 (7:18 pm)

View All

Other Collaboration Methods

- Accelerated research Models
  - Myelin Repair Foundation
  - Ideas Lab (National Science Foundation)
- Business Plan Competitions
  - Annual Rice Business Plan competition
- America COMPETES Act
  - Public – Private partnerships
- NASA Human Health and Performance Center
- Center of Excellence for Collaborative Innovation

Future Work

- New challenges through
  - NASA@Work
  - NASA Tournament Lab
  - New contracts: open innovation, consortium
- Metrics
- Strategic decision framework
- Accelerated research models
- NHHPC
- COECI