The Power of Crowdsourcing

NASA's Toolkit for Innovation using Prizes and Challenges with the Curated Communities

NASA's Center of Excellence for Collaborative Innovation (CoECI)

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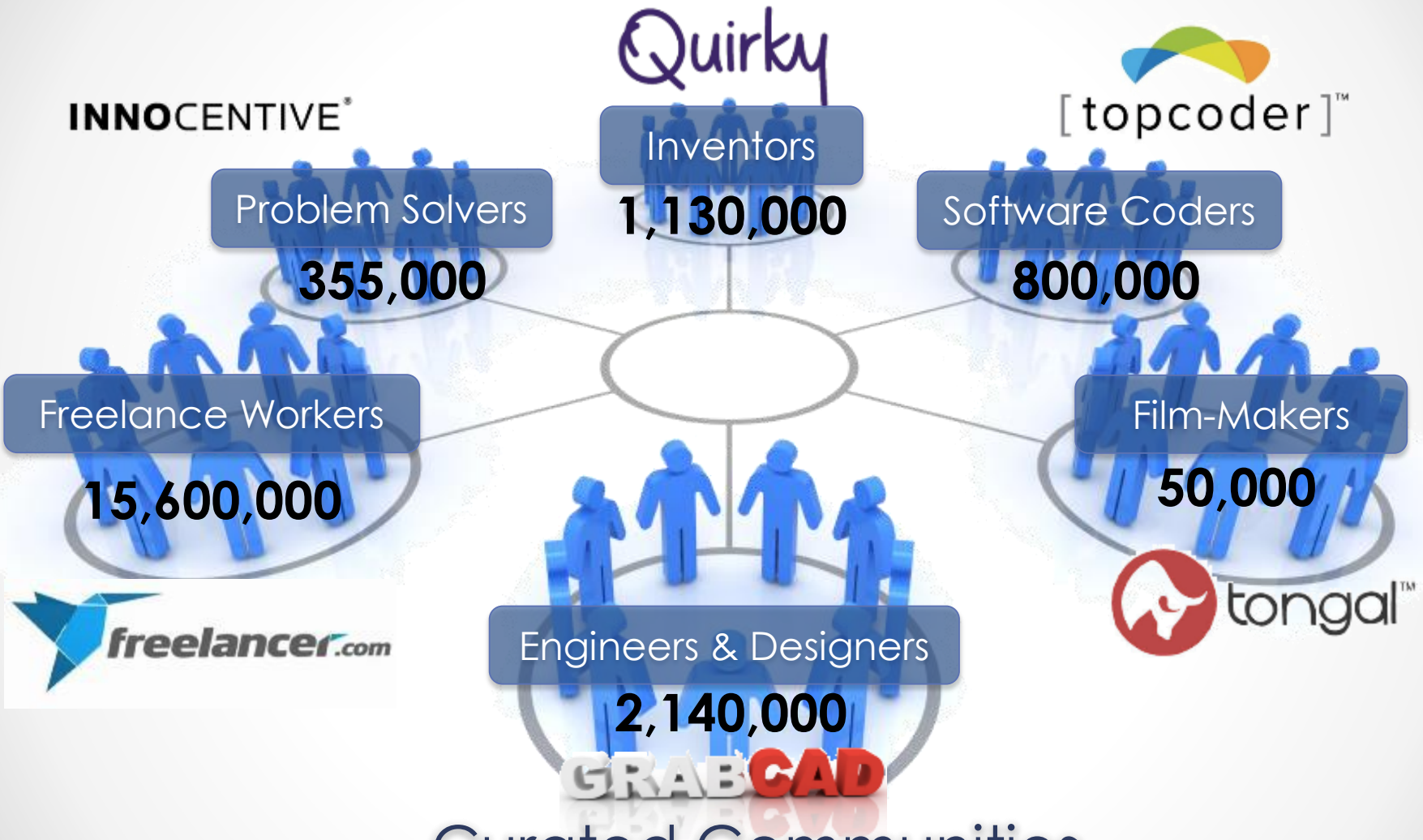
Networks & Communities



Curated Communities

Well formulated crowd-based platforms actively work to build a community of users that are **passionate enthusiasts.**

Effectively Using Communities

Solve a Problem

Create an Innovative New Solution

Apply an Existing Technology

(in an innovative way)

Find an Existing Solution

(you didn't know existed)

Develop a Product | Provide a Service

Access Best Possible Product or Service

(competition winner)

Access Very Specific Expertise

(found through competition)

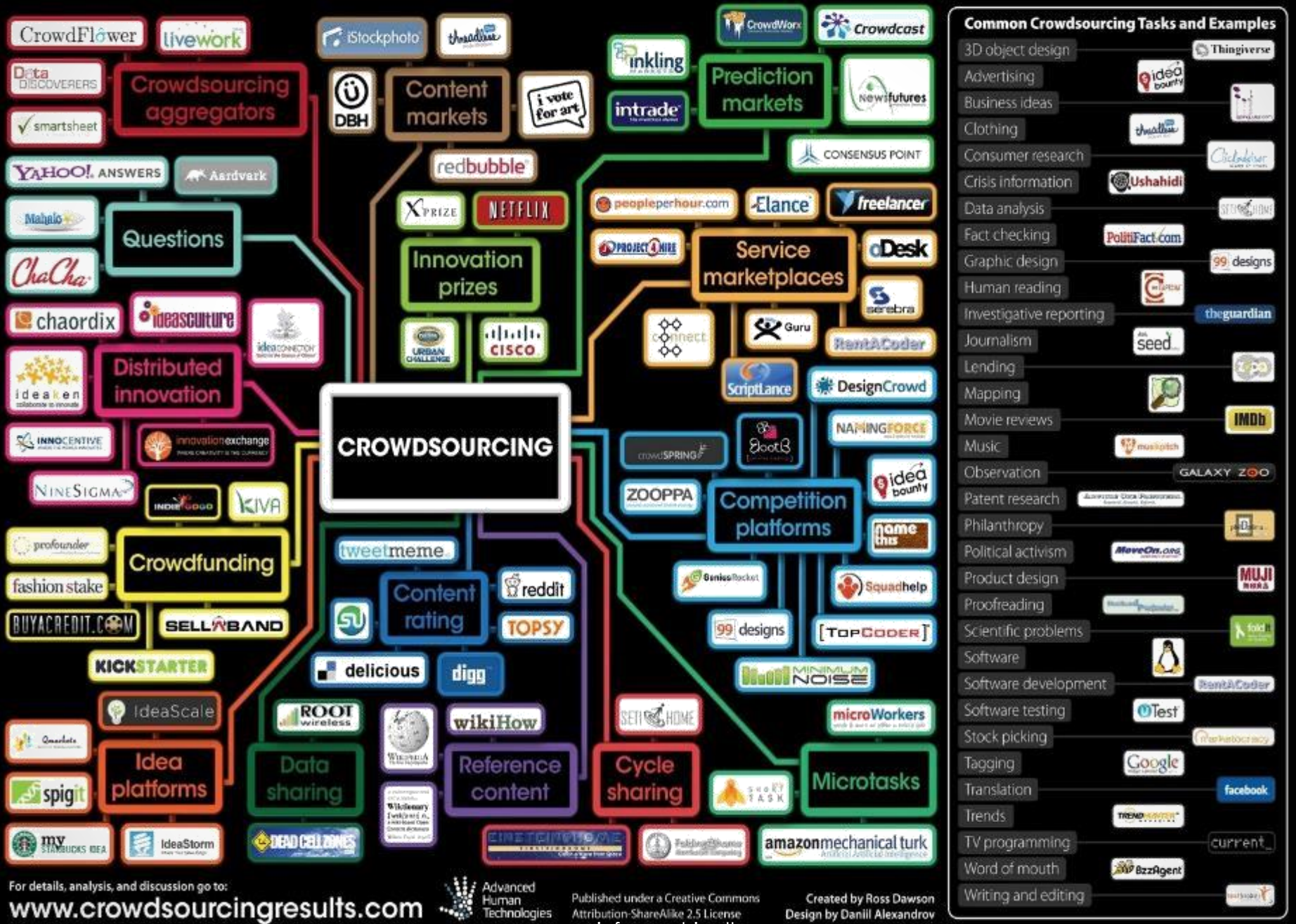
Diverse Membership

Innovation from Diversity found via Challenges
(Experience, Context/Perspective, Expertise)

Expert or Domain Focused Membership

High Quality Products/Services
(via Competition to get Best in Domain)

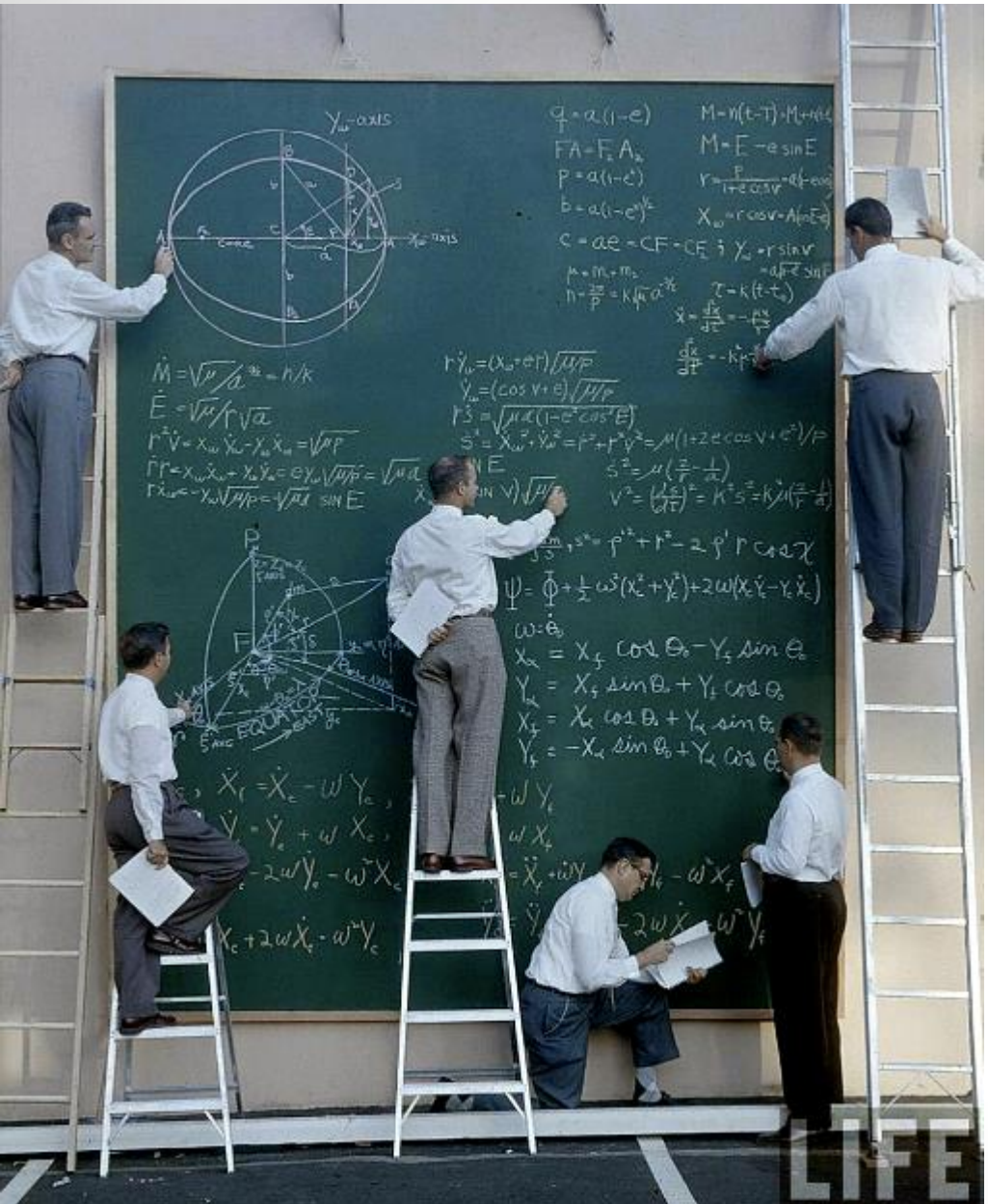
This is an established and GROWING INDUSTRY!



www.infographically.com

Crowdsourcing is Mainstream

NASA@WORK



First Things First!

NASA has some of the most amazing employees on the PLANET!

Tap into that crowd FIRST!

NASA@WORK

What Is NASA@work?

A NASA-wide crowdsourcing platform for employees to find technical solutions, new ideas, or expertise using prize-based challenges.

How Can NASA@work Be Used?

- Generate new ideas, concepts
- Collect new and creative input
- Survey NASA for knowledge or expertise
- Refine a challenge prior to external crowdsourcing

NASA@work is **FREE** for any NASA projects that want to post a challenge!

Group On-Call Notification Alternatives

Lab Equipment Obsolescence: Cytometer

Ideas for New Technology Demonstration Prize Competitions

Deep Space Human Spacecraft

Display Format Development System

Inflight Calcium Isotope Measurement Device

Protection of the Human from Galactic Cosmic Rays Challenge

Solutions on the Use of Thorium Instead of Uranium

Successful NASA@WORK Challenges

Packing Foam Alternatives Challenge

A Durable/ Permanent Anti-Fog for the Space Suit Helmet

Reduce Waste in Space: Creating Feedstock for Additive Manufacturing (3D Printing)

As Good as Dollars: Incentives for NASA@work that Count!

Determining Urine Volume in Microgravity

Hands-On Tutorial for Reed Solomon Encoding Method

Advanced Exercise Concepts for Long-Duration Space Flight

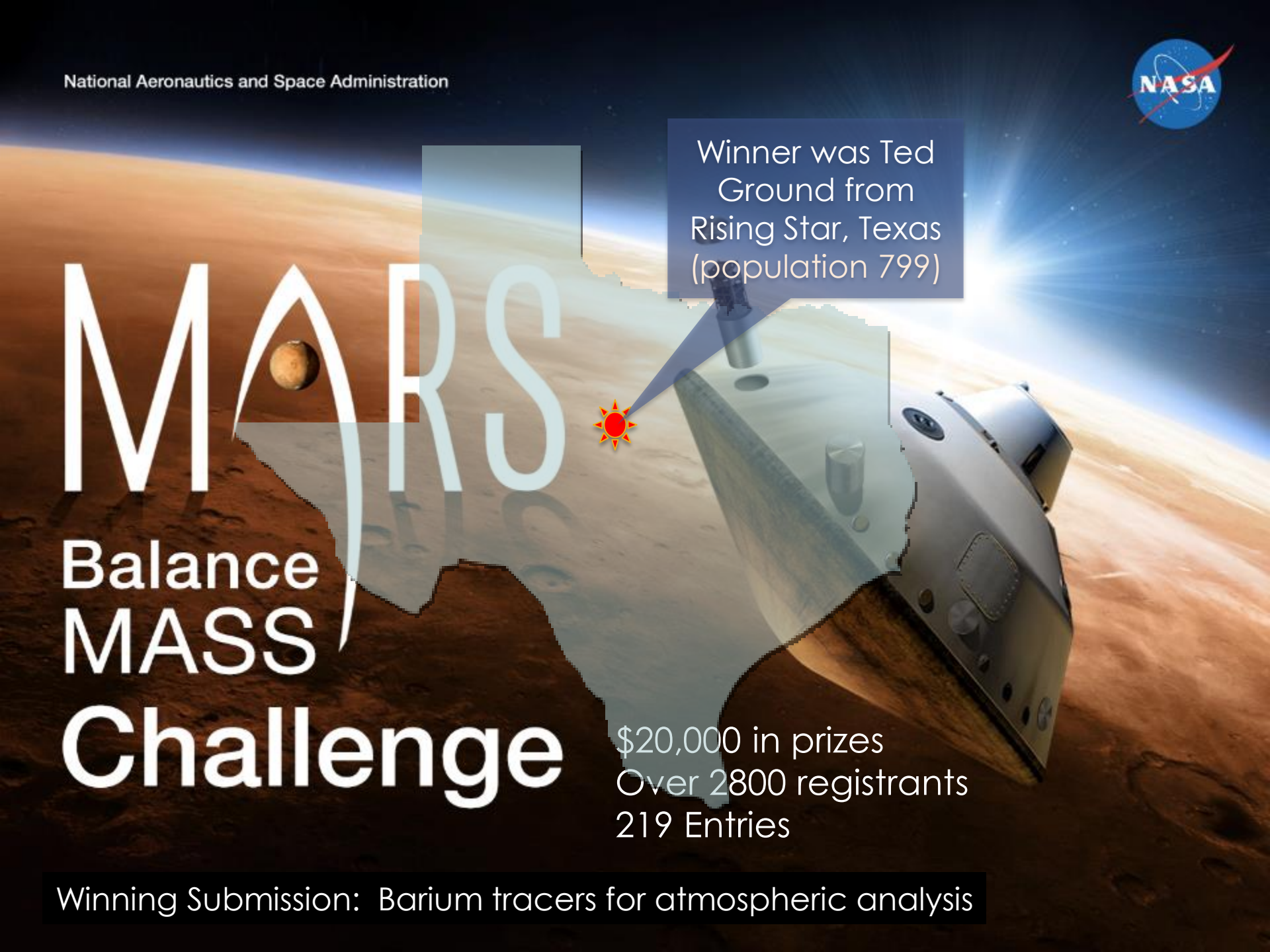
Innovation & Problem Solving

Using Challenges with Diverse Communities to develop unique and innovative approaches to unsolved problems

Diversity is the Key to Innovation

One MIT study into InnoCentive revealed that solvers were more successful when they had less experience in the relevant discipline.

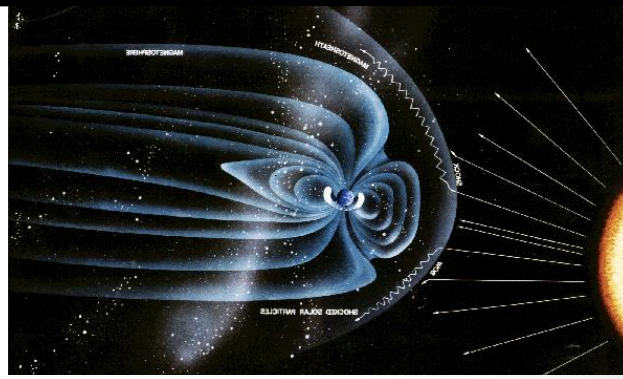
Some data suggests that as much as 70% of successful InnoCentive challenge solutions are solved by individuals outside of the challenge's specific technical domain.


National Aeronautics and Space Administration
NASA
Winner was Ted Ground from Rising Star, Texas (population 799)
MARS
Balance MASS Challenge
$20,000 in prizes
Over 2800 registrants
219 Entries
Winning Submission: Barium tracers for atmospheric analysis

Additional InnoCentive Challenges

Galactic Cosmic Ray Mitigation

Finding ways to protect humans from the effects of cosmic galactic rays in deep space.

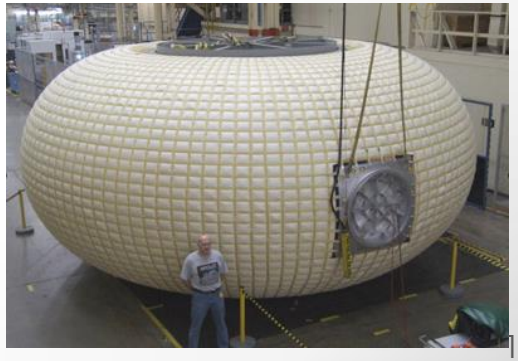


Non-Invasive Intra-Cranial Pressure Monitoring

Finding methods to monitor the pressure in the human brain that are non-invasive.

Strain Measurement of Vectran and Kevlar Webbing

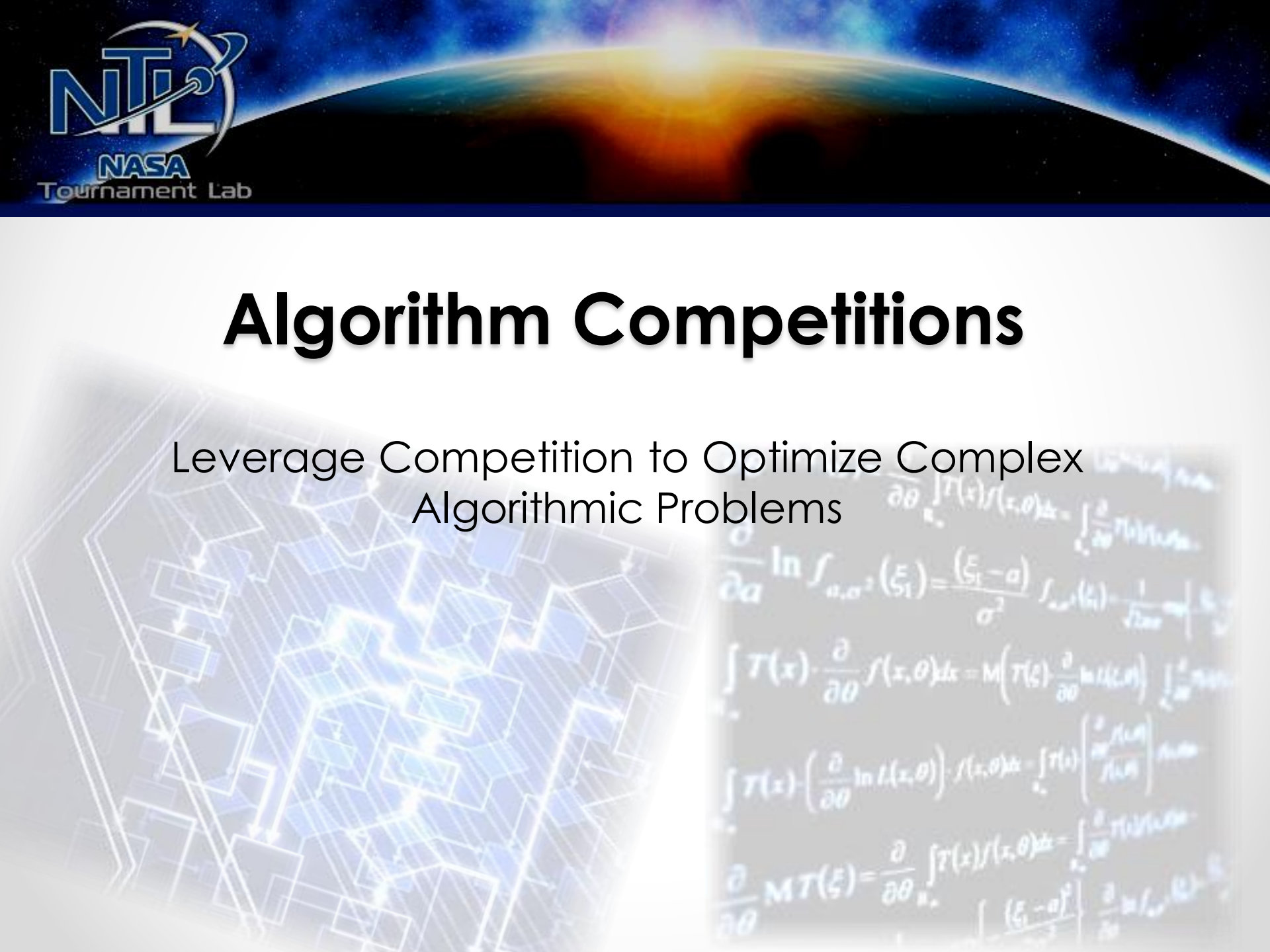
Seeking improved methods for strain measurement under very specific conditions for inflatable habitat testing.



NASA Tournament Lab

Algorithm Competitions

Leverage Competition to Optimize Complex Algorithmic Problems



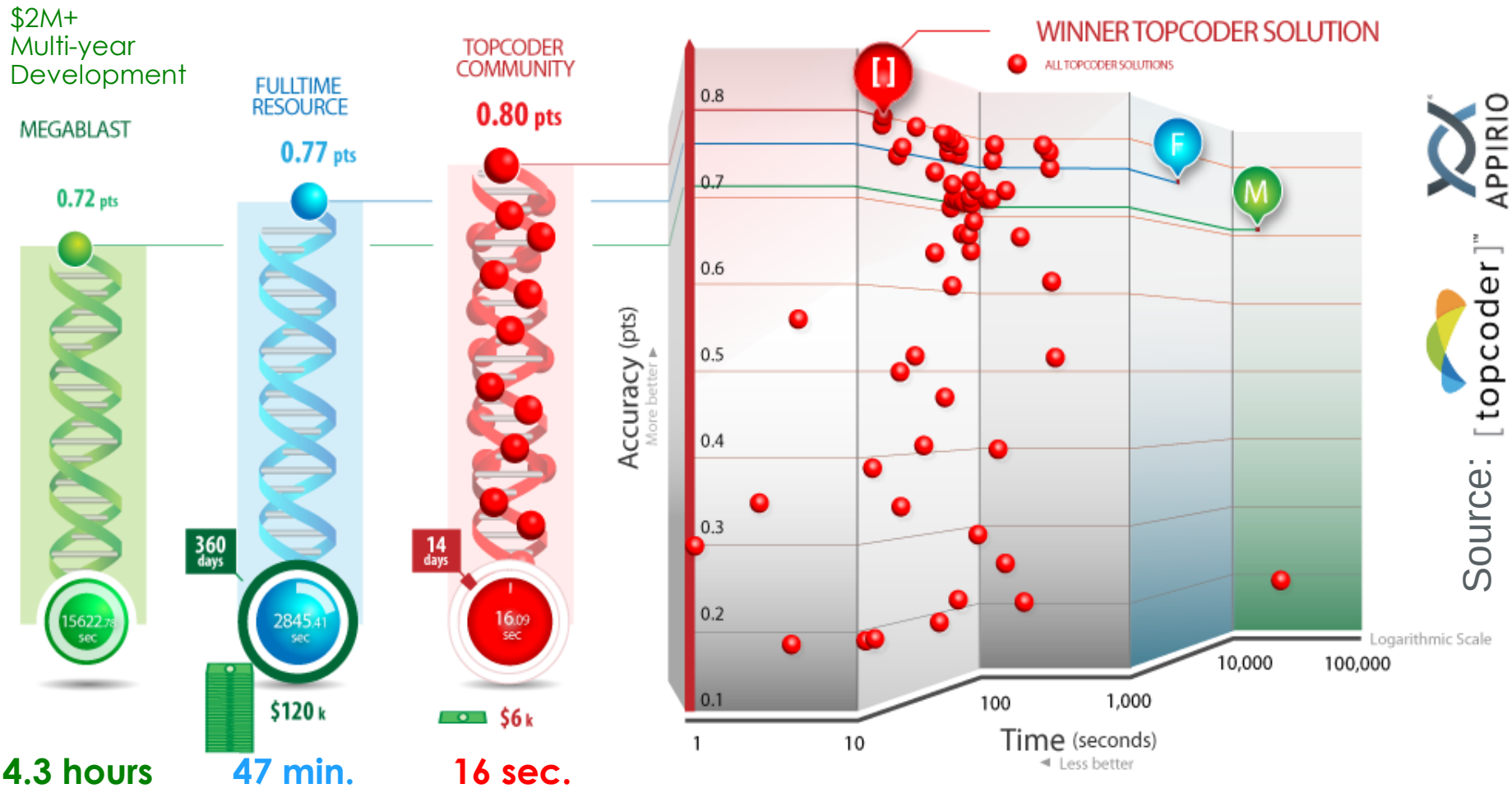
HARVARD MEDICAL SCHOOL

Case Study

ANTIBODY SEQUENCE ANNOTATION

Winning solution performs 120x faster

Improve on NIH MegaBlast algorithm for nucleotide sequence alignment



122
CODERS SUBMITTED

654
SOLUTIONS

89
DIFFERENT APPROACHES TO SOLVE PROBLEM IDENTIFIED

5
WINNING COUNTRIES
RUSSIA, FRANCE, EGYPT, BELGIUM & US

NASA & PLANETARY RESOURCES
ASTEROID DATA HUNTER

15% Improvement!

Over current method of identifying asteroids in the main belt of Asteroids that orbit between Mars & Jupiter

1241 Registrants
625 Solutions Submitted
$74,124 in Prizes Awarded
Algorithm AND App

Learn more & download the app at: **topcoder.com/asteroids**

NASA

NASA Tournament Lab

[topcoder]

ASTEROID

PLANETARY RESOURCES

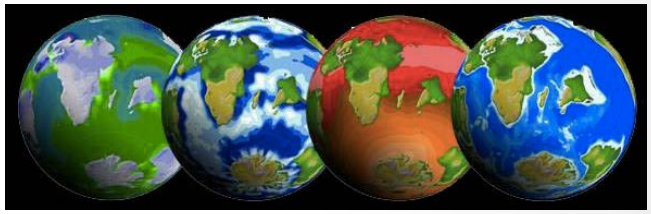
Additional Recent Harvard/ TopCoder Algorithm Challenges

Asteroid Tracker

Optimized algorithm for tracking multiple asteroids with an array of antennas.

Earth Science

Developing ideas for tools that use NASA earth science data to help local communities with climate resilience.



Planetary Data System (PDS) - Cassini

Image processing of Saturn rings data to detect possible new satellites or moons.

Using Competitions for Software Development

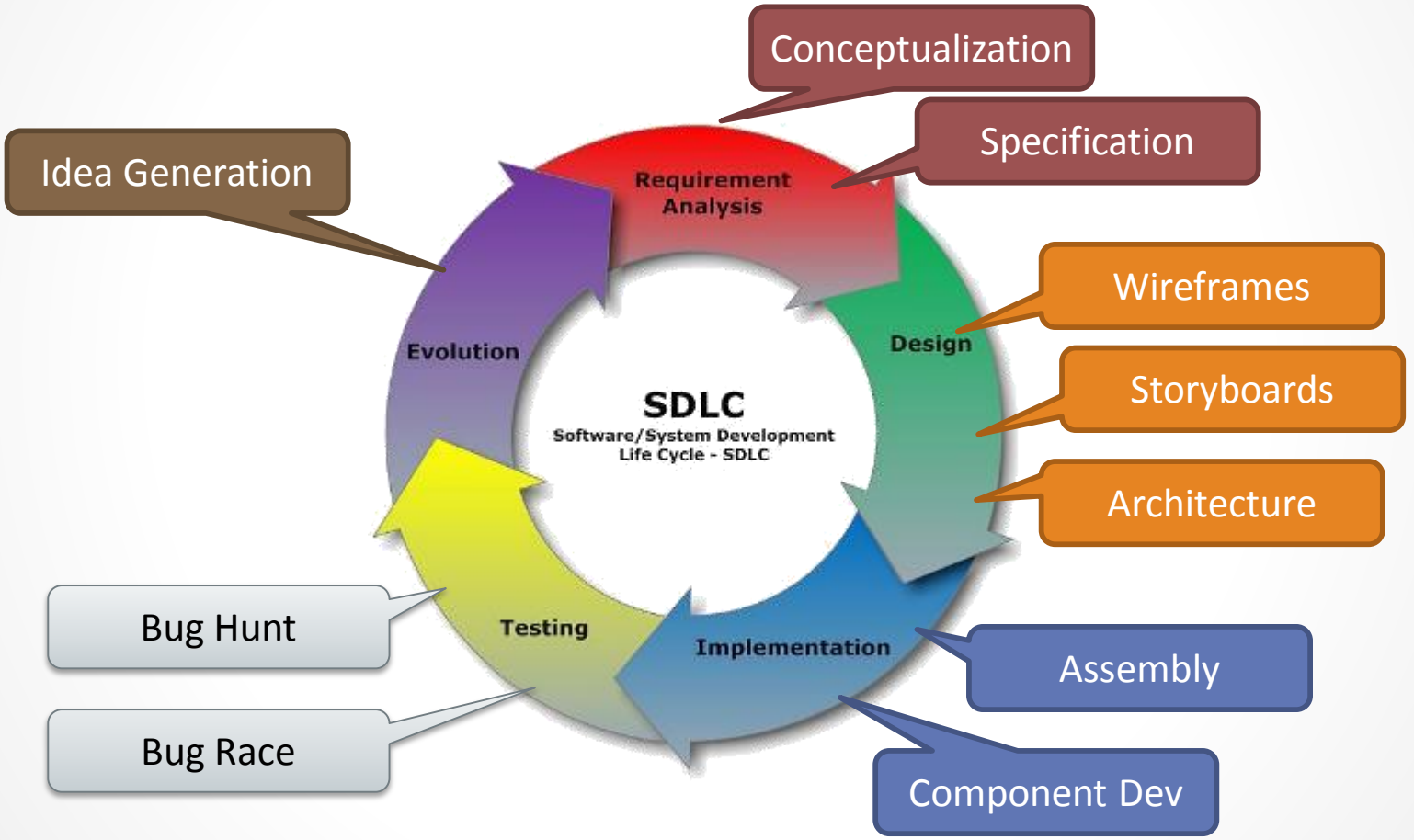


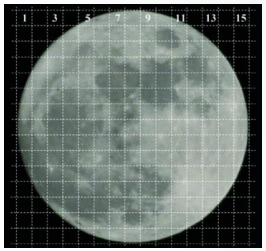
Image Credit: Wikipedia, *Systems development life-cycle*, http://en.wikipedia.org/wiki/Systems_development_life-cycle (as of Mar. 27, 2013, 05:48 GMT).

Source: [topcoder]™ APPIRIO

Recent Harvard/TopCoder Software Development Challenges

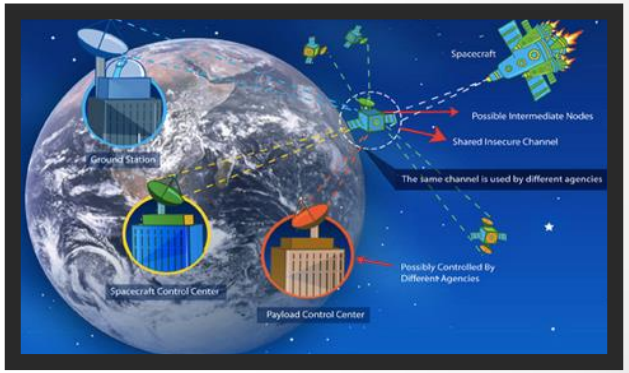
Lunar Mapping and Monitoring Project (LMMP)

Has reduced image processing times from 18 hours to 3 hours.



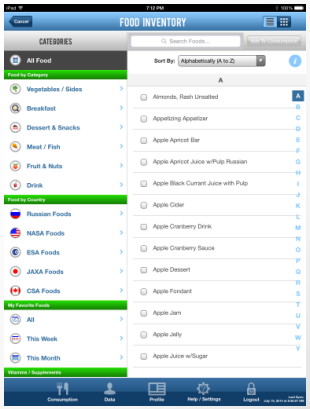
Disruption/Delay Tolerant Network (DTN)

Attempting to solve a problem with distributing security keys in a disrupted/ delayed network. Building out the protocol stack.



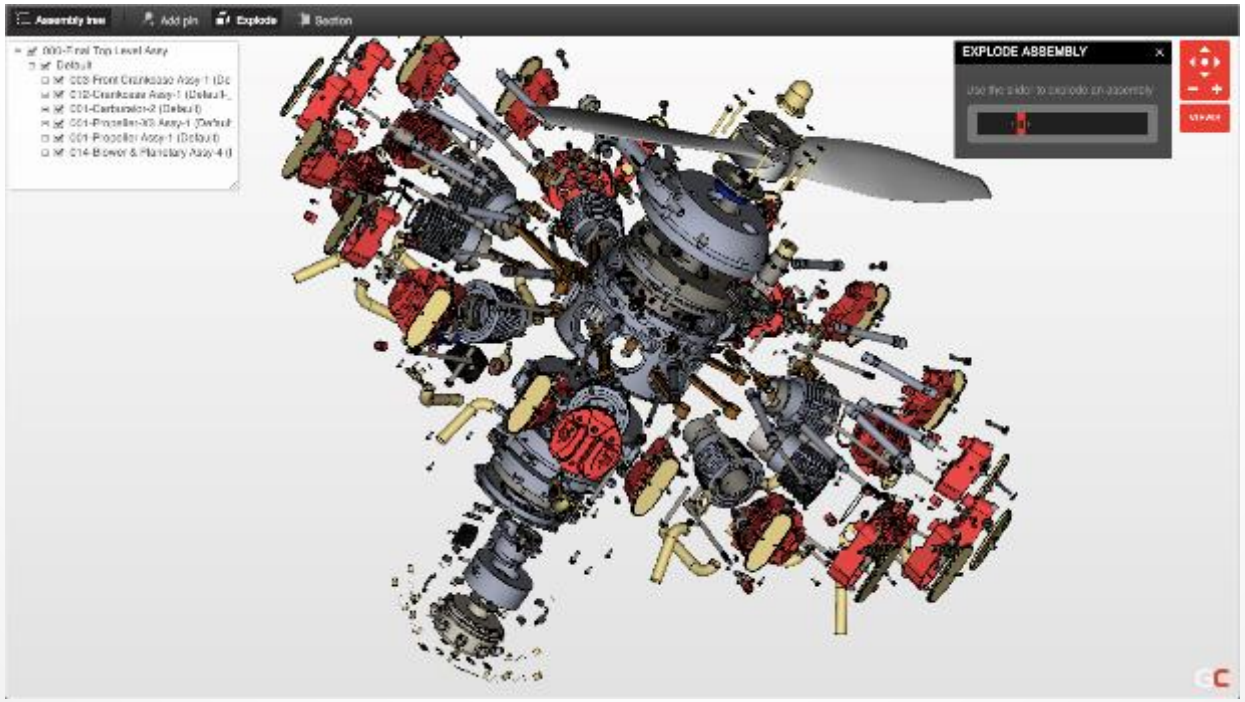
ISS Food Intake Tracker

An iPAD app designed for the ISS to better track their food intake (featured at the Apple Developers Conference in 2014).

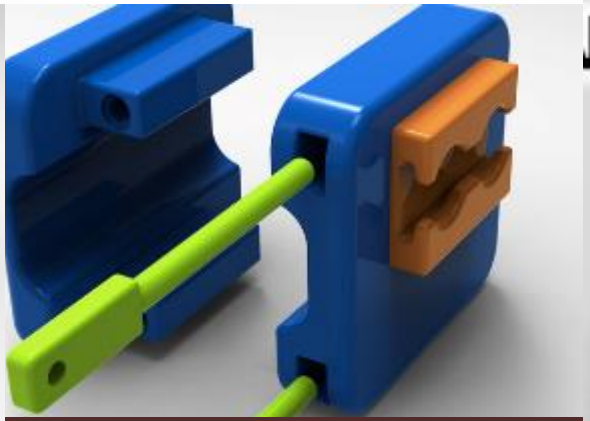


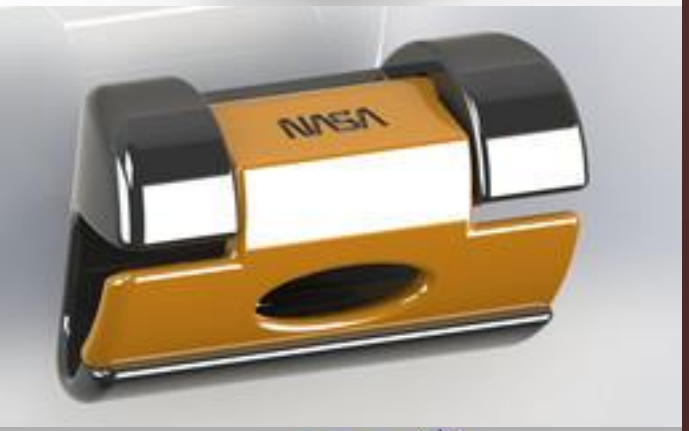
Design Challenges

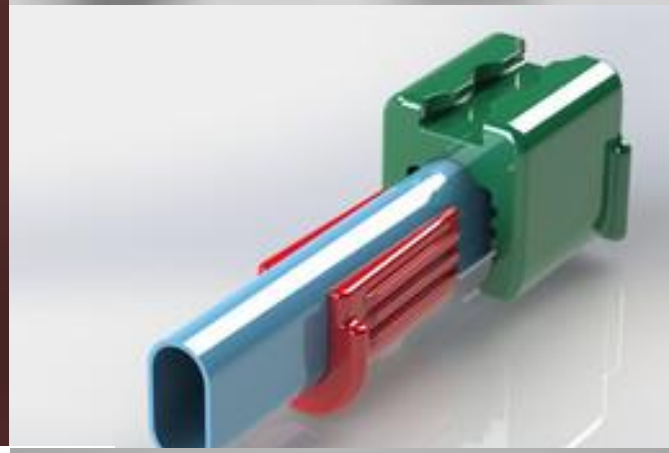
Leverage Competition to Optimize Engineering Designs

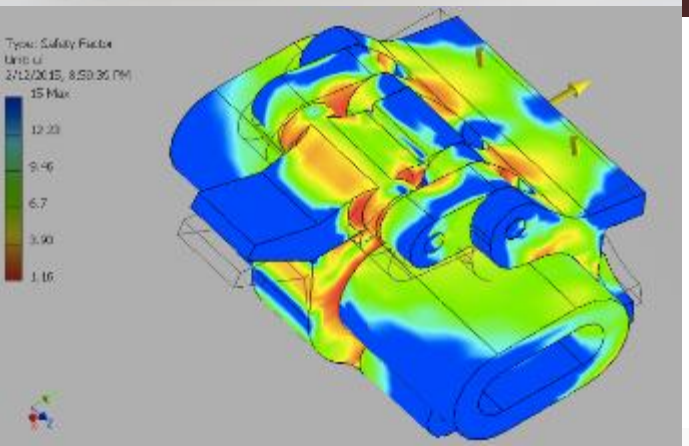


GrabCAD 30 Day challenge for $3000: 492 CAD Designs Submitted





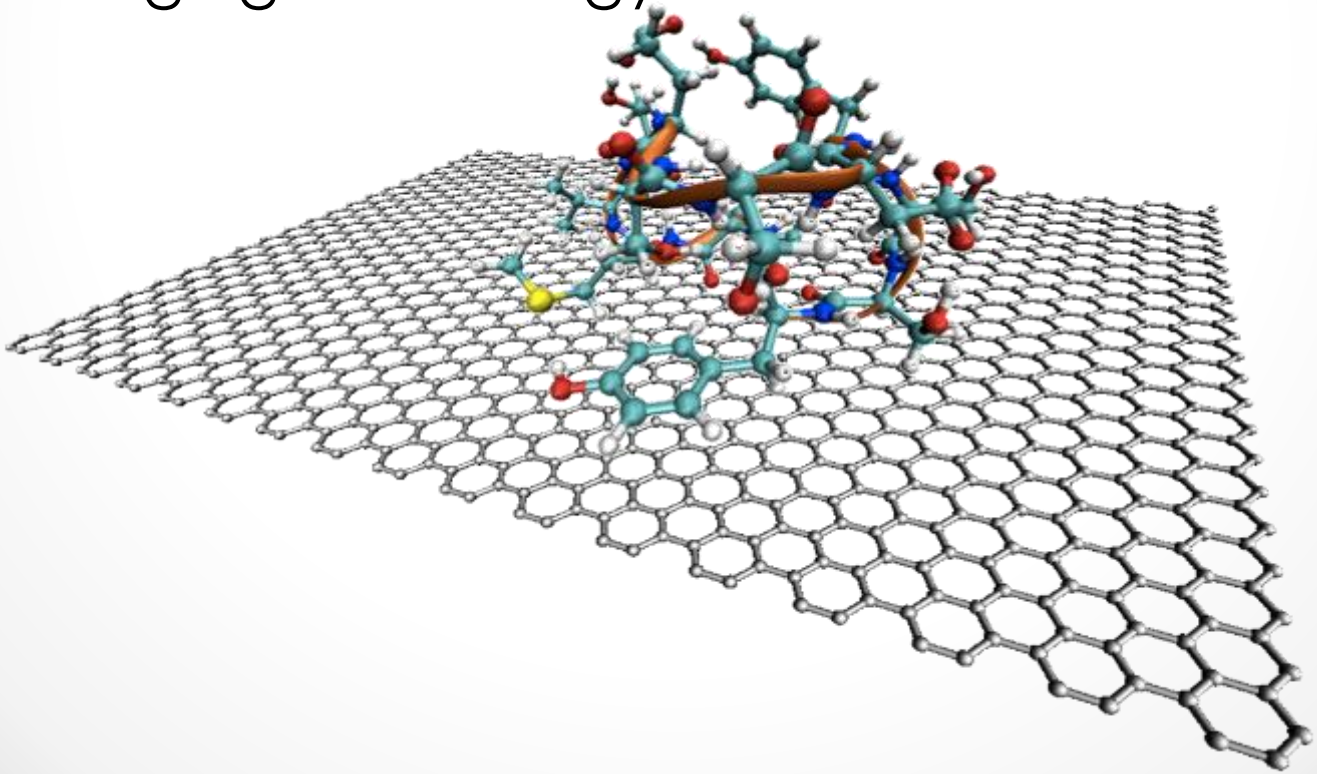




NASA Tournament Lab

Searching for Technologies

Using New Methods to Search for New and Emerging Technology to Meet NASA's Needs



Yet2.com

Provides a "matching" service that finds technologies and solutions from industry, academia, and/or individuals for a given need/challenge.

Includes a 130,000 member community and links to over 16,000 commercial entities.

Very effective (and cost effective) in searching for existing products or development efforts.

Yet2.com Challenges

Non-Invasive Intra-Cranial Pressure Measurement

"Much more than we expected! Very pleasantly surprised that this process exposed so many potential solutions with such wide breadth and depth"

"Learned that we should have revisited technologies that we rejected earlier

81 Leads Identified

63 Rejected

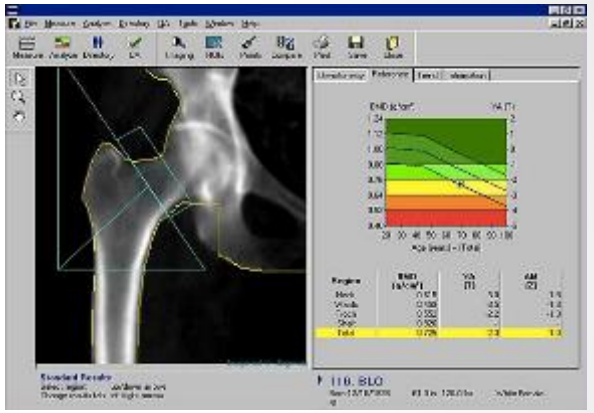
3 High Interest Solutions

5 Other Interesting Solutions

6 Potential Complementary Technologies

2 Potential Solutions

Bone Density Measurement



Monitoring of Water and Biocides

NASA's Center of Excellence for Collaborative Innovation

- The **Center of Excellence for Collaborative Innovation (CoECI)** is working across NASA and other federal agencies to *infuse crowdsourcing methods as set of available tools* for engineers and scientists on projects where applicable.
- CoECI has the contracts in place with multiple vendors and works with both users and vendors (formulation, management, performance metrics).
- NEW set of **tools in the toolkit** for NASA challenge owners
  - **NASA@Work** – NASA's Internal Crowd Challenge Platform
    - Innocentive Contract
  - **NASA Tournament Lab (NTL)**
    - NOIS Contract Vendors: Appirio/TopCoder, Common Pool, HeroX, InnoCentive, Kaggle, Luminary Labs, NineSigma, OpenIDEO, Patexia, Tongal
  - **Technology Scouting**
    - Yet.com Contract
  - **Small purchase challenge vendors**
    - GrabCAD, Freelancer, etc. via Gov't Purchase Card
- **Other NASA Crowd-Based/Challenge Programs**
  - **NASA Centennial Challenges** – Similar to X-Prize competitions
  - **SpaceApps & Citizen Science Challenges**

Challenge.gov

NASA CENTENNIAL CHALLENGES