

#BTA2013
Breakthrough
U: BTAGuest
P: andbeyond

1. Rover, sponsored by BASF

Big strategy

To get to Mt sharp - 5km high (similar to Grand Canyon)

Research is driving on the terrain

Climbs the foothills with layers (there are clay layers)

Take the terrain of mars and unpeel the history (over decades/millenia) - how has the habitability change?

Checkout capabilities at different slope levels (21 degrees) and max it out at 30 degrees

Concept of drilling

How safe is the vehicle and how does it perform

---photos will be uploaded later---

List below is related to photos:

See commonalties of earth - could be an ancient riverbed

An old supervolcano of Mars

Looking for deposit layers, to specifically look for volcanic layers (clays easily differentiated because they are water-borne)

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Rover is really like a "roving laboratory"

Has mass spectrometer, turbopumps to vacuum samples and analyze

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Analyzing mass loss on earth

Scoops up the material for analyses

PI uses a penny (coin collector) to reference the scale of what is being

photographed at different distances, etc.

Skycrane (heavy lift)

Airbags (material strength of balloons are not there)

They had to go back to the viking days

The vehicle is 1 ton (airbag does not have capacity)-- they need 4 or 5 tons for humans, even 40 tons for a human habitat

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next mission "2020"

Chemen or the sam (turbo prompts) Are analytical sifters, which would bring samples back to earth.

Robotics vs humans

Humans always operate, robots excel in harsher environments and they work on the weekends, 470 people on the science team.

Q&A

Instrument that shrinks the geology to the size of a table (lookup)

Microprocessing technology, miniaturization technology

Innovations involved in developing skycrane - computer

software for landing somewhere, rockets -- assembly

Heat shield, parachute, lowered the rockets, cut the

parachutes to land, not much hardware

Rover is limited to 100meters a day (blind driving in

stereo, 1st mode; 2nd mode they drive a way from the rocks

- it is slower)

2. Swapped Oculus Rift with makers presentation

Valley companies focusing on hardware

Jim Newton, from "Tech Shop" - valley hardware company.

Boosted boards (Sanjay) went through ycombinator and

kickstarter using Arduino, add ons for arduino

Tech shop; The other machine company - mike este - milling machine --

kickstarter

Being lean, and iterate on a product, MVP close the loop - test and iterate

Kickstarter-crowdsourcing

Some point, we have to make the product (manufacturing in China and some in the

valley) -- huge culture clash

Software is high-risk whereas hardware is risk-adverse (the opposite)

They work with a distributor, education route, teaching people to make, keeping

most things local, and sourcing stuff to china if they don't have it

Age barrier (used be 18 limit, but now is 8) - opens up the barrier, get kids

interested in using arduino and soldering. STEM

A lot of people start off with making a gift or hobby, then

a friend is interested and asks to make one for them -- commercial path

Mike uses kickstarter as advertising (can use many materials), originally used to make guitar pedal pads

Y-combinator told Sanjay to build 5 and then sell them (space constraints), it validated the price point, and how people use them, msrp is \$1200; very different from retail experience -- being transparent with problems unlike retail, people are understanding and support this customizable market

Oculus rift (sony, microsoft want to make their wn vr head device)

Building 10 of something vs building 100 (corporations will continue bc they have expertise), but these 10 may not follow traditional business models -10yo

Everything will accelerate, it will build a local talent pool and market.

Rapid turnaround manufacturers will open up around the states to compete with the turnaround time of factories like China to support kickstarter campaigns.

Look at makerbot, get out in the world despite patent/legal standpoint. When these types of companies mature they get bought out by a bigger company, like makerbot was sold to a 3d printing company.

Ways to protect ip from bigger companies copying you. Gopro (community) or pebble watch (hardware + software) Focusing on the Community + software (booster board) > sony can't compete with creating communities.

Nest is successful.

Hardware - sensitive - manufacturing processes are heavily patented.

Relationship with customers, education project to reinvent shop classes for 2000; students from shop classes don't have the skills to make things.

3. Autonomous cars (skynet)

Moderator following - X47b program

How expansive autonomy is - robots coming different shapes and functions.

john cup (general motors)

Joseph chody, North grubman - land a jet on a jet carrier
Vijay - quad rotors intact with each other

Darpa urban challenge kicked off the idea that a car can drive itself. Gm
developing a super-cruise unlike 200 sensors on a car.
Super-cruise will allow people to take their eyes off the road. How does a car know what lane its on - what sensors: 6 radars, 2 cameras, lots of processors.

Camera on the windshield determines lane-markings, looking to integrate maps and gps to this sensor. Machine learning
Imperfect driving conditions - robots (a limited) tells human to take over - data is analyzed to improve autonomous driving -- heavy on the HCI
Gm's next step might program robotCars to control lane-changes too

Uaf vs drone... Rely on gps, the ship has a gps, the plane has gps -- software calculates differentials. As they do autonomous fueling? - they will use IR sensors, PAL (precision automatic landing) system will locate carrier via gps.

Ceu operator commands vehicle (integrate operation) -- use a manned vehicle to augment the mechanical vehicle.
Carrier, after the 6th one, the operator landed; serious headway in one afternoon (incremental improvements will be determined by safety records, etc.)

Savings with robotics (you don't have to train as much or test as much)

Vijay - uav (remotely piloted vehicles not drones), no gps, but there might be sensors on board but the robot has to determine where it is in the environment (cameras and similar sensors on phone)

Payloads -- group of quads

Imagine a disaster, 100 robots to go in and sweep the

environment - map, to get actionable data; anonymity of what quads do what (cheap several hundreds to thousands so easy to experiment - crash and burn) a- in 5 years, quads will be the fraction of this cost.

James Bond videos on quad -- look up; national airspace, faa will figure out how uav will be integrated in the airspace
Social pressure of robots carrying cameras above
Who owns the space above your house -- intrusion of privacy?

Autonomy becomes thinking vs. decision-making, who is in charge? Who is responsible? In autonomous driving, the robot or the driver? Was it the road at fault, the driver, etc?
Currently, the driver is at fault -- will robots help the driver and decrease crash rates.

Q&a

- liability nightmare, can only take the driver as far as the technology
(communicate to the driver what liability does the machine have) - what it (car) can do, what it can't do?
- northrup grubman (design contingencies)
- gov't shutdown; will research be private or federal?
NR depends on the DOD, but they make private investments
- federal gov't will fund autonomy research

4. Big impact of tiny sensors Logan ward - lead partner

Paul bunje - ocean health xprize, ucla center for climate change solution,
worked with policy makers, carbon emissions impact on oceans -- specifically
acidification by using sensors. Collect actionable data in order to make
decisions.

What kind of sensors are you looking for? Sensors built and integrated into
analytical systems like (eg transfer, interpreted which allows the globe
researchers to asses and analyze data), wendy smith ocean x

prize, we don't know
\$2m, breakthrough, accuracy of ph levels, cheap, and
usable, this device solves the big data program.
pH sensor to measure oceans

Anita goel - nokia sensing, nanobiosym
Affiliated with the xPrize. Phd, md, ceo and founder
nanobiosyn; convergence of nanotech, physics, and biology
"The gene radar sensing technology" senses disease using
biomarkers in blood."
10⁻⁹ (get down to small scales - intuitive)
Quantum mechanics
Information processors, molecular motors, xeroxing the
information of life, create polymers.
To control these to read and write dna. Was honored by the
x-prize a couple of weeks ago.
Her machine reads dna/rna markers - this platform can give
you precise
information.
Hand-held device (harnessing real-time processing by
controlling environment; start, stop, move forward -- the
knobs of the environment) - embedded them into microsystems
and mims... Mobile dna/rna diagnostic system (molecular
diagnostic - PCR)
PCR - blood analysis (time and space intensity)
Current problem with hiv, is that results occur 6 weeks
later, those people move and perhaps spread disease within
6 weeks.
Her machine can give the result in real time, which will be
affordable.

Michael goldfarb - indego exoskeleton, mit, directing lab
at Vanderbilt
University in TN, his desire to help patients that are
injured (mobility),
because he focused on the patient. Semiconductor
revolution, mims (micro
mechanical electrode system - darpa) technology in the 90's
to encourage
technology/sensors on fabrication. Can sense force,
magnetic fields, etc.
References richard feynman's paper

"The decision you make can only be good as the information
that you have."

Gerald Loeb - biomimetic fingertip

Prosthetics, creator of the cochlear implants, USC,
developing machine touch,
developing a sense of touch that is more responsive than
human touch.
Convert light, and sensing input to electrical signals. Get
information about states of energies in the world (a matter
of input and analysis)

Artificial intelligence (definitely the software side),
validation of the
movements > feedback loop (embed this loop in silicon)

Example: why humans can determine certain textures. They
picked a problem, how do you judge textures? What are they
doing when they run their fingers on them.
They are determine how hard or soft a surface is, millions
of times -- then wrote the algorithm ; performance is
better than humans discriminating textures.

- solve big data problem

Accelerometer, gyroscope, temperature.

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Q&a

Manufacturing Cmos (process of fabrication of semiconductor
technology that enables complex functions)

Inertial measurement unit (imu 2mm by 2mm) will help create
artificial limbs

Will these technologies be used in broader marketplaces?

Researchers and

application developers will be using first.

Part of xprize is to accelerate the development of building
the ph sensor in oceans.

Before sandy hit, they were able to move ships out to the
ocean determined by the data of waves (buoy sensors)

-pH sensing is very difficult to achieve...

Anita's technology would be disturbing the bigger medical
industries. Partner with the developed and the developing
world. It would take a billion dollar investment from a
company to build roads to service care. Developing world is
the early adopter for these technologies.

Health is one implication. Biofuels using nanotechnology.

Nature is at the

convergence of these silos.

"Abundance"

Book title Abundance

Peter diamandis is the founder of x-prize

Peter Diamandis is the author. News media is in the business of feeding us negative news vs. realistic news.

Look at he rate of good news getting better. Steven Pinker at Harvard wrote that we are getting better - people have to solve their problems.

People that solve problems are the innovators.

3 billion new people are coming online in the next seven years.

Eg go online and you buy a dress from Bangladesh, the next morning your closet just printed out the dress.

They target certain places where things are not possible. That mindset really matters or where there is a monopoly-- this is where they target.

Area of ocean health. We could create businesses to get lots of data out of the ocean.

Rationality of creating X Prize is to create a new economy--change the status quo - make everything faster, bigger.

\$2 million prize - (reason why there were no innovations in oil cleanup is because thats how people made their money, paid by the hour)

Richard Branson space travel

Wendy Schmidt oil clean up spill

Singularity university

Apollo was amazing but won't happen again because of politics. The only way to open up space research is through economics.

Constantine Levantine? Russian astronomers

Xprize focus on Finding--Asteroids rich in dihydrogenic oxide (basically water), up to 20% water, remove the water from the asteroid. For space vehicles.

Going after - Refueling systems orbiting space.

Platinum elements- as asteroids smack the earth, mining platinum.

1/2km asteroid is worth \$2-3 trillion dollars, is valuable because it has hydrogen, carbon, etc?

His heroes:

Arthur c Clark

Gerard K O'neil (space)

Lindberg was a hero (audacity of what he pulled off)

Are you passionate to not give up when everyone else has given up.

Ray Kurzweil - we have 300 million pattern recognizers in our head. We need to free them up (use a calculator, spell, outlook memorizing contacts) -- imagination/creativity, getting kids to be problem solvers

What you can't measure, you can't improve.

Q&a

X-prize is an innovation tool

There are a universe of problems.

They are trying to extend-- objectives are clear for graduate students to solve.

-ageing, is possible - he watched a show on genomes, a collection of a hundred trillion cells. Over time, your cells to fall apart. The question is can we fix them -- mechanic genome solution.

\$53 trillion in old people's bank accounts.

Zero-sum game.

One planet living (comes from Rome) - notion that we are inefficient how we use stuff; eg we are using oil, but we are also find new petro-chemicals

Scarcity is a mindset (debeers scarcity) manufacture a perfect diamond at \$5 bucks a carat.

Opticogenetics and cortical implants?

Timeline is 20-30 years. Everything is fundamentally changing (education, intellectual property, technology)

Elon Musk

Here is an image from Kevin Werbach's Gamification course on inducement prizes, including XPrize:

