The Future of Health and Medicine: Where Can Technology Take Us?

DANIEL KRAFT, MD
Faculty Chair for Medicine, Singularity University
Executive Director, Exponential Medicine

@Daniel_Kraft
Daniel@SingularityU.org
About Daniel Kraft M.D.

Daniel Kraft is a Stanford and Harvard trained physician-scientist, inventor, entrepreneur and innovator.

Dr. Kraft has over 20 years of experience in clinical practice, biomedical research and healthcare innovation. Daniel chairs the Medicine track for Singularity University and is Executive Director for FutureMed, a program which explores convergent, exponentially developing technologies and their potential in biomedicine and healthcare.

Following undergraduate degrees at Brown and medical school at Stanford, Dr. Kraft was board certified in the Harvard combined Internal Medicine and Pediatrics residency program at the Massachusetts General and Boston Children’s Hospital, and completed Stanford fellowships in hematology/oncology & bone marrow transplantation, and extensive research in stem cell biology and regenerative medicine. He has been published in multiple scientific publications, including Nature and Science. He has patented medical device, immunology and stem cell related products through faculty positions with Stanford University School of Medicine and as clinical faculty for the pediatric bone marrow transplantation service at UCSF.

Dr. Kraft recently founded IntellijMedicine, focused on enabling connected, data driven, and integrated personalized medicine. He is also the inventor of the MarrowMiner, an FDA approved device for the minimally invasive harvest of bone marrow, and founded RegenMed Systems, a company developing technologies to enable adult stem cell based regenerative therapies.

Daniel is an avid pilot and serves in the California Air National guard as an officer and flight surgeon with an F-16 fighter Squadron. He has conducted research on aerospace medicine that was published with NASA, with whom he was a finalist for astronaut selection.
For a short online TEDTalk version of the Keynote to share with colleagues click on this link:

http://www.ted.com/talks/daniel_kraft_medicine_s_future.html
The **Future of Health and Medicine**

Exponentially...
- Faster
- Smarter
- Smaller
- Cheaper
- **Better**
Has the Practice of Medicine Changed much in over 100 years?

Daniel Kraft MD
Silo’d Medicine
Old definitions and Divisions

Ophthalmology

Oncology

Hematology

Urology

Neurology

Plastics

Otolaryngology

Radiology

Gastroenterology

Cardiology

Hepatology

Dermatology

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RE-IMAGINATION

THEN...
Dedicated Camera / Manually Transfer Digital Files / Develop Films

NOW...
(Instagram / Camera+ / Hipstamatic...)
Always With You Camera (Smartphone) / Instant Digital Effects / Share / Sync / Discover

THEN...

NOW...
(Amazon Kindle / Apple iBooks)
RE-IMAGINATION

THEN

NOW
Linear → Exponential

1996
Market cap of $28B
Revenue ~ $16B
Employees 140,000

2012
Market cap <$100M
Revenue ~ $6B
Employees 17,000

Facebook Acquires Instagram for $1B

Slide courtesy Peter Diamandis
Mitochondrial DNA Haplotype K1a1b1a

Daniel Kraft MD
Leveraging Cross-Disciplinary Exponentially Growing Technologies

- Low-Cost Gene Analysis
- Computational Bio-Informatics
- High resolution Imaging
- Artificial Intelligence
- Internet Connectivity
- Mobile
- Social Networking
- Online T-Shirt Ordering

Daniel Kraft MD
EXPONENTIAL GROWTH &
THE LAW OF ACCELERATING RETURNS

Credit: Ray Kurzweil and KurzweilAI.net
EXPONENTIAL GROWTH &
THE LAW OF ACCELERATING RETURNS

Credit: Ray Kurzweil and KurzweilAI.net
CONVERGENCE of Many Fast Moving Technologies

- Mobile
- Privacy & Security
- Robotics
- Social Networking
- Networks & Computing
- Computer Science
- Big Data
- Devices
- Apps
- Sensors
- 3D Printing
- I.T.
- Synthetic Biology
- Materials Science
- Artificial Intelligence
- Nanotech
- Engagement
- Gaming
- Telecom
**Major Challenges in Healthcare**

<table>
<thead>
<tr>
<th>Cost</th>
<th>Demographics</th>
<th>Access</th>
<th>Variation in Clinical Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inefficient Use of Information</td>
<td>Fragmented Care Versus Integrated Care</td>
<td>Duplication, Defensive Medicine &amp; Waste</td>
<td>Protracted Adoption of Innovation</td>
</tr>
</tbody>
</table>

- Inefficient Use of Information
- Fragmented Care Versus Integrated Care
- Duplication, Defensive Medicine & Waste
- Protracted Adoption of Innovation
TRENDS: Moving to the Left
Benefits of Proactive Mitigation of Disease Risk

<table>
<thead>
<tr>
<th>Health Status</th>
<th>20% of Population Generate 80% of the Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy / Low Risk</td>
<td>Chronic Disease Progression</td>
</tr>
<tr>
<td>At-Risk</td>
<td>End of Life Care</td>
</tr>
<tr>
<td>High Risk</td>
<td>chronic disease early stage</td>
</tr>
<tr>
<td></td>
<td>acute disease</td>
</tr>
</tbody>
</table>

20% of Population Generate 80% of the Costs

Healthy / Low Risk
At-Risk
High Risk

Value

Cost

Slide Concept: George Poste
New Players & Accelerators
Singularity University’s mission is to educate, inspire and empower leaders to apply exponential technologies to address humanity’s grand challenges.
The Executive Program (EP) enables corporate innovators to keep pace with accelerating change and understand how emerging technologies will impact their industry. Participants learn to recognize the growth opportunities and disruptive influences of exponentially growing technologies and how key breakthroughs in various technology areas will impact their careers, companies, and industries in the coming years. The EP is offered as a 7-day workshop or custom program for corporate groups.

**Understand and Leverage Fast Moving Technologies**

On the NASA Ames Research Park Campus in Silicon Valley

- 10 week **Summer Graduate Studies Program**
- 1 week **Executive Programs**
- Custom 1-3 Day Corporate programs

SingularityU.org
Exponential Medicine is a unique 4 day program bringing together thought leaders and innovators focused on understanding and leveraging fast moving technologies in Healthcare & BioMedicine

ExponentialMedicine.com
Come Shape the Future of Medicine
Join us in San Diego, CA November 9-12

"The ideas, the exchanges, the interaction with the people is just extraordinary."
- Dr. Marty Kohn, Chief Medical Scientist, IBM Watson

"I stay for the entire event because what happens on the stage is truly remarkable."
- John Mattison, CMIO, Kaiser Permanente
Next Exponential Medicine Nov 9-11th 2014 Hotel Del Coronado, San Diego

Apply Now to Participate: Spaces Limited ExponentialMedicine.com
Mobile Heath

WORLD POPULATION
6,852,472,823

MOBILE USERS
5,300,000,000
Health & Medical Apps

Daniel Kraft MD
iBGStar

Glucose Meter integrated with iPhone

Trend Chart
- Plots glucose readings from the Scorecards over time.

Logbook
- At-a-glance view of glucose readings from Scorecards.

Statistics
- Displays averages, standard deviation, and total tests for glucose readings from Scorecards.

Alerts
- Provides hypo and hyper alerts when glucose readings are out of the normal range.
Cluster-Randomized Trial of a Mobile Phone Personalized Behavioral Intervention for Blood Glucose Control

Charlene C. Quinn, RN, PhD
Michelle D. Shardell, PhD
Michael L. Terrin, MD, MPH

Erik A. Barr, BA
Shoshana H. Ballew, BA
Ann L. Gruber-Baldini, PhD

OBJECTIVE—To test whether adding mobile application coaching and patient/provider web portals to community primary care compared with standard diabetes management would reduce glycated hemoglobin levels in patients with type 2 diabetes.

RESEARCH DESIGN AND METHODS—A cluster-randomized clinical trial, the Mobile Diabetes Intervention Study, randomly assigned 26 primary care practices to one of three stepped treatment groups or a control group (usual care). A total of 163 patients were enrolled and included in analysis. The primary outcome was change in glycated hemoglobin levels over a 1-year treatment period. Secondary outcomes were changes in patient-reported diabetes symptoms, diabetes distress, depression, and other clinical (blood pressure) and laboratory (lipid) values. Maximal treatment was a mobile- and web-based self-management patient coaching system and provider decision support. Patients received automated, real-time educational and behavioral messaging in response to individually analyzed blood glucose values, diabetes medications, and lifestyle behaviors communicated by mobile phone. Providers received quarterly reports summarizing patient’s glycemic control, diabetes medication management, lifestyle behaviors, and evidence-based treatment options.

RESULTS—The mean declines in glycated hemoglobin were 1.9% in the maximal treatment group and 0.7% in the usual care group, a difference of 1.2% (P < 0.001) over 12 months. Appreciable differences were not observed between groups for patient-reported diabetes distress, depression, diabetes symptoms, or blood pressure and lipid levels (all P > 0.05).

CONCLUSIONS—The combination of behavioral mobile coaching with blood glucose data, lifestyle behaviors, and patient self-management data individually analyzed and presented with evidence-based guidelines to providers substantially reduced glycated hemoglobin levels over 1 year.

Diabetes Care 34:1934–1942, 2011

Interventions to assist patients and PCPs (12–14). The Mobile Diabetes Intervention Study, reported here, evaluated a diabetes-coaching system, using mobile phones and patient/provider portals for patient-specific treatment and communication. The hypothesis tested was that mobile telephone feedback on self-management of blood glucose results and lifestyle and clinical management offered to patients with type 2 diabetes and their providers can reduce glycated hemoglobin levels over 1 year.

RESEARCH DESIGN AND METHODS

Eligibility and study design
The Mobile Diabetes Intervention Study was a cluster-randomized clinical trial conducted in primary care practices in four distinct Maryland areas. Eligible practices included groups of at least three physicians without academic affiliation who provided diabetes care to at least 10% of their patients and were identified from a list of primary care practices in the study geographic areas. A detailed description of the study design was reported previously (13). Group assignment was concealed until a practice agreed to par-
Exponentially Faster Smaller Cheaper Better
FASTER IMAGING: SPEED, RESOLUTION, RECONSTRUCTION...
Data Explosion
One Data Set, One Patient

- **Yesterday:** 100 slices $512^2$ pixels **50MB** or 50 books
- **Today:** 2400 slices $512^2$ pixels **20GB** or 800 books
- **Tomorrow** $1024^3$ voxels 100Hz, **1 Terrabyte** or 800,000 books

Daniel Kraft MD
VIRTUAL ANGIOGRAM
CONVERGENCE

MR Guided Focused Ultrasound for Image Guided Robotic Acoustic Surgery (MRgFUS)
PARADIGM SHIFT: GOING DIGITAL...

Biomedicine + Information Technology + Wireless

mHealth: Digital - Mobile- Healthcare

Concept illustration from yankodesign
The AliveCor Heart Monitor is cleared by the FDA for sale in the U.S. to licensed medical professionals and prescribed patients to record, display, store, and transfer single-channel electrocardiogram (ECG) rhythms.
EyeNetra TEST2CONNECT platform for eye care

mobile phone eye diagnostics
actionable data mobile app
care providers via wireless network
Medical Records Going Electronic
A $35 Tablet...
Exponentially...
Faster
Smaller
Cheaper
Smarter
“The complexity of modern medicine exceeds the capacity of the unaided human mind.”  David Eddy, MD
Artificial Intelligence...
Imagine when the Power of ‘Watson’ is Available as an AI Physician

IA... Intelligence Augmentation
“In Brazil and India, machines are already starting to do primary care, because there’s no labor to do it. They may be better than doctors. Mathematically, they will follow evidence—and they’re much more likely to be right.”
A.I. Machine Learning Based Apps: for helping diagnose dermatology issue (i.e. Melanoma)
Tricorder Team: Scanadu (started at Futuremed 2011)

- Infrared Thermometer
- Photoplethysmograph (PPG Sensor)
- Electrocardiograph (ECG Sensor)
  - Negative Electrode
  - Positive Electrode
- Piezo-ceramic Stethoscope

Diamond Concept Device

Tricorder Team: Scanadu (started at Futuremed 2011)

- Infrared Thermometer
- Photoplethysmograph (PPG Sensor)
- Electrocardiograph (ECG Sensor)
  - Negative Electrode
  - Positive Electrode
- Piezo-ceramic Stethoscope
Smart Point of Care Testing

Influenza Testing

Scanaflo - Urinalysis
Scanadu Scout, the first Medical Tricorder

A scanner packed with sensors designed to read your vital signs and send them wirelessly to your smartphone in a few seconds, any time, anywhere.

Technology – Mountain View, California, United States

Scanadu Scout™ - The first medical Tricorder

$1,176,754

Raised of $100,000 Goal

27 days left

Flexible Funding campaign

CONTRIBUTE NOW

Select a Perk for your contribution
TeleMedicine & TelePharmacy
Expanding Access with Virtual Visits

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Using Mobile Devices to Enable Exams

SmartphonePhysical.org

- **Body analysis** using an iHealth Scale.
- Blood pressure reading using a **Withings BP Monitor**.
- Oxygen saturation/pulse **Masimo iSpO2** placed on the finger.
- Visual acuity via an **EyeNetra** phone case.

- Optic disc visualization using a **Welch Allyn iExaminer**
- Ear drum visualization with a **CellScope** phone case.
- Lung function using a **SpiroSmart Spirometer** app

- Heart electrophysiology using the **AliveCor Heart Monitor**.
- Body sounds: A **digital stethoscope** from ThinkLabs
- Carotid artery visualization using a **Mobisante probe**.
TeleMedicine & TelePharmacy
Expanding Access with Virtual Visits

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VIRTUAL VISITS & TELEMEDICINE via Tables/SmartPhones

AmericanWell.com

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TelePresence: TeleRobotics
Low Cost = $1,500 and Modular Design

fellowrobots.com
SingularityU.org/labs
TelePresence MedSensation Glove:
2012 Singularity University Team Project led by Harvard Medical Student now funded and being developed

- Pressure
- Vibration
- Ultrasound
- Microphone
- Accelerometer
- Flow Sensor
- Thermometer
- Buzzer/Speaker
- Electronic Palpation
- Galvanic skin conductance
- Camera
- Heat Infrared Camera

www.augmilabs.com/
VIRTUAL VISITS & TELEMEDICINE
The Digital Check Up

WIRELESS HOME MONITORING

HEALTHWARE

Daniel Kraft MD
WheezoMeter...
Connected Blood Pressure Cuff

Test Result
Daniel

- **SYS (mmHg)**: 118
- **DIA (mmHg)**: 77
- **PULSE (beats/min)**: 60

History

<table>
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<tr>
<th>Date</th>
<th>Time</th>
<th>Values</th>
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<tbody>
<tr>
<td>10-01-2011</td>
<td>10:53</td>
<td>118/77</td>
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<tr>
<td>10-01-2011</td>
<td>10:50</td>
<td>120/81</td>
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<tr>
<td>10-01-2011</td>
<td>10:55</td>
<td>121/86</td>
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<tr>
<td>10-01-2011</td>
<td>10:53</td>
<td>119/74</td>
</tr>
</tbody>
</table>

Classify

- 0: 0%
- 1: 20%
- 2: 40%
- 3: 40%

Daniel Kraft MD
Prescribing Apps...
Wearable Computing / Body Computing
Today

Quantitative storytelling

Slide courtesy Rachel Kalmar
Commercial health sensors
1. Pocketfinder personal GPS locator
2. Tagg GPS dog tracker
3. Fitbit One and Zip physical activity sensors
4. iPING personal putting coach and app
5. Wahoo Fitness bluetooth heart rate strap
6. Scosche Rhythm heart rate monitor armband
7. Jawbone Up physical activity and sleep sensor
8. Pear Training heart rate monitor and training app
9. Adidas MiCoach bluetooth heart rate monitor
10. Adidas MiCoach Speed Cell activity sensor
11. Nike+ sports sensor
12. Nike+ Fuelband physical activity sensor
13. Withings baby monitor
14. Philips in.Sight wireless baby monitor
15. IZON Wireless Camera -
16. Philips in.Sight wireless camera
17. Lark sleep sensor wristband
18. Lark Life physical activity and sleep sensor
19. iBGStar blood glucose sensor
20. iHealth wireless blood pressure wrist monitor
21. Withings blood pressure monitor
22. Withings wireless scale
Sensor Evolution

Sensors 1.0
ability to measure and record signal

Sensors 2.0
sensor integration with web; sharing and accessing data

Sensors 3.0
passive data gathering, aggregation and meaningful interpretation
Smart Integration

Daniel Kraft MD
Augmented Reality for Behavior Change
### Before and after: Wired magazine redesigns the lab report

**The topic at hand:**

The standard blood workup takes more than 10 measurements and can go on for more than four pages. All sorts of things can turn up in the report. The challenge for physicians and nurses alike is to find the signal within the noise.

**Key Points:**

- **Make it clear:** Doctors presumably know what high or low numbers might mean. But they need to reason out to augment the data with qualitative interpretations for all results above and below “normal.” Are your test results a little too or a bit too high? No judgment.
- **Make it colorful:** The aesthetics of type, print, and fonts can be one of the most effective tools in information design. We adopt a familiar greenish red palette to make it easier to identify what means immediate action.
- **Make it relevant:** Information is salient without explanation and a call to action. So we augment the patient’s results with relevant data risks and offer guidance about what the patient might do to improve their health.
- **Make it simple:** The advent of “one-page reports” has made it possible to fit all the data on one page. This original format is a testament to the need for simplicity and efficiency.
- **Make it easy:** Sorting various “reference ranges” on the right of the page makes it easy to filter the results. By the time you finish reading, you’re ready to turn back and forth as you evaluate the numbers.

#### Your Test Results

<table>
<thead>
<tr>
<th>Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>Value 1</td>
</tr>
<tr>
<td>Test 2</td>
<td>Value 2</td>
</tr>
<tr>
<td>Test 3</td>
<td>Value 3</td>
</tr>
</tbody>
</table>

#### WHAT DO YOUR RESULTS MEAN?

- **CD4 Count:** This is a measure of the number of CD4+ T cells, which are a type of white blood cell. A low CD4 count is often associated with a higher risk of developing complications from HIV/AIDS.
- **Liver Function Tests:** These tests help doctors assess the function of the liver. Abnormal results could indicate liver damage or disease.

#### WHAT CAN YOU DO?

- **Improve Your Health:** While your numbers look good, maintaining a healthy lifestyle is crucial to keeping your health in check.

From Thomas Goetz WIRED MAGAZINE and 1+1Labs
ROBOTICS / ENABLING THE SURGEON
ROBOTIC SURGERY

- Augmented Reality
- Decision Support
- Remote Mentoring
- Scarless surgery
BRAIN-COMPUTER INTERFACE (B.C.I.)

- Chip on Motor Cortex
- Clinical trials underway in quadraplegics
Consumer BCI Devices

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INTEGRATION
Brain to Bionics

LUKE Arm

Dean Kamen

Daniel Kraft MD
“Exoskeletons Will Be the Eyeglasses of the 21st Century”
Discover Magazine January 2012

“Exoskeletons Will Replace the Wheelchair”
Bigthink.com - January 2012
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FANTASTIC VOYAGE

iPill.... Diagnosis and Rx

Battery
Fluid pump
Drug reservoir

pH sensor
Microprocessor, thermometer and radio transmitter
Dispensing hole

GENERAL
SUSPECTED BARRETT'S
ESOPHAGITIS
VARICES
'I've dreamed in colour for the first time in 20 years': Blind British man can see again after first successful implant of 'bionic' eye microchips

May 2012
Google Glass to stream Internet straight to eyeballs...

Behind the Google Goggles, Virtual Reality

By NICK BILTON
Published: February 22, 2012

Daniel Kraft MD
Google Glass Healthcare Applications
DESIGN THINKING
THINK DIFFERENT
Lessons from AVIATION applied to HEALTHCARE
Cockpits: Analog to Digital
JOHNS HOPKINS COLLABORATES WITH LOCKHEED MARTIN TO BUILD NEXT-GENERATION INTENSIVE CARE UNIT

Systems Integration, Virtual Simulation to Guide Study of Complex Health Care Setting
CheckLists
Simulation
Air Traffic Control
LAB ON A CHIP

Quake lab, Stanford
Digital Checkup from Anywhere...
Exponentially Faster
Smaller
Cheaper
Better
Human Whole Genome Sequencing & Functional Interpretation

Includes human whole genome sequencing (30X), annotation, and comparative analysis for only $4,998 per genome (minimum 10 genomes)

While quantities last.

Knome delivers your data on a secure hard drive. Just click to access raw reads, queriable annotated genomes, candidate shortlists, and powerful software tools.

TIME

Want to Know My Future?

New genetic tests can point to risks—but not always a cure

BY BONNIE ROCHMAN

Daniel Kraft MD
$100 Genome... by 2015?
## PharmacoGenomics

### Your Genetic Data

<table>
<thead>
<tr>
<th>Who</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Substantially increased warfarin sensitivity. May require greatly decreased warfarin dose.</td>
</tr>
<tr>
<td></td>
<td>Increased warfarin sensitivity. May require decreased warfarin dose.</td>
</tr>
<tr>
<td>Greg Mendel (Dad)</td>
<td>Slightly increased warfarin sensitivity. May require decreased warfarin dose.</td>
</tr>
<tr>
<td><strong>Daniel Kraft</strong></td>
<td><strong>Typical warfarin sensitivity.</strong></td>
</tr>
<tr>
<td>Lilly Mendel (Mom)</td>
<td></td>
</tr>
</tbody>
</table>

Show genotypes for: Daniel Kraft

<table>
<thead>
<tr>
<th>SNP</th>
<th>Genotype</th>
<th>Combination</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs1799853</td>
<td>CC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rs1057910</td>
<td>AA</td>
<td>CYP2C9 *1/*1, VKORC1 -1639/3673 GG</td>
<td>Typical warfarin sensitivity.</td>
</tr>
<tr>
<td>rs9923231</td>
<td>CC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Personalized
What is the best combination of services for this individual?

Predictive
What negative health trends are likely to develop in our communities?

Preventive
What actions can we take now to prevent a negative episode?

Proactive
Who is at risk? Who needs to be informed?

Participatory

P4 Medicine
Predictive
Preventive
Personalized
Participatory

Daniel Kraft MD
Participatory:

The Engaged Empowered Patient & Community
US Healthcare Costs

Are 2.4 Trillion Annually

Costs from Genetics

Costs from Behavior
The Social Graph

The Hidden Network
Exponentially...
Faster
Smarter
Smaller
Cheaper
Better
Adaptive Clinical Trials Design
Faster, Cheaper, Smarter...

I-SPY 2: An Adaptive Breast Cancer Trial Design in the Setting of Neoadjuvant Chemotherapy

Translational Medicine, Clinical Pharmacology & Therapeutics, 86, 1, 97–100, 2009.
3D Printing / Digital Fabrication

Daniel Kraft MD
3D Printed Patient Specific Prosthetics
How a 3D printer gave a man his face - and his life - back

Richard Gray April 01, 2013

Eric Moger has a partial prosthetic face after suffering from face cancer. Photo: Supplied: Geoff Pugh
3D printed ear binds biology with electronics

PRINCETON (US) — Using 3D printing tools, scientists have created a functional ear that can “hear” radio frequencies far beyond the range of normal human capability.

Princeton scientists used 3D printing to create a “bionic ear” made up of a coil antenna and cartilage, demonstrating an efficient method of merging electronics with tissue. (Credit: Frank Wojciechowski)
TARGETED MOLECULAR & GENETIC THERAPY

The Economist
Lung Cancer = 1000s of sub types
PERSONALIZED ONCOLOGY
REGENERATIVE MEDICINE
Repair, Replace & Regenerate
Aged, Diseased & Damaged Tissues

Pluripotent Stem Cells Differentiate into many Cell Types
Add different growth factors

Muscle
Blood
Nerve
INDUCED PLURIPOTENT STEM CELLS (iPS)

Figure: Kit Rudolfo
StemBook.org
3D Organ Printing
Patient care, measurements are mostly **EPISODIC & REACTIVE** ...
FUTURE: HEALTH DATA

... when they need to be CONTINUOUS & PROACTIVE
Innovation Perspective

- Identify, Predict and Track Exponentials
- Look for Convergence & New Synergies
- Disruptive Technologies Emergence
- Leverage and Connect
- Plan for the 2, 4, 8, 16, 32x

You are here...
Innovation Perspective

- Identify, Predict and Track Exponentials
- Look for Convergence & New Synergies
- Disruptive Technologies Emergence
- Leverage and Connect
- Plan for the 2, 4, 8, 16, 32x

Go to where the puck is heading...
FAST MOVING, CONVERGENT TECHNOLOGIES

- EMPOWERING THE PATIENT
- ENABLING THE CLINICIAN
- IMPROVE OUTCOMES, CLINICAL TRIALS
- COMPLIANCE, COMMUNICATION, FEEDBACK
- ENHANCING WELLNESS & IMPROVE Rx
- RE-IMAGINE PHARMA & REGULATORY
STAGE ZERO MEDICINE

Early Stage Disease Detection: 90% survive
Late Stage Disease Detection: 10% survive

The Future Is Already Here... Its Just Not Evenly Distributed...
William Gibson

The Best Way to Predict the Future... Is to Create It...
Alan Kay
Thanks

Contact Me: Daniel.Kraft@SingularityU.org

Follow me on Twitter: @daniel_kraft

ExponentialMedicine.com
SingularityU.org
Resources

• Exponential Medicine Faculty Videos:
  http://exponential.singularityu.org/medicine/videos/

• ExponentialMed.com FlipBoard

• SingularityHub.com

• MedGadget.com

• SingularityU.org

• iMedicalApps.com