

AUSTIN FORUM

ON TECHNOLOGY & SOCIETY

Connect. Collaborate. Contribute.™



Health Tech: How Technology, and Austin, Will Help You Live Longer & Better

*February 4, 2020
Austin Central Library*



Dr. Jordan Amadio
Ascension Seton



Scott Collins, Ph.D.
BioAustin

Welcome!

Our Annual Partners Make This Possible!

arm



Welcome, Valkyrie Intelligence!



Charlie Burgoyne
CEO and Founder



Teri Kelly
Chief Revenue Officer



VALKYRIE
APPLIED SCIENCE & STRATEGY CONSULTING

Thank you, Rhonda! Welcome, Eric!



Rhonda Dirvin
Sr. Director of Embedded, IOT



Eric Hennenhoefer
VP of Research

arm

We Are Passionate About Technology Influence & Impact on Society



Connect! Collaborate! Contribute!

Austin Forum Events: Expert Presentations to Inform & Inspire

We bring leaders, thinkers, builders, creators, and learners together to [connect, collaborate, contribute!](#)



5:15-6:15

early networking in lobby

6:15-7:45

presentation and Q&A

7:45-8:15

networking and discussion

8:15-?

discussion, drinks, and pizza at *Trifecta on 3rd*



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ON TECHNOLOGY & SOCIETY

@AustinForum
#healthtechAF

Join Us for Great Events in 2020!



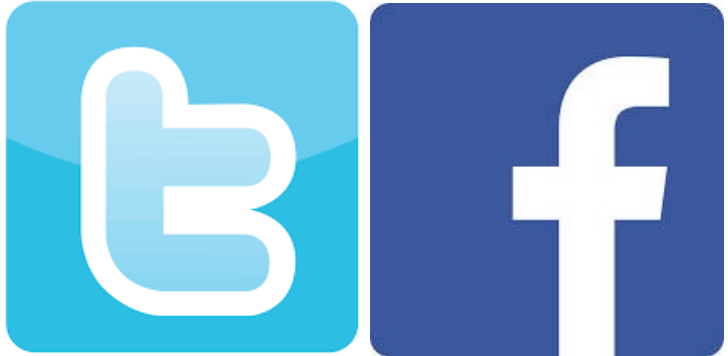
Coming up this year:

- **Tech & Art**
- **Creating tech startups**
- **Tech & food**
- **Gaming**
- **AI**
- **Military/Defense Tech**
- **Smart Cities**
- **Quantum Computing**
- **and more!**

More Great Content: Austin Forum Upload & Austin Forum Update!



<https://medium.com/@AustinForum>



Help us share the Austin Forum goodness with everyone!

Remember to tweet!
#healthtechAF @AustinForum

Questions for speakers?
<https://www.sli.do> in browser
or download the **sli.do** app!
Use event code **#healthtechAF**



SXSW[®]

**Use sli.do
to submit questions
and maybe win a
SXSW badge!**

To win, you must :

1. Post your **questions** in **sli.do** using event code **#healthtechAF** , and providing your name
2. Be registered and be present
3. Follow Austin Forum on some social media (Facebook, Twitter, etc.)

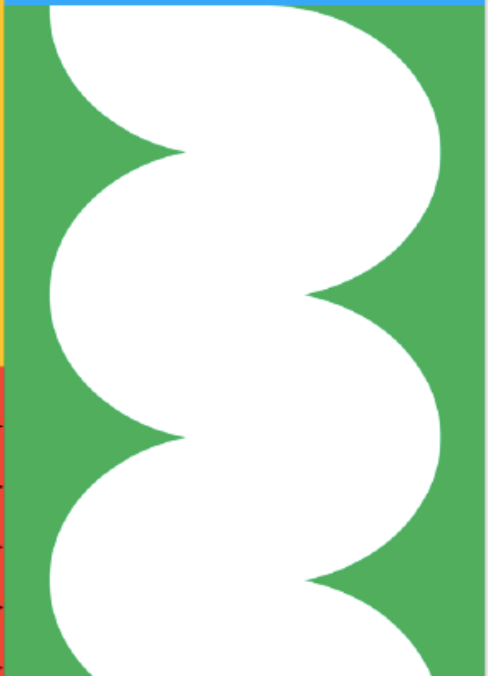
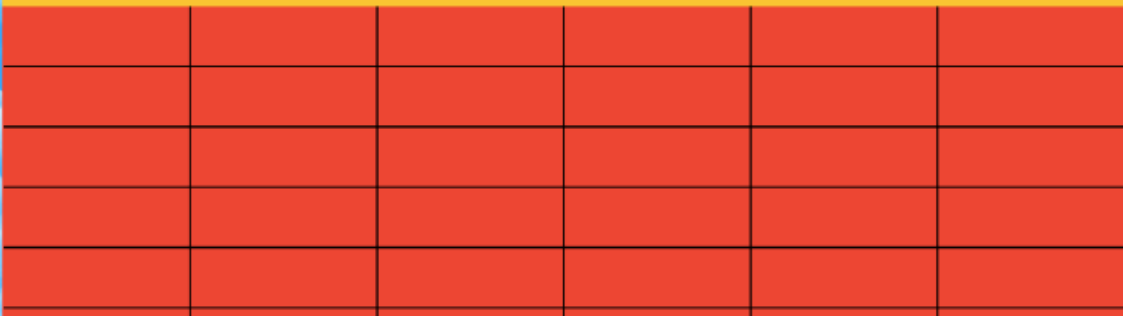
SXSW

2020



AUSTIN •

MARCH 13-22





Health & MedTech

March 13 – 17 JW Marriott

Dana L. Abramovitz

Conference Programming Consultant

dana@sxsw.com



Health & MedTech

March 13 – 17 JW Marriott

Session Highlights:

- Can Health Care Ever Be Simple in this Country? *Mar 13 11am*
- Healing Health Care: 2020 and Beyond *Mar 14 9:30am*
- Data-Driven Strategies for Advancing Health Equity *Mar 15 12:30pm*
- Patients Calling the Shots: Dementia Friendly Care *Mar 15 3:30pm*
- Sustainable Healthcare: Transforming an Industry *Mar 14 11am*
- Electricity as Medicine: A Future Without Pills? *Mar 15 – 5pm*



Health & MedTech

Important Dates

Mar 13 – 17 – Health & MedTech at the JW Marriott

Feb 11 – Next Big SXSW Keynote & Featured Speaker Announcement

Feb 14 – Next Registration Deadline

Mar 14-15 – SXSW Wellness Expo at the Palmer Events Center **FREE**

Volunteer information at volunteer.sxsw.com

Email me at dana@sxsw.com

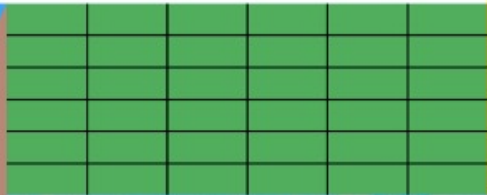
SXSW 



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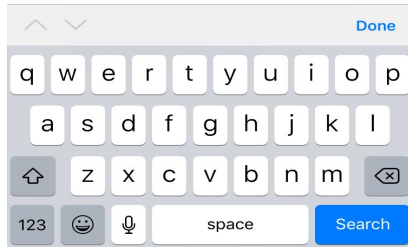
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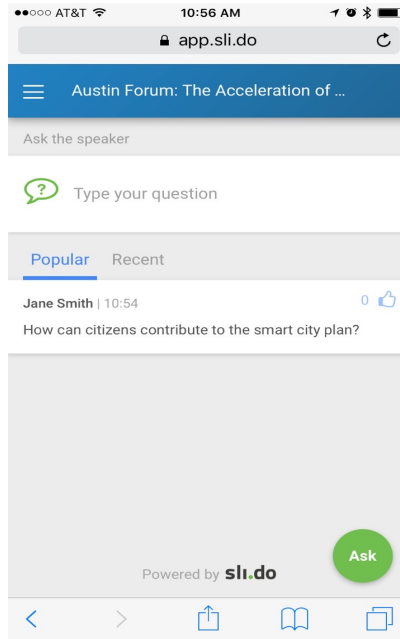
AUSTIN

• MARCH 13-22

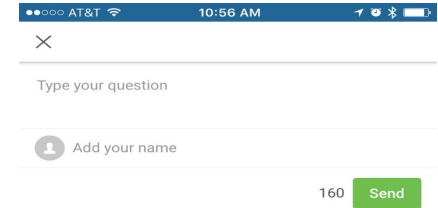
Using sli.do from your smartphone is easy!



Enter hashtag **#healthtechAF**



Type your question/comment



Add your name

And now, our featured presentation...

Please:

- ✓ Silence your devices
- ✓ Hold conversations until the networking session
- ✓ Share key points via Twitter (**#healthtechAF @AustinForum**)
- ✓ Share questions via Sli.do (**#healthtechAF, and *your name***)
- ✓ Learn, think, enjoy!



Health Tech: How Technology, and Austin, Will Help You Live Longer & Better

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Early Medical Technology

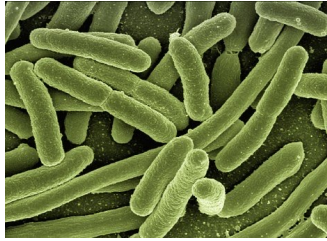


Prevent Brokenness



Why do we break down?

- **Injury/Trauma** “Between Sept. 5 and Nov. 30, Austin Public Health found that around 200 people suffered scooter-related injuries.” -KVUE



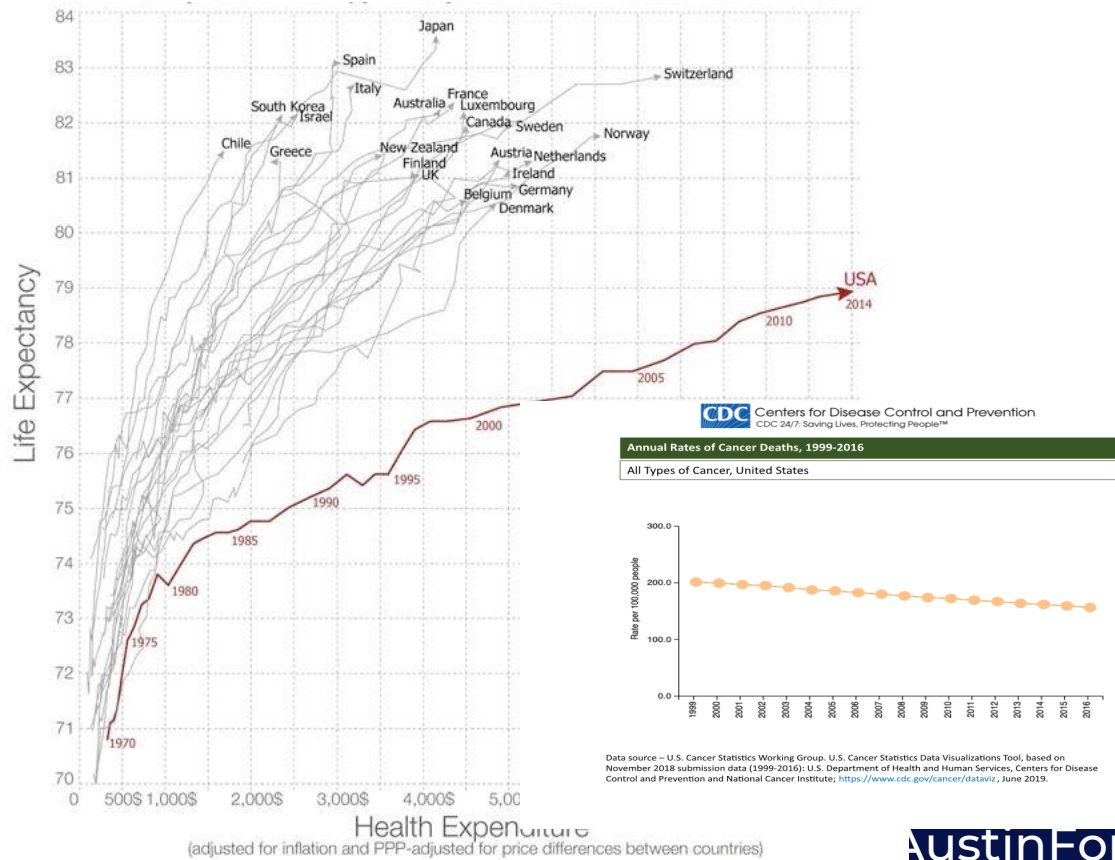
- **Disease**



- **Genetics**

How are we doing?

- Heart Disease
- Cancer
- Life Expectancy
- Organ Donations



Technology Types

- Medical Devices
- Pharmacologic / Drugs
- Procedural Technologies
- Replacement Body Parts
- Data / Analytics (AI/ML)

Medical Devices

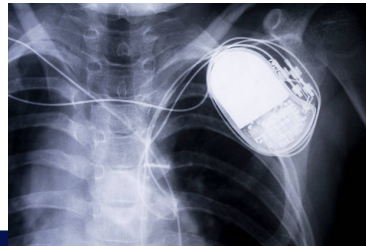
- Class I



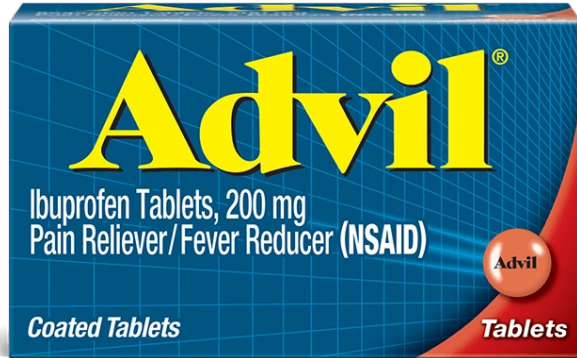
- Class 2



- Class 3

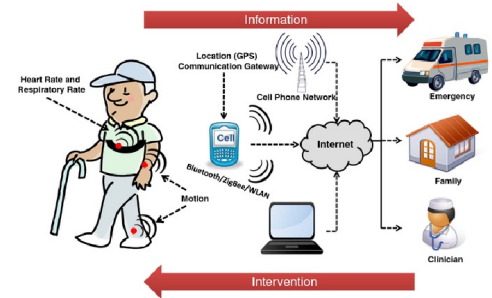


Pharmacologic / Drugs / Biotherapeutics

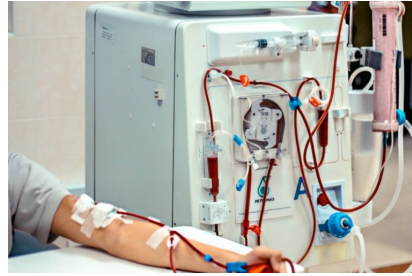


Procedural Technologies

- Electronic Health Records (EHR)
- Collaborative Technologies
 - Remote Monitoring
 - Telehealth



Replacement Body Parts



Is there a better way?

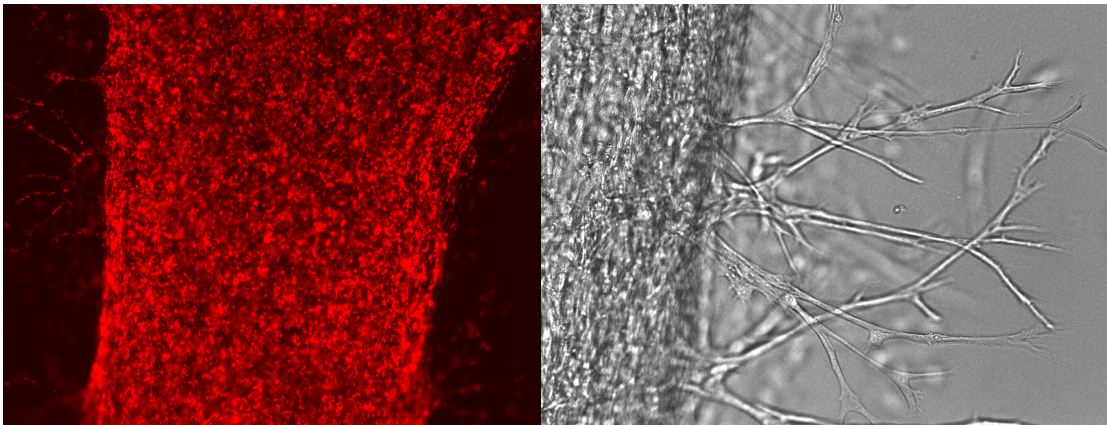
Engineered Organs / Tissues



Organs On Demand

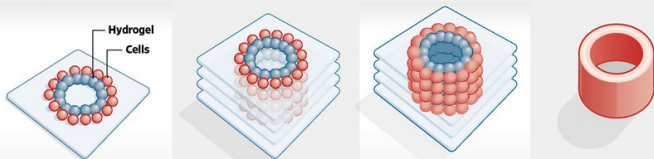
Researchers and companies such as Organovo are using three-dimensional printers to produce living tissues, hoping someday to be able to print personalized body parts.

Area of detail, below



Printing a blood vessel:

Photo by Sandy Huffaker for The Wall Street Journal



1. One printer nozzle deposits drops of cells, while a second nozzle deposits a hydrogel that acts as a mold to shape the tissue.

2. The printer builds up the cells and the mold layer by layer, creating the three-dimensional structure.

3. After printing, the cells naturally knit themselves together to strengthen the tissue structure.

4. The supporting hydrogel mold is removed, leaving a structure made solely of living tissue.

Sources: University of Houston; University of Missouri; WSJ reporting

The Wall Street Journal



Methuselah Foundation



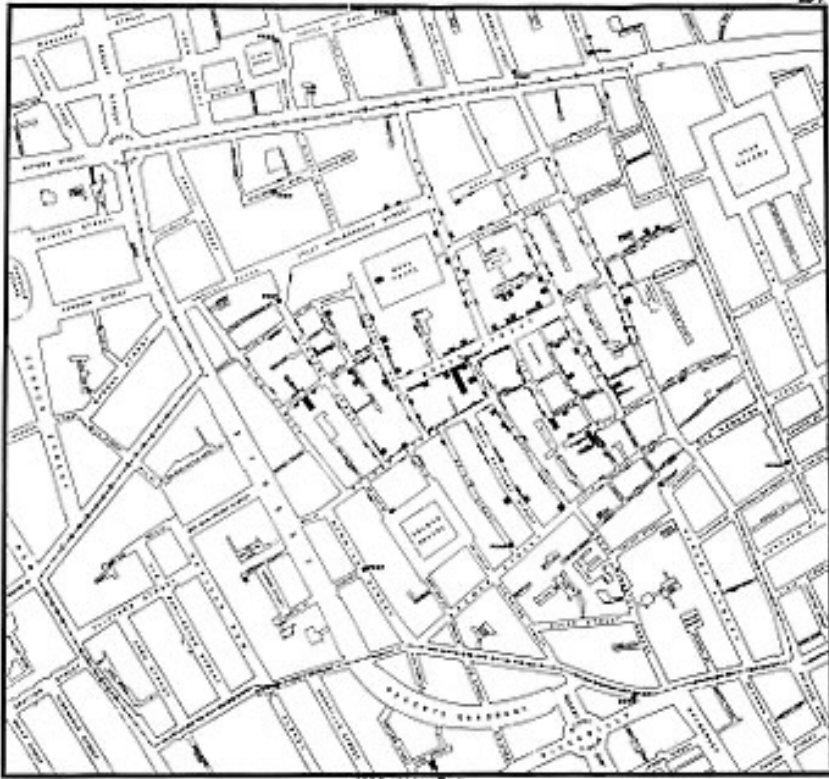
New Organ
RESEARCH ALLIANCE

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Data / Analytics



- Data Complexity
- Data Trends
- Precision Medicine
- Sensors
- Access
- AI/ML

Key

Life Science Application Areas

Application Definitions
Further segments the types of companies or company focus areas

Application Subcategories

Austin Area Companies

Some companies are represented in multiple categories. The line identifies additional categories within the section

Biopharmaceutical/ Pharmaceutical/ BioTherapeutic 27

Non-biotech small molecule drugs, therapies and drug delivery

Biomolecule drugs, therapies and vaccines

- Products & Discovery**
Affinium Pharmaceuticals
ALK - Abello
Applan Labs (ETI)
Astrogenix
Caisson Biotech (ETI)
DisperSol Technologies
Edgemont Pharmaceuticals
Genprex
Grifols (Biomat USA)
Hospira
Lumos Pharma
Mimetic Solutions
Mystic Pharmaceuticals
Pure Vaccine Solutions, LLC
Spinal Restoration
Xens Pharmaceuticals

Aeglea BioTherapeutics
Ausano Biomedical
Beacon Sciences
Celling Biosciences
Genprex, Inc.
Mima Therapeutics
Molecular Templates
Pain Therapeutics, Inc.
Savara Pharmaceuticals
Therapio
TVA Medical

Contract Research Organization 28

CRO serving biotech: Manage clinical trials for biotech and biopharma

CRO laboratory tests

- CROs**
Benchmark Research
Cenotron Diagnostics
Coghlan Group
Community Clinical Res.
DermResearch, Inc.
Emissary International
FutureSearch Tnals
Globiox
INC Research
Inventy Health Clinical
KCR U.S.
Lovelace Scientific Res.
MetsClin Research
PPD Development
PSC Clinical
Premier Research Group
Quintiles
Redstone Research
Research Point Global
SilesGen
Tektro Research
Theorem Clinical Research
Worldwide Clinical Trials

Altogen Labs
Asuragen
Cenotron Diagnostics
Genomatic
Radix BioSolutions

Medical Device 45

Healthcare medical devices, drug delivery

Orthopedics
Cardiology
Diagnostics
Wound Care

Use biomolecules: molecule-coated implants, in vitro assays

- Healthcare**
Admittance Technologies
Aifaair Biosciences
Apollo Endosurgery
Atrrocare Corp.
DIFUSION Tech
Genotex Laboratories
Hospira
Int'l Biomedical
Monebo Technologies
Patton Medical Devices
Patton Surg (Styker)
Pure Transplant Sol (ETI)
Zimmer Biologics

AeonClad Coatings
Spinal Restoration
SpineSmith Partners

Diagnostic 21

Biomolecule in vitro assays and diagnostics, molecular diagnostics, reference labs

Non-biotech and healthcare diagnostics

- Products/Development**
AeonClad Coatings
Asuragen
Beacon Sciences (ETI)
CertChem
Global BioDiagnostics
Luminex
Nano Science Diag
Pro-Lab Diagnostics
Quantum Logic Devices
Respiratory Research
Vermillion, Inc.

Stellarray Inc.

Biotechnology/ Life Science 56

Biomedical research
Nucleic Acids
Proteins
Antibodies
Serum
Research products
Service
Software
Instrumentation

Healthcare research

- Services & CMO**
AeonClad Coatings (ETI)
AltoGen Labs
ARQ Genetics
BioEden
Blood & Tissue Center
Caisson Biotech (ETI)
CertChem
Embank Scientific
Thermo (Life)
Myriad RBM
Pure MHC (ETI)
Pure Transplant Sol (ETI)
Pure Vaccine Sol (ETI)
Radix BioSolutions
Receptor Logic, Inc.
RiboSolutions
Selenium (ETI)
Stellarray Inc.
Veterinary Clin. Res.

Other Biotechnology 18

Non-biomolecule technology
biosciurity

Biosecurity, Military, Safety
Environ., Consumer goods
Human Identification,
Paternity, forensics, Plant foods
Animal/livestock foods
Companion animals
Sport animals
Diagnostics & Therapeutics

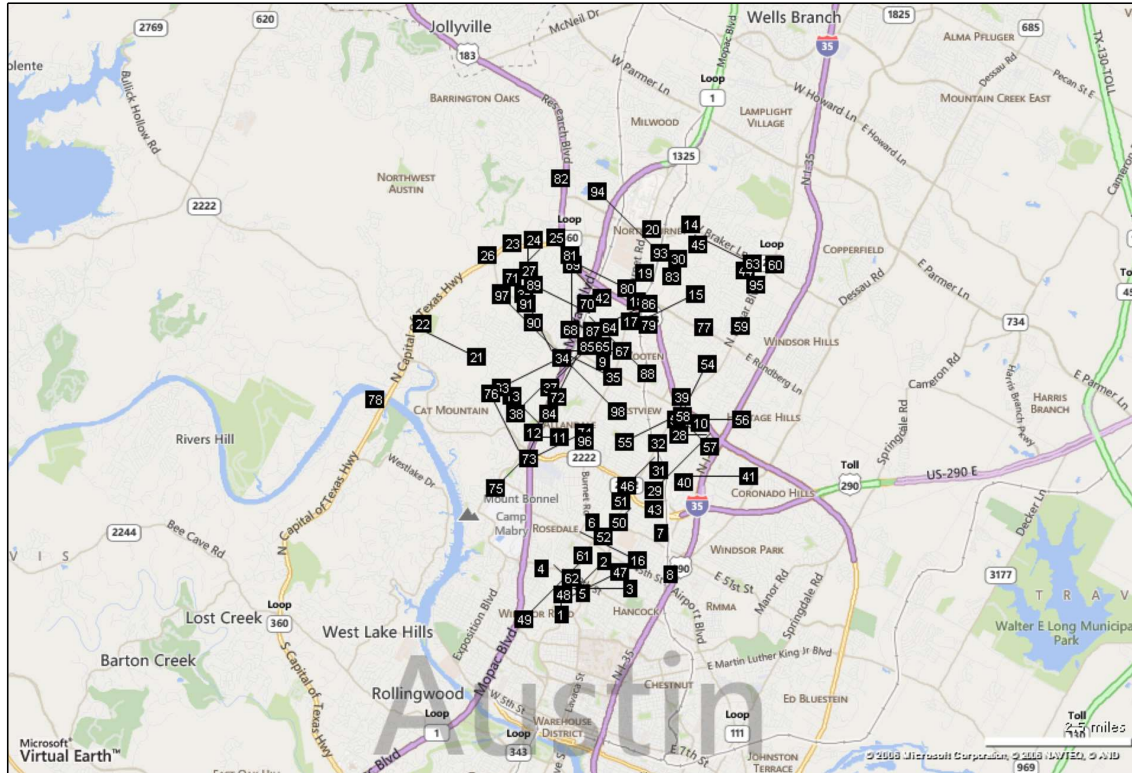
- Consumer Goods**
PlastiPure
Selenium (ETI)
Yorktown Technologies

Agricultural/Food Biotech
Bio Scientific Corp.
CertiChem
Defekt Biomedical LLC
Genomatic
Nano Science Diagnostics
PanAmerican Vet Lab

BioSecurity, Environ. ID
Airologic LLC
VUV Analytics

Antimicrobial Test Labs
Defekt Biomedical LLC
DPS Crime Lab Service
Genomatic
Luminex
Radix BioSolutions
Signature Science

Austin Biotech Companies



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1/19/2015
Page 1

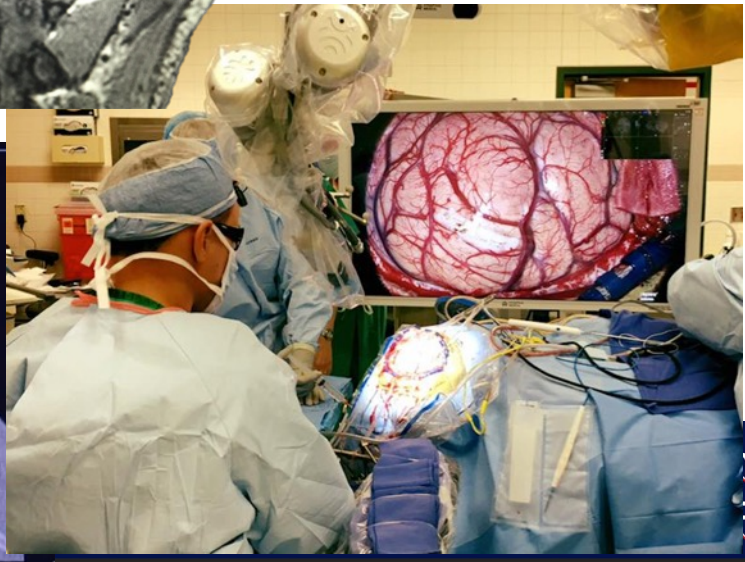
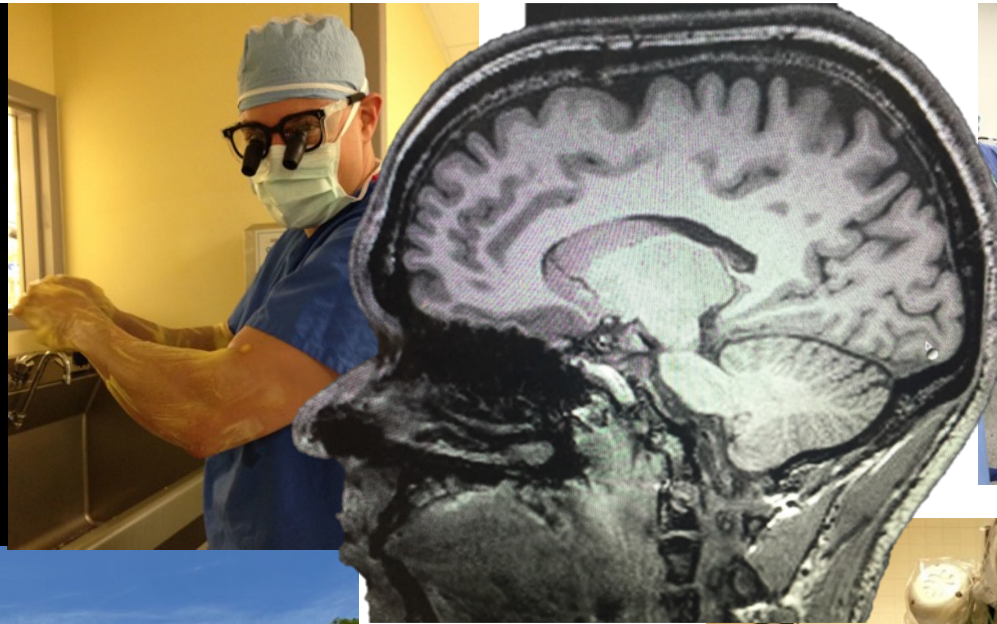
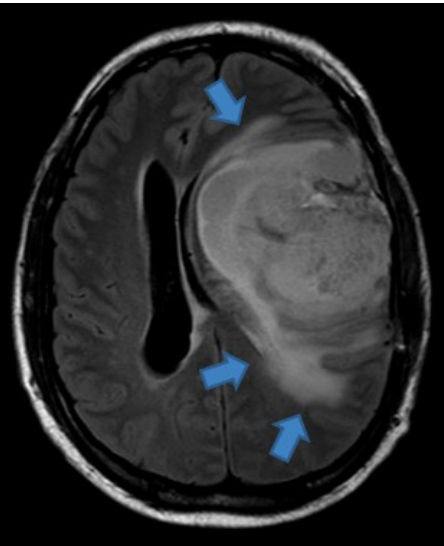


The Future of Health Tech, Surgery, and You

Jordan Amadio, MD, MBA

Neurosurgeon
Ascension Seton Brain & Spine Institute

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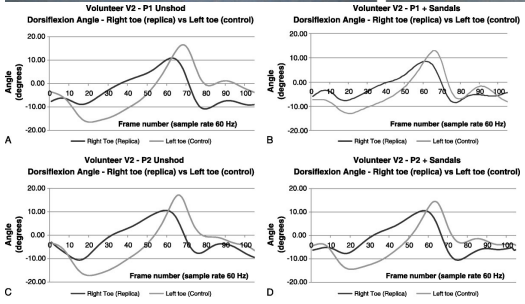
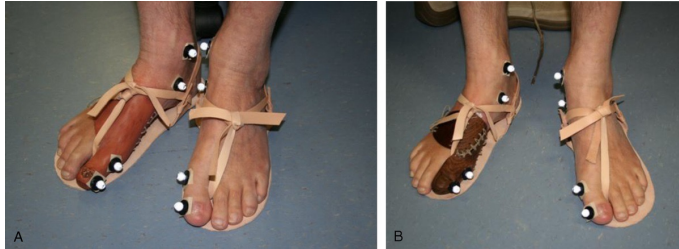


Why health tech?

- Reducing suffering
- Living longer
- Living better
 - *“Health-Related Quality of Life”*
- Improved outcomes
- Lower costs
- Individualization vs. Justice
- Wellness for the non-sick
- ? Human enhancement



Luxor, Egypt 950 BCE



Finch et al.
2012





Health Tech 2020

- CRISPR/Cas9
- Neuromodulation
- Telehealth
- Virtual reality
- Precision medicine
- Health wearables
- Artificial organs
- Smart inhalers
- Transplantation
- Robotics
- *Exponential increase in innovation over time*

BASIC RESEARCH



CLINICAL TRANSLATION/TRIALS



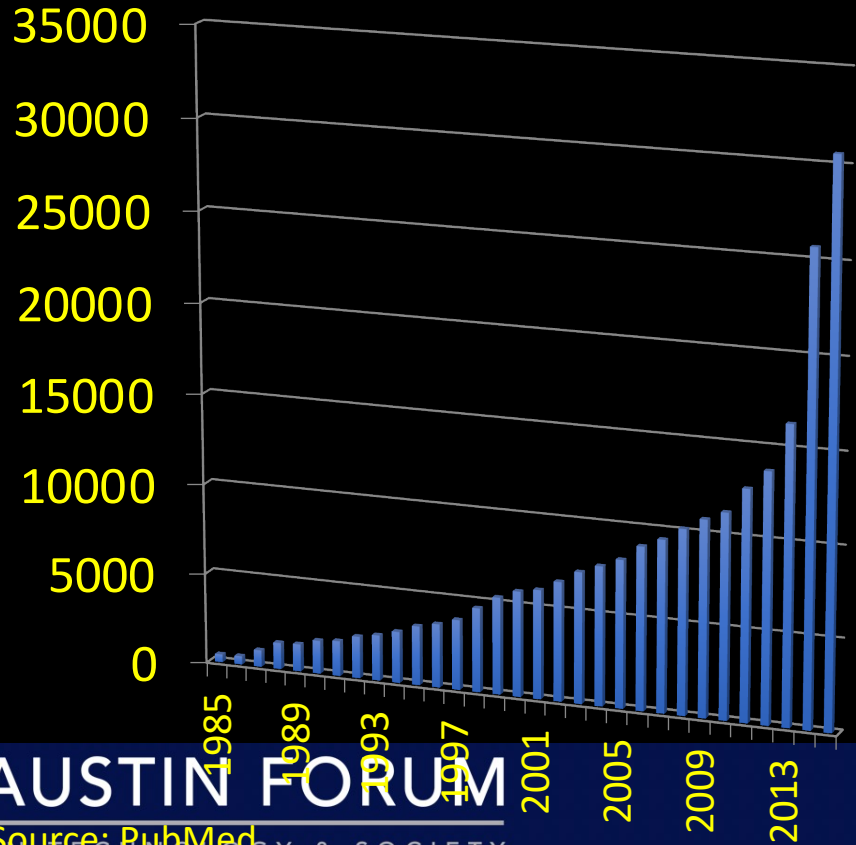
COMMERCIALIZATION



PATIENT CARE



Neuroscience research publications

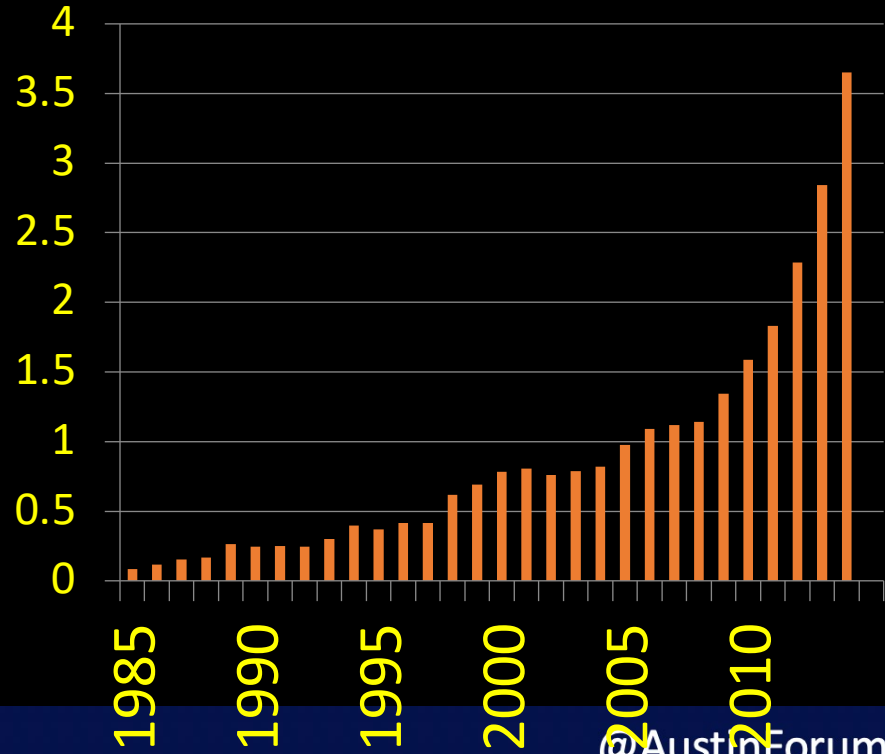


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Source: PubMed

Patent activity in neuro tech



Source: DOCDB/PatentInspiration

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The Data Revolution for Health Tech

- Electronic Medical Record (1980s)
- Evidence-Based Medicine (1990s)
- Quantitatively track outcomes across population, registries (1990s-present)

Levels of Evidence



Drivers of change in health care



Information age



Globalization



Cost containment



Aging of society



Administrators



Increasing public accountability



Sophisticated consumers



Science and technology

*Crossing the quality chasm:
A new health system for the
21st century*

Institute of Medicine (U.S.)

- Focused public attention on medical quality
- Highlighting preventable medical errors
- Strategies for improving health quality

2001

CROSSING THE
QUALITY CHASM

Health System for the 21st Century

IOM report: 6 aims for improvement

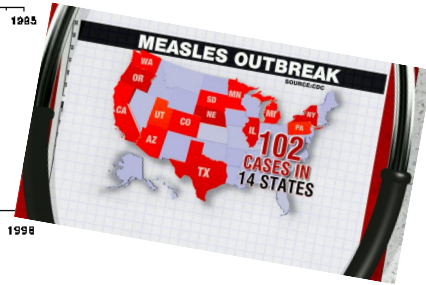
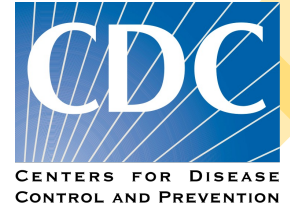
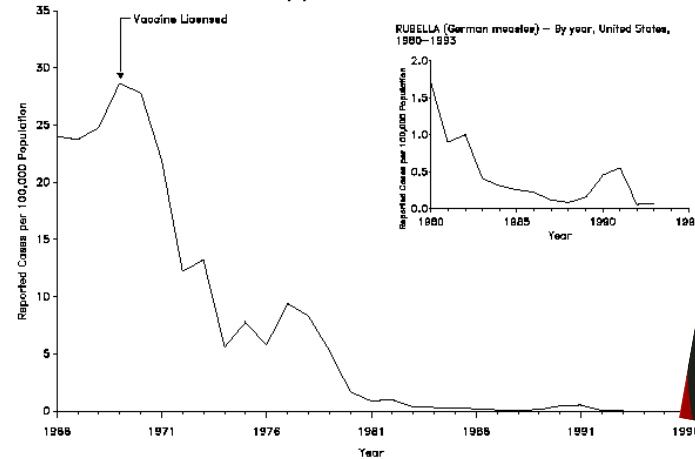
- Safe
- Effective
- Patient-centered
- Timely
- Efficient
- Equitable



A need for caution

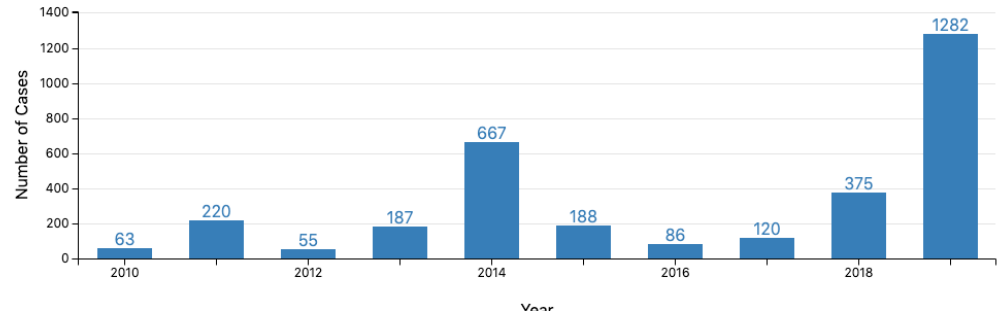
- Technology does not exist in a vacuum
- There are no panaceas
- Ethical and societal concerns
 - AI and medicolegal liability.
- Health disinformation
 - “FAKE NEWS”
- Not always “can we?” but “should we?” and “how do we?”

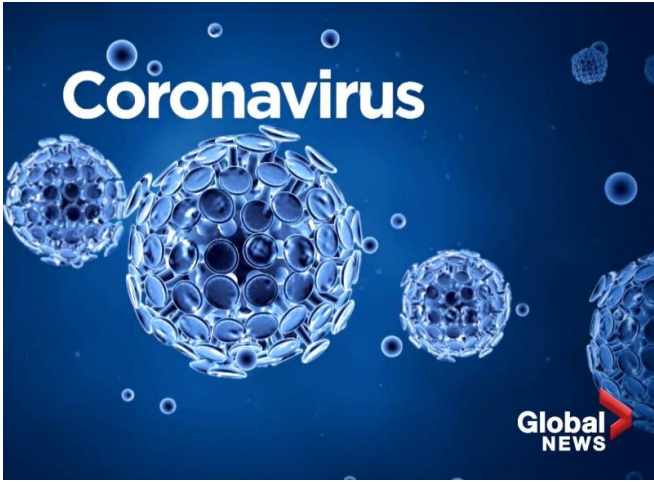
RUBELLA (German measles) — by year, United States, 1966–1993



Number of Measles Cases Reported by Year

2010-2019*(as of January 31, 2019)



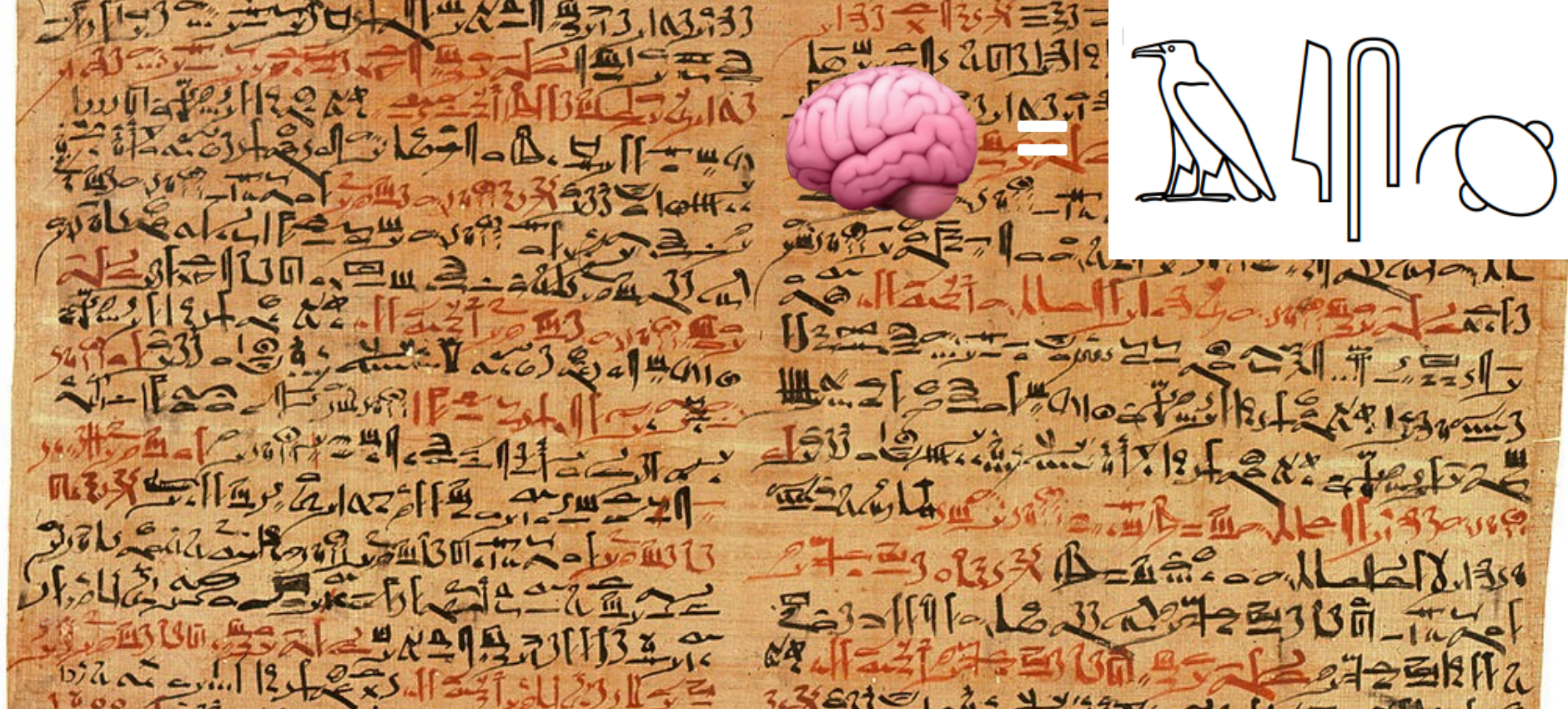


When it comes to our health, as citizens we share an ethical duty to remain informed and vigilant



The Future of Surgery

- Most ancient and most modern
- Leading indicator of innovation
- High stakes, event-based, highly technical, capital available
- WYSIWYG – immediately tangible



Oldest surgical textbook: Edwin Smith Papyrus – 1600 BCE



General Anesthesia – October 16, 1846 (“Ether Day”)

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Antiseptic surgery

Dr. Ignaz Semmelweis
(1818-1865)

Pasteur's germ theory of
disease, 1865

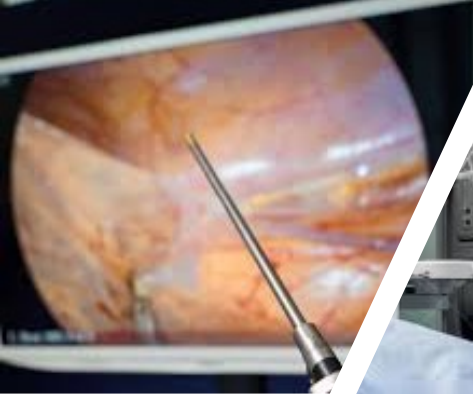
Joseph Lister, 1867

Fleming - penicillin, 1928





The modern operating room: February 2020

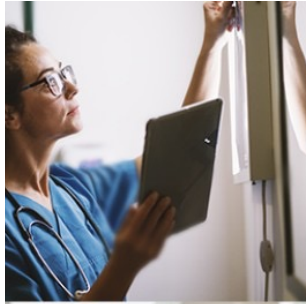


Surgical Team

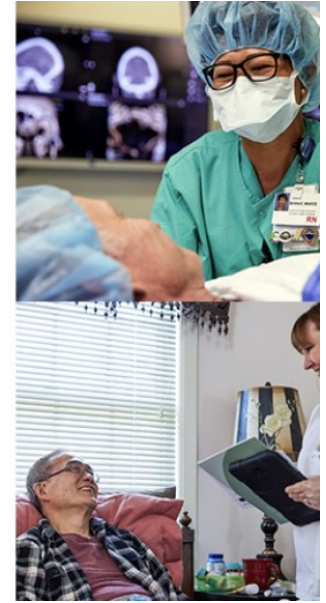


Technology is at the core of surgery today, but the human touch matters

Surgery is a
team sport!



LEARN MORE:
SeeYouNowPodcast.com



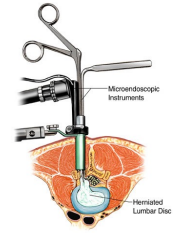
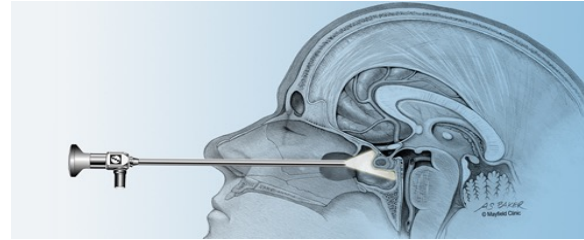
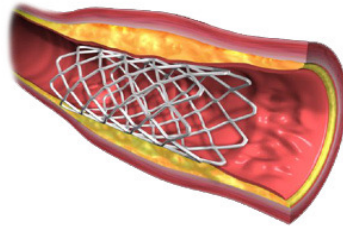
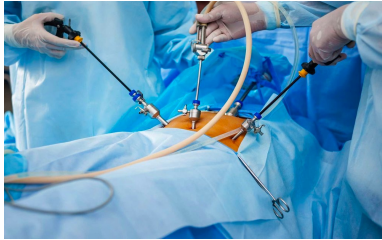
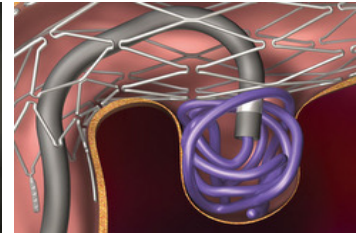
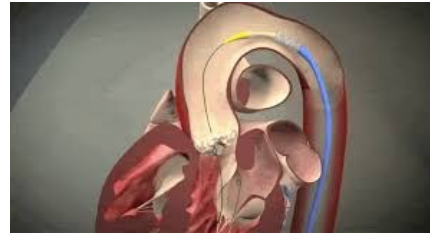
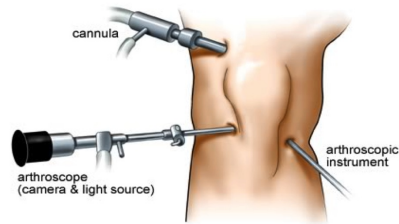
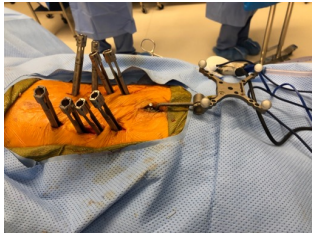
- Nursing
- Anesthesia
- Physical Therapy
- Allied health professions

Surgery in the 21st century...

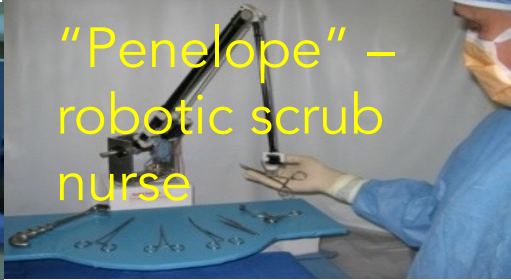
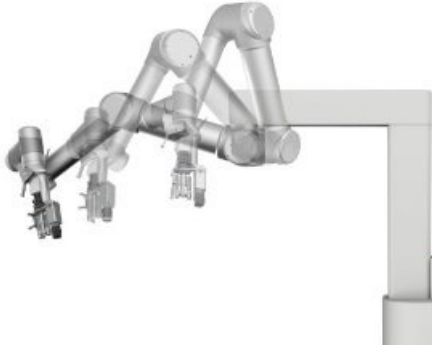
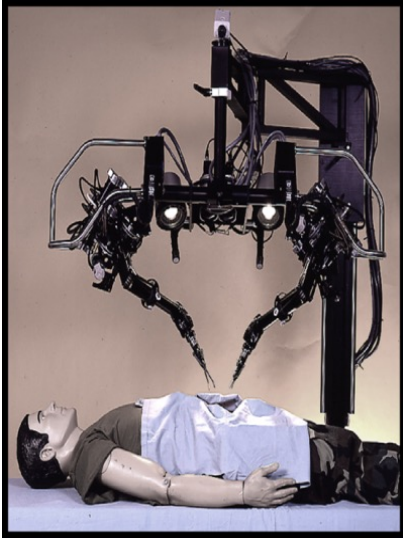
- ✓ Anatomically precise
- ✓ Minimally invasive
- ✓ Imaging-based
- ✓ Restorative
- ✓ Molecular
- ✓ 4-Dimensional (time)
- ✓ Evidence-based
- ✓ Multidisciplinary
- ✓ Personalized
- ✓ Surgeon-Machine Collaborative

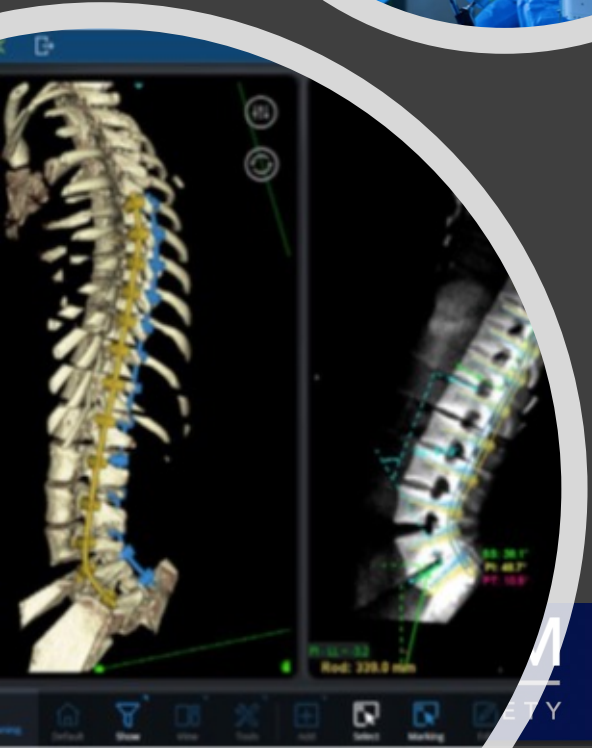
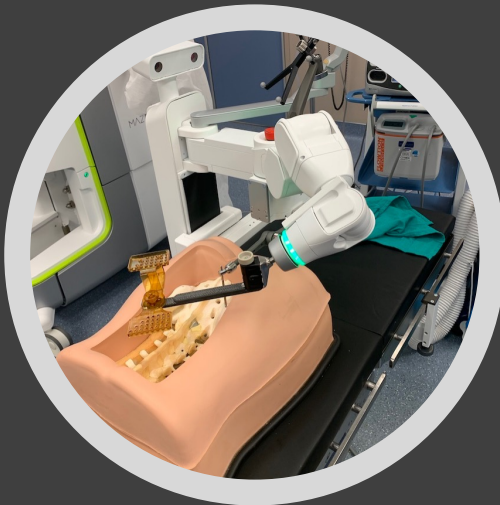
**Goals drive
technology**

Minimally invasive surgery: less pain, less hospitalization, happier patients



Robots: in their infancy, but they are here to stay

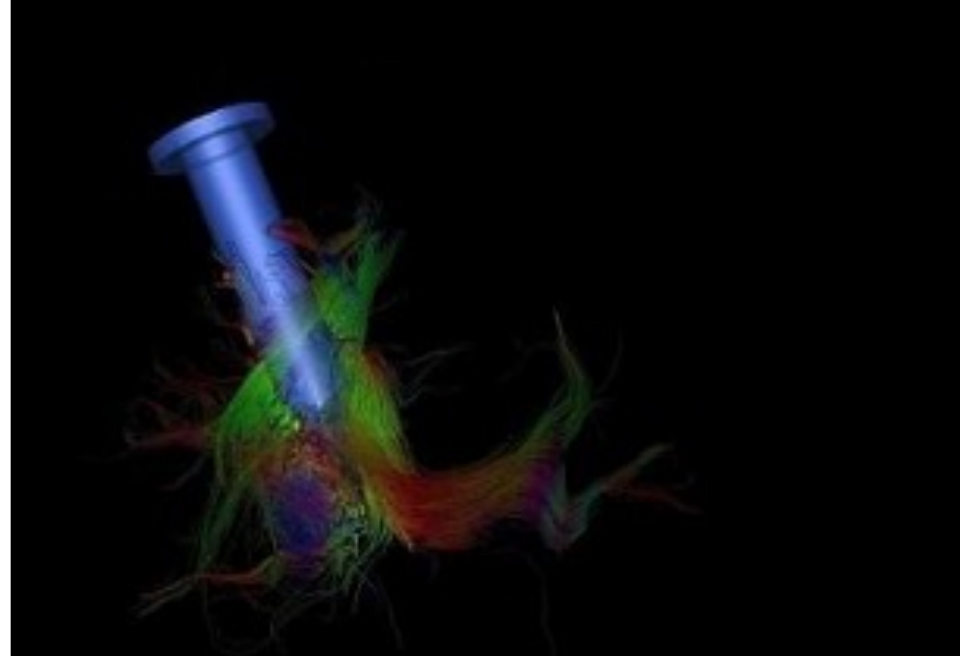




Robotic spine surgery.
Now in our local OR.

Predictable.
Precise.
Just how you want your
spine surgery.





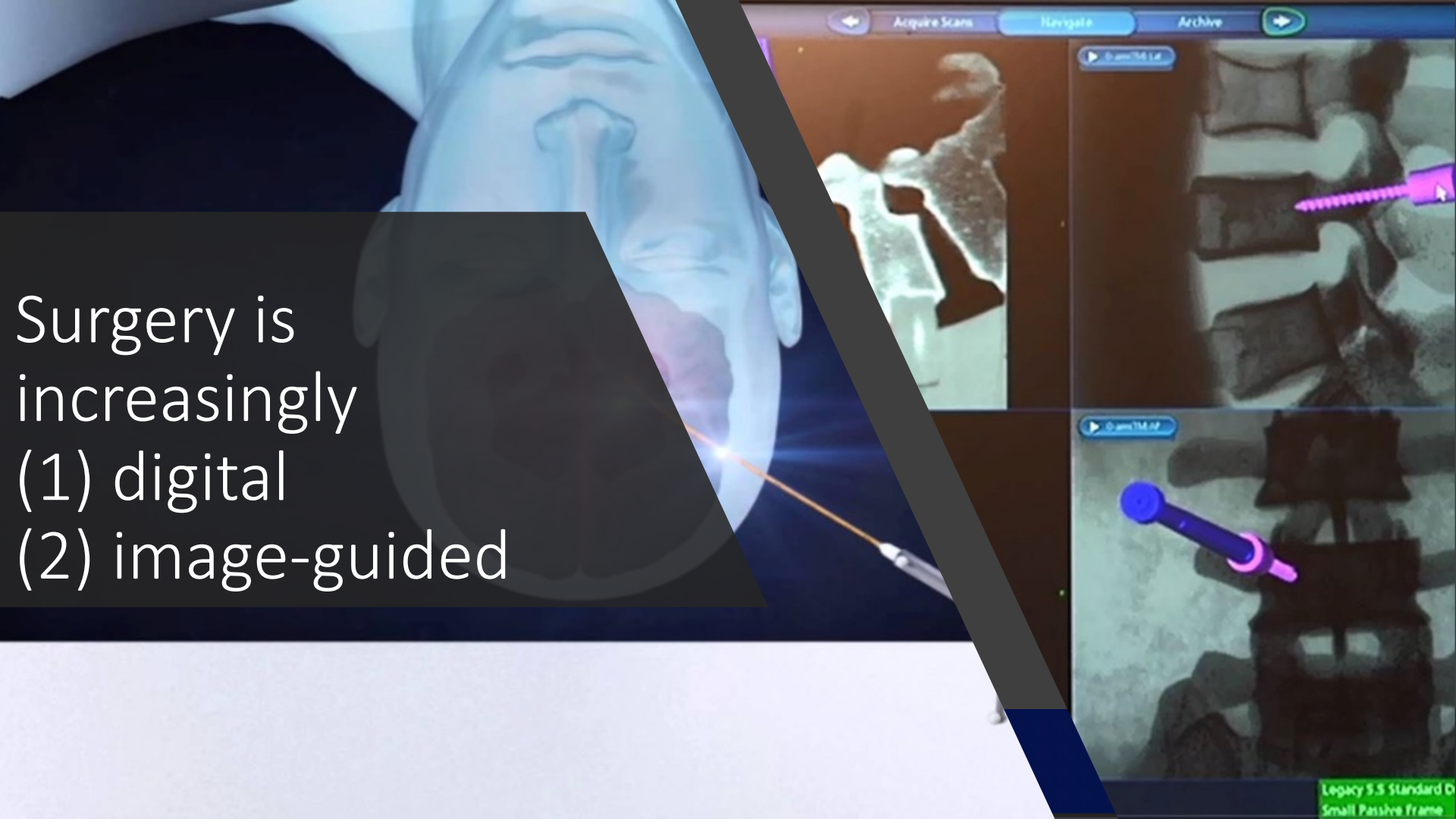
Robot-assisted brain surgery for malignant brain tumor (Synaptic/Emory SOM)

Artificial Intelligence & Machine Learning in Surgery

- Diagnosis
- Treatment
- Autonomous vs. Semi-Autonomous vs. Guidance

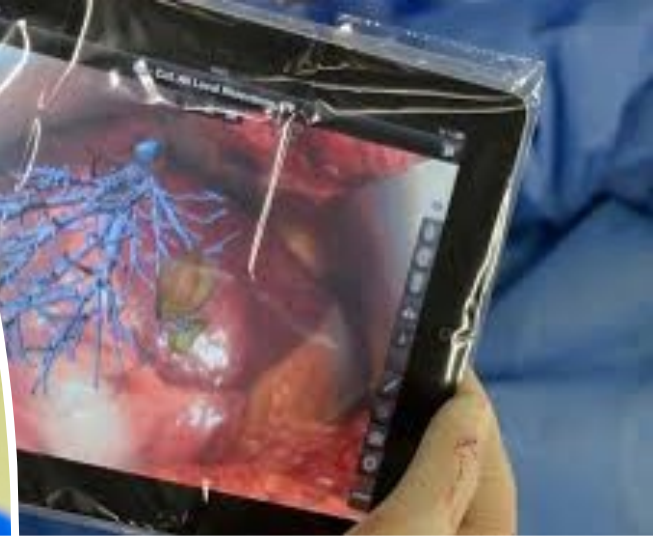


Surgery is increasingly
(1) digital
(2) image-guided



Virtual and augmented reality (VR/AR) for surgeons

- Has not yet achieved widespread adoption
- VR has promise for education of young surgeons
- AR applications for intra-operative guidance, limitations in hardware brightness/sterility/usefulness
- Google Glass 1st gen. (2014)
- Dr. Shafi Ahmed – first VR surgery (2016)

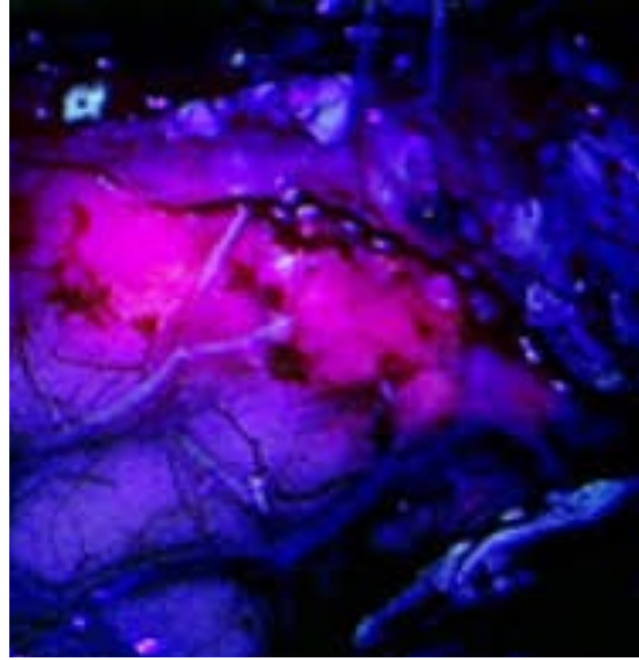
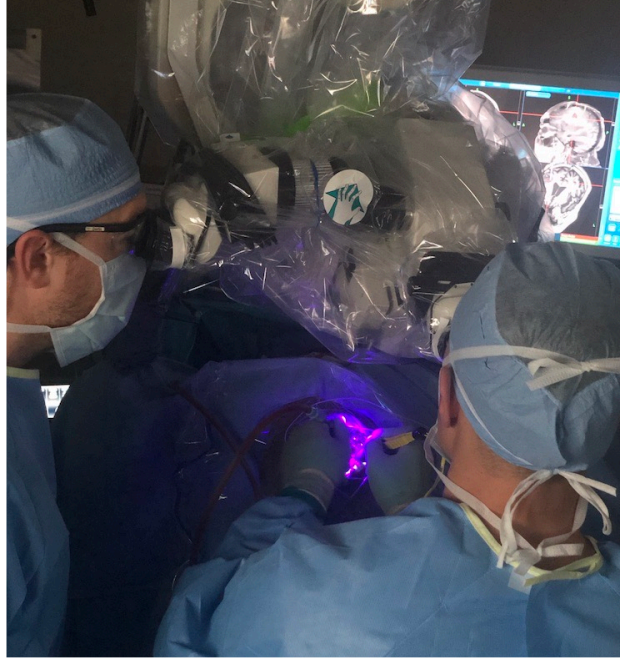
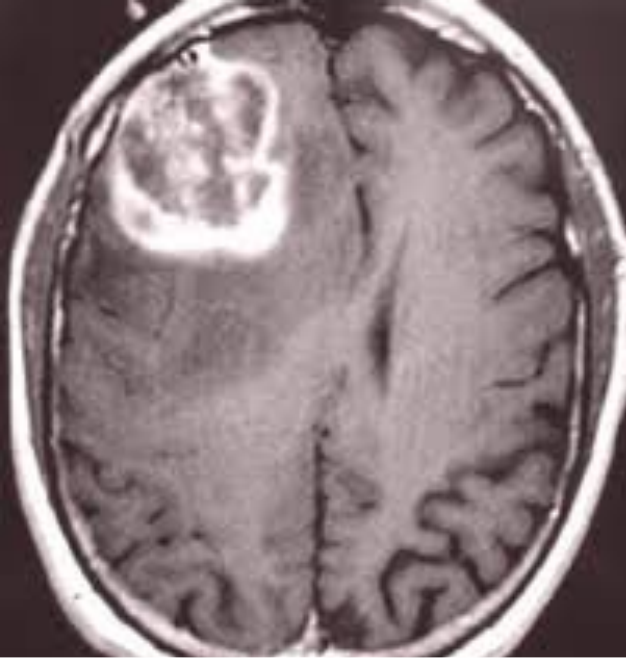




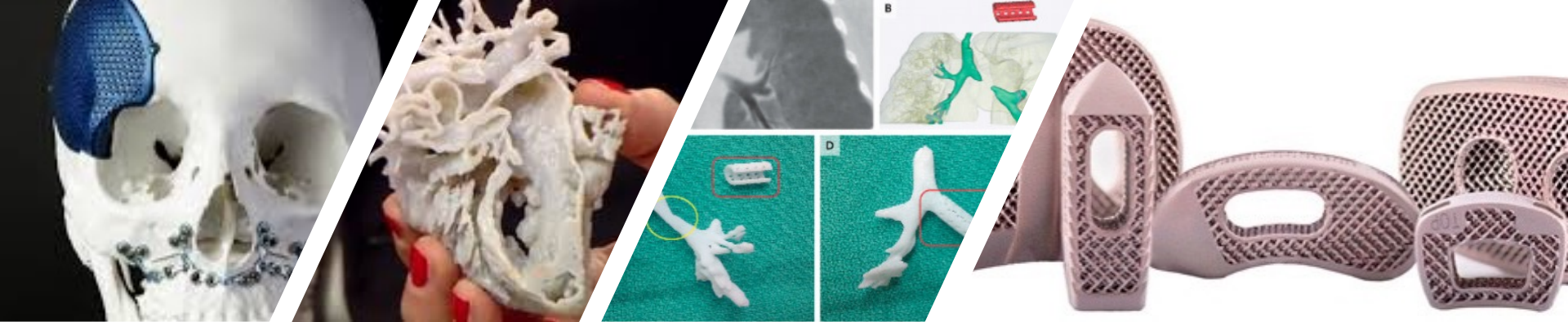
VR for Surgical Patients

Number of studies
showing alleviated pain
and anxiety.

Reduced opioids.



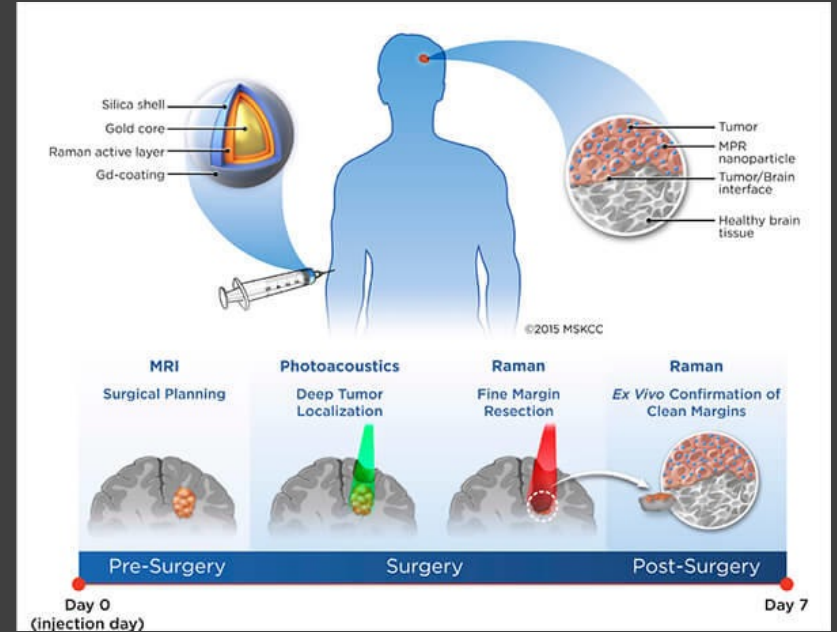
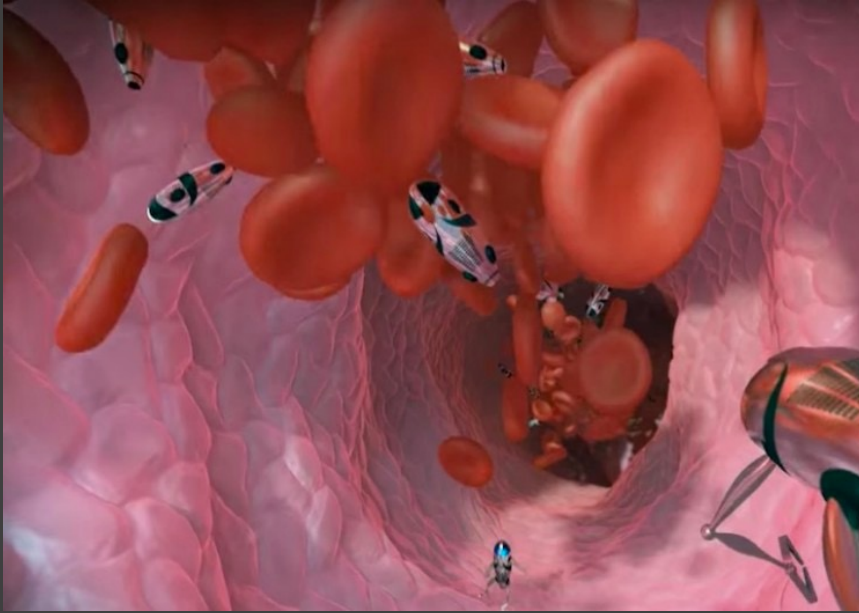
“Superpower vision”: fluorescence guidance for removing malignant brain cancer



3D Printing in Surgery

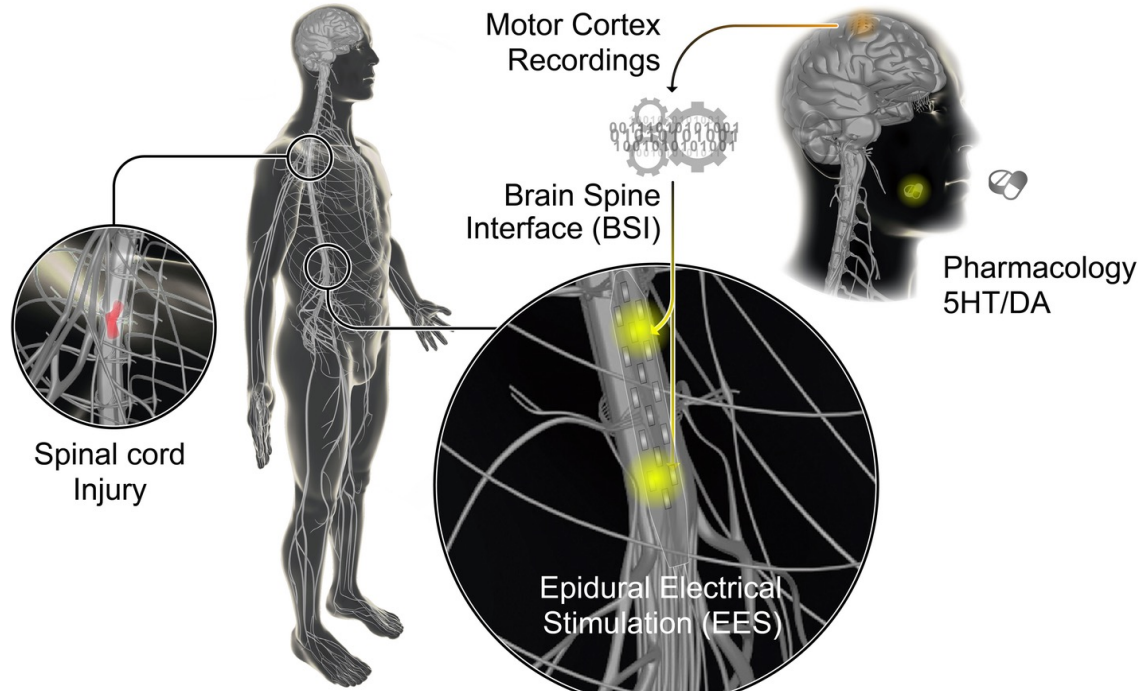
- Implants
- Surgical planning
- Biological (soon to include organs)
- Driving cost and time down
- Things we could never do before





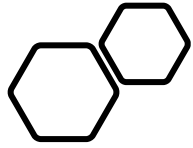
Cellular and Molecular Surgery: Fiction vs Fact

Neuromodulation of circuits below the injury



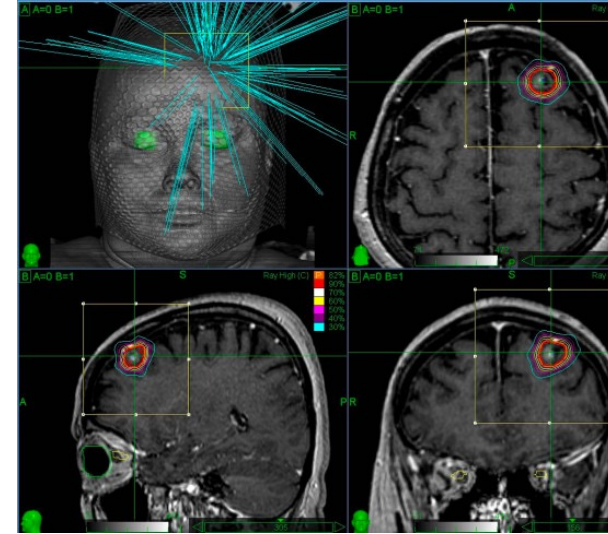
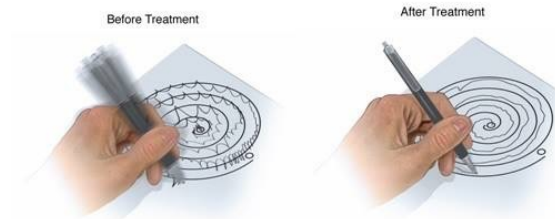
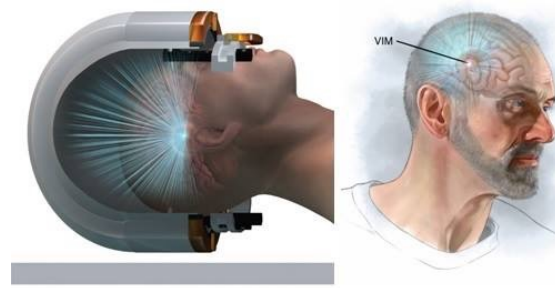
Restorative Surgery

Restoring function and healing in ways the body cannot do itself.
(e.g., spinal cord injury)



Knifeless surgery

- Stereotactic radiosurgery
- Focused ultrasound
- Smaller, faster, cheaper, more widespread

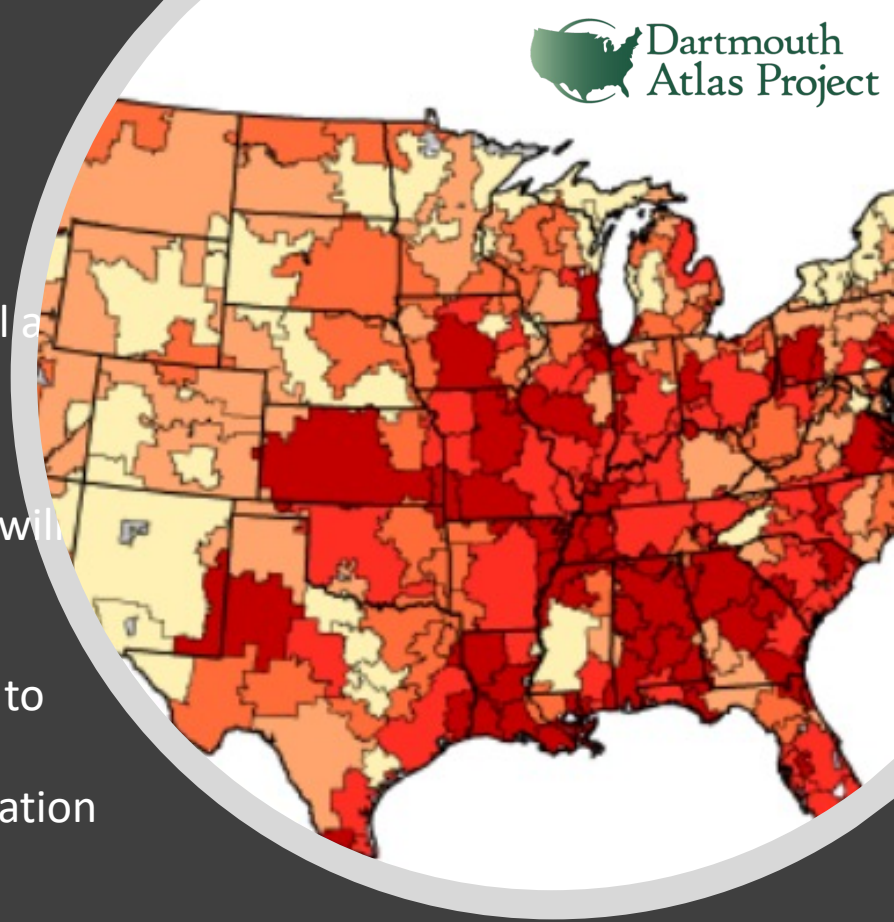




Technology in Surgical Training

A world of data-driven, evidence-based surgery

- Based on data: "less art, more science...but still a
- Exponential rise in clinical trials and guidelines
- Patient outcomes are the priority
- Payers and government – not device makers – will drive cultural shifts
- Should we be doing surgery at all?
 - Old paradigm: "A chance to cut is a chance to cure."
- **ACHIEVING CONSISTENT RESULTS** across population
 - Not sexy, but important

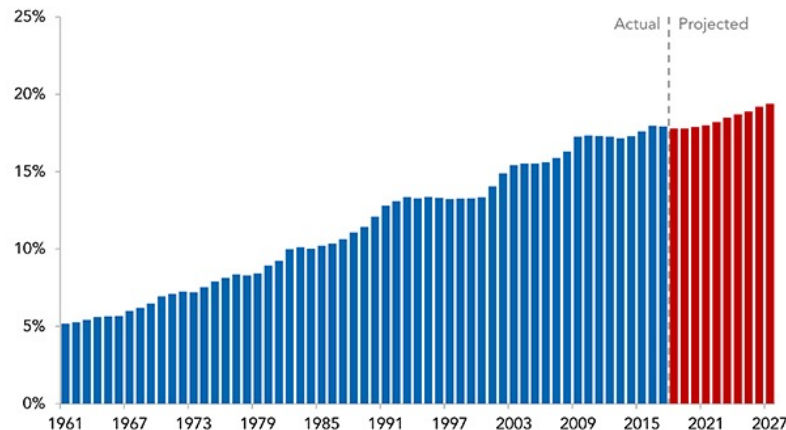




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Healthcare costs in the U.S. have increased drastically over the past several decades

NATIONAL HEALTH EXPENDITURES (% OF GDP)



SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditure Data, February 2019. Compiled by PGPF.
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PGPF.ORG

The new imperative for health tech innovation:
COST-EFFECTIVENESS

TECHNOLOGICAL INNOVATION IN NEUROSURGERY: A QUANTITATIVE STUDY

Hani J Marcus, MRCS^{1,2,*}, Archie Hughes-Hallett, MRCS¹, Richard M Kwasnicki, BSc¹, Ara Darzi, FRS¹, Guang-Zhong Yang, FREng¹, and Dipankar Nandi, D. Phil.²

¹The Hamlyn Centre, Institute of Global Health Innovation, Imperial College London, London, UK

²Department of Neurosurgery, Imperial College Healthcare NHS Trust, London, UK

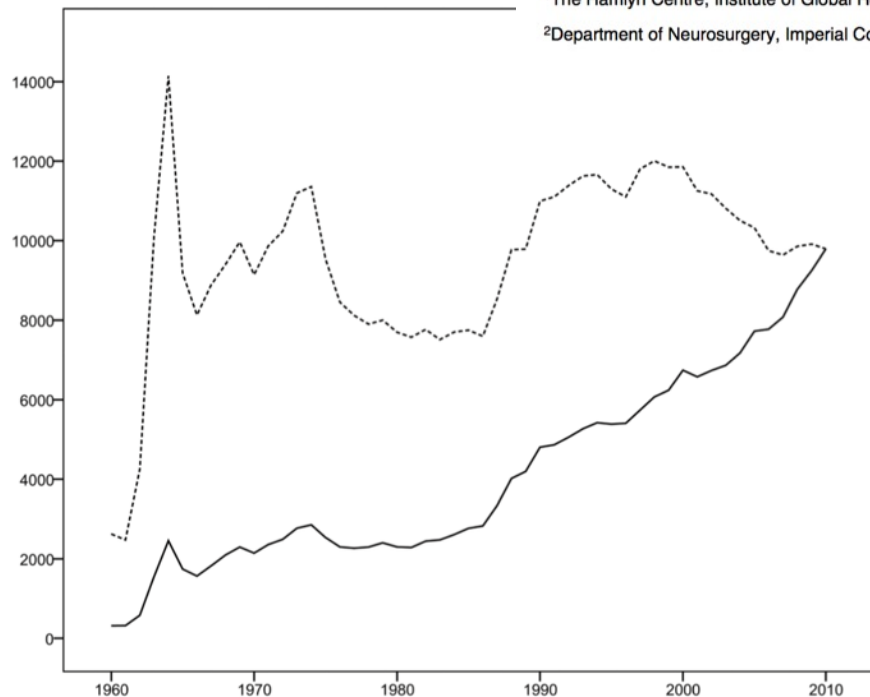


Figure 1.

Plots of (a) patents and (b) publications related to neurosurgery over time (solid line = raw data; dashed line = normalized data).

Table 2

Top 50 performing patent codes over (a) between 1960 and 2010, and (b) between 2005 and 2010.

Rank	Technology cluster	Number of codes	Number of patents*
1960 – 2010			
1	Image Guidance Devices	8	2625 (37.9%)
2	Clinical Neurophysiology Devices, including those measuring Motor Evoked Potentials and Somatosensory Evoked Potentials	4	1450 (21.0%)
3	Neuromodulation Devices, including those for Deep Brain Stimulation, Spinal Cord Stimulation, and Peripheral Nerve Stimulation	4	1294 (18.7%)
4	Operating Microscopes	2	420 (6.1%)
5	Endoscopes	2	391 (5.7%)
6	Miscellaneous	4	738 (10.7%)
2005 – 2010			
1	Image Guidance Systems	9	1110 (46.0%)
2	Clinical Neurophysiology Devices, including those measuring Motor Evoked Potentials and Somatosensory Evoked Potentials	5	532 (22.0%)
3	Neuromodulation Devices, including those for Deep Brain Stimulation, Spinal Cord Stimulation, and Peripheral Nerve Stimulation	3	517 (21.4%)
4	Endoscopes	2	152 (6.3%)
5	Operating Microscopes	1	103 (4.3%)
6	Miscellaneous	5	391 (16.2%)

*Normalized data

1. Innovation trigger (early adopters)
2. Peak of inflated expectations
3. Trough of disillusionment
4. Slope of enlightenment
5. Plateau of productivity (laggards adopt, becomes a standard)

Gartner Hype Cycle for Emerging Technologies, 2019



- Dell Medical / DSMC / Waterloo Park
- Generate \$800 million in economic output
- 2800 new, permanent jobs

Source: Capital City Innovation / Downtown Austin Alliance



Austin's Health Innovation District



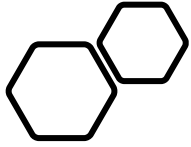
A New Model of Academic Medicine



The University of Texas at Austin
Dell Medical School

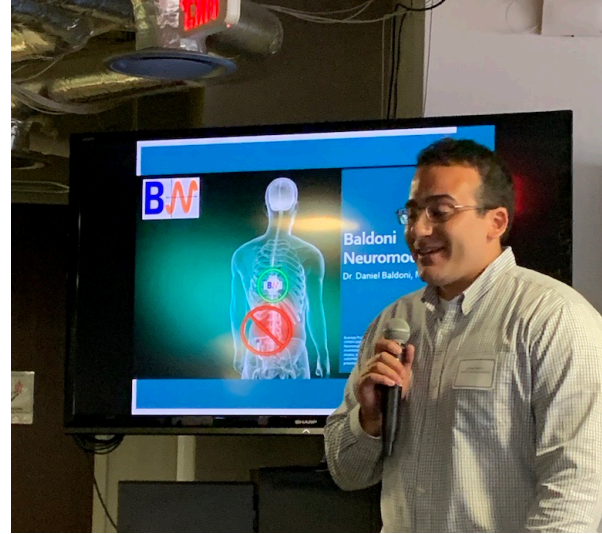
- Population-based
- Innovative
- Value-based
- Quality-oriented






Healthcare Innovation Roundtable (2019-)

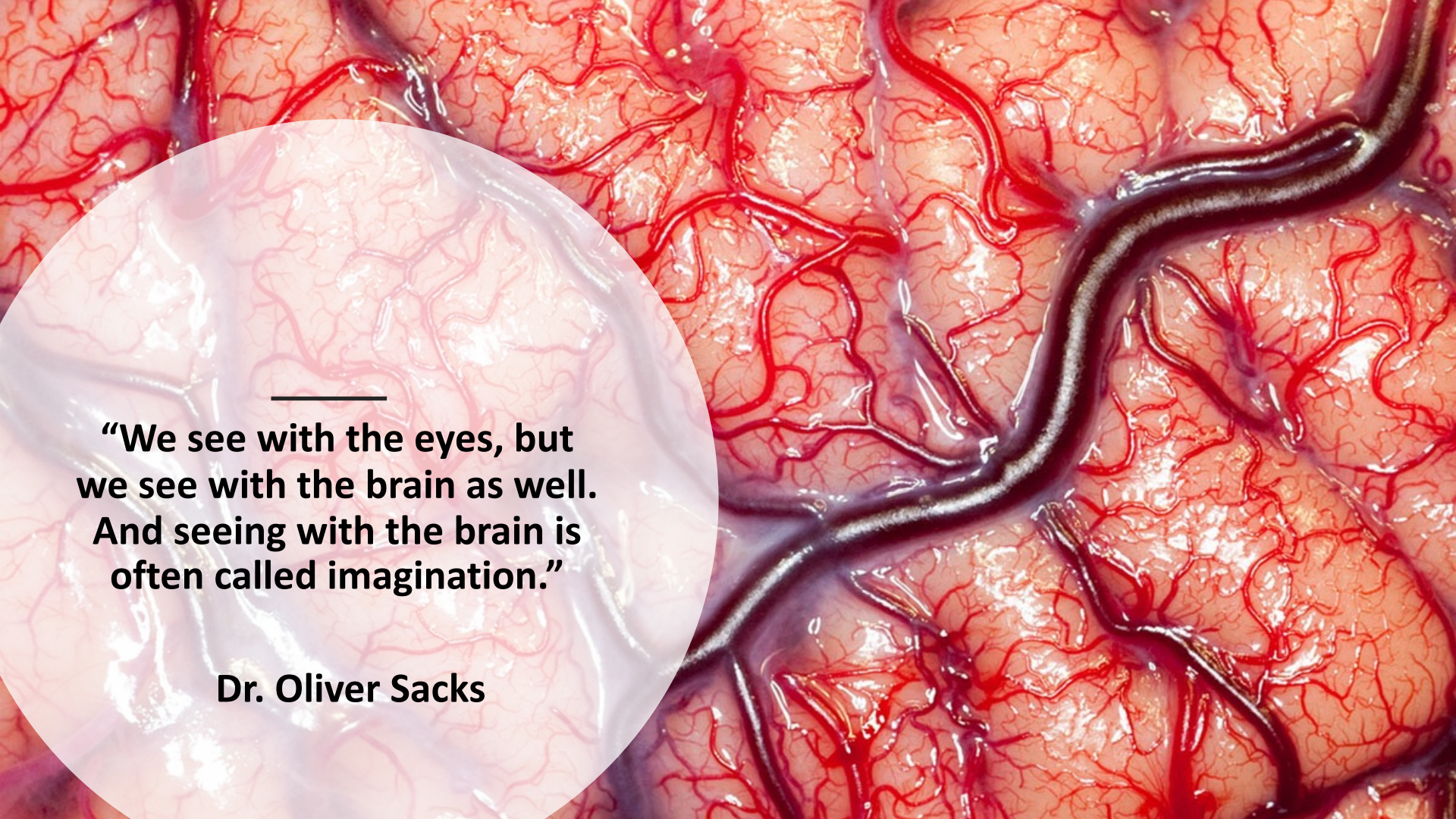
A community event series connecting health administrators, doctors, nurses, health innovators, startups, engineers, and investors in Austin.



Call to Action

A small green plant with several leaves is growing out of a crack in a grey concrete surface. The background is a blurred, dark grey concrete wall with some faint, reddish-brown stains.

- As a citizen-patient, YOU are the CEO
- Informed = healthy
- Resist disinformation
- Contribute to innovation
- Collaborate with those outside your tribe
- The point is not to predict the future but to prepare for it and to shape it
- Assess technological innovations as they arise
- Develop strategies to prepare for the future



**“We see with the eyes, but
we see with the brain as well.
And seeing with the brain is
often called imagination.”**

Dr. Oliver Sacks

Get Involved

- BioAustin.com (volunteers needed!)
- TexMDA.org
- ATI @ UT
- ACC Bioscience Incubator
- Texas Health CoLab at DMS
- TLCC in Georgetown
- STAR Park @ Texas State University
- M2M Element

email: af@ScottCollinsPhD.com

twitter: @ScottCollinsPhD

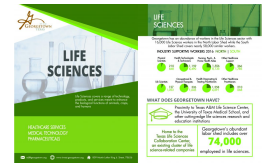


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Audience Q&A with
Dana Abramowitz
SXSW



Dr. Jordan Amadio
Ascension Seton

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amadio@gmail.com



Scott Collins, Ph.D.
BioAustin

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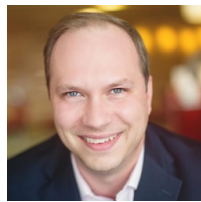
And now, for the winning question,
and a free badge to SXSW 2020...

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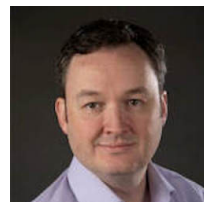
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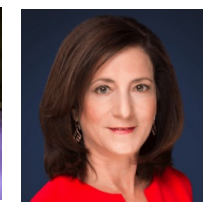
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*Brad Englert
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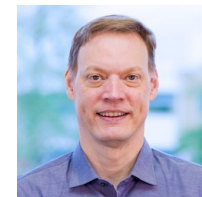
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Amber Gunst
*Austin Technology
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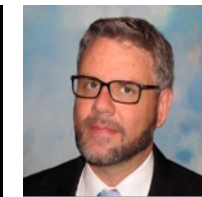
Eric Hennehoefer
Arm



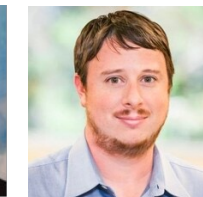
Harold Ingersoll
*Atchley &
Associates*



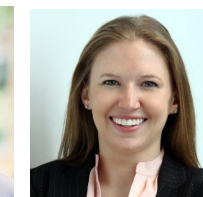
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Karl Popham
Austin Energy



Matt Sanchez
CognitiveScale



Marie Todd
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Jay Williams
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The AF Team



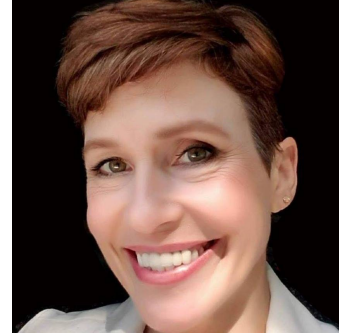
Jay Boisseau
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Jessica Sager
Managing Director



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Vanessa Burnette
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Kristen Grewe
Finances

And tonight's volunteers!

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Austin Pathways will provide them to deserving Austinites!



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We collected 250+ devices 2018-19—We want to surpass that in 2020!

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March 5 - *register now!*

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- **Tech & food**
- **Gaming**
- **AI**
- **Smart Cities**
- **Quantum Computing**
- **and more!**



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OPEN.

Apply for MassChallenge's 2020 accelerators in
Austin + Houston by March 9, 2020 at 1:00PM ET.

masschallenge.org/apply

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*Please share the upcoming events with your friends
and colleagues!*

Just One More Thing...

- We are restarting the Austin Forum Slack Team to enhance and expand our AF community: austinforum.slack.com
 - To communicate with speakers before events
 - To answer far more questions, after events
 - To see news about events, podcasts, blog posts...
 - The share info that helps us connect, collaborate, and contribute!
- Watch your email (that you use to register for AF events) for an invitation!
- **Extra incentive: we will switch from Sli.do to Slack for Q&A—and thus you need to use Slack to win the SXSW badge!**



Network Now, and Network Later!

We'll talk here until 8:15pm, then continue at **Trifecta on 3rd**



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Connect. Collaborate. Contribute.™

