



# Technology and Transformation

*One ID10T's view of the future*

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Deep inside, JERRY wondered if the other guys really listened to his ideas or regarded him only as comic relief.

Gary Larson is a genius!



# Catching Up to...





# NDI





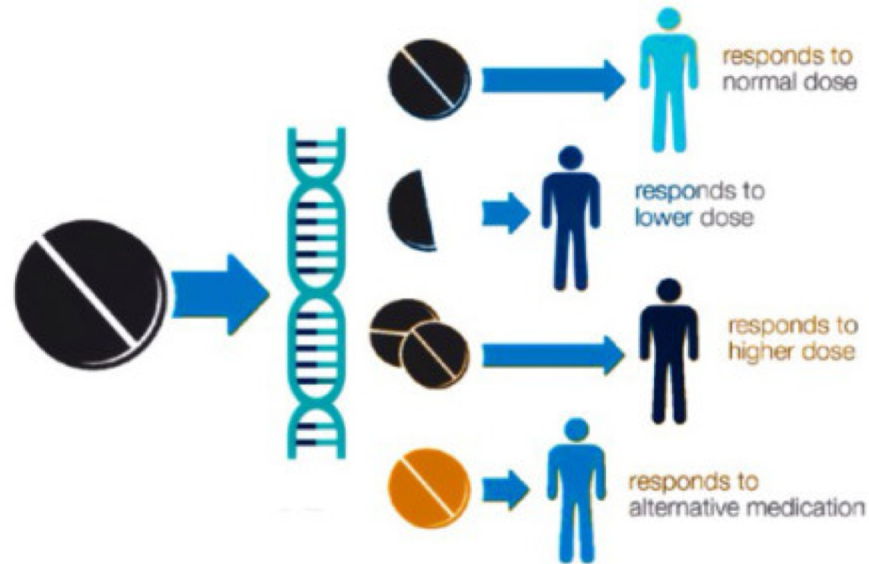
NDI  
3/20/19



# GENOMICS

## PERSONALIZED PRESCRIBING

Enables selection of the right drug and dose



GENOMIND®

### Drug Interactions

This summary provides:

### Medication

## Antidepressants

### Citalopram (Celexa®)

**Escitalopram (Lexapro®)**

### Fluoxetine (Prozac®)

### Fluvoxamine (Luvox®)

**SMS**

### Anticonvulsants cont'd

Brand Name	Generic Name
Vimpat	Lacosamide
Zarontin	Ethosuximide
Zonegran	Zonisamide

## Antidementia Agents

Brand Name	Generic Name
Aricept	Donepezil

[www.genomind.com](http://www.genomind.com)

s genetic profile

## Sequencing

## Test

## Health

# zoom



# NeuroStar rTMS



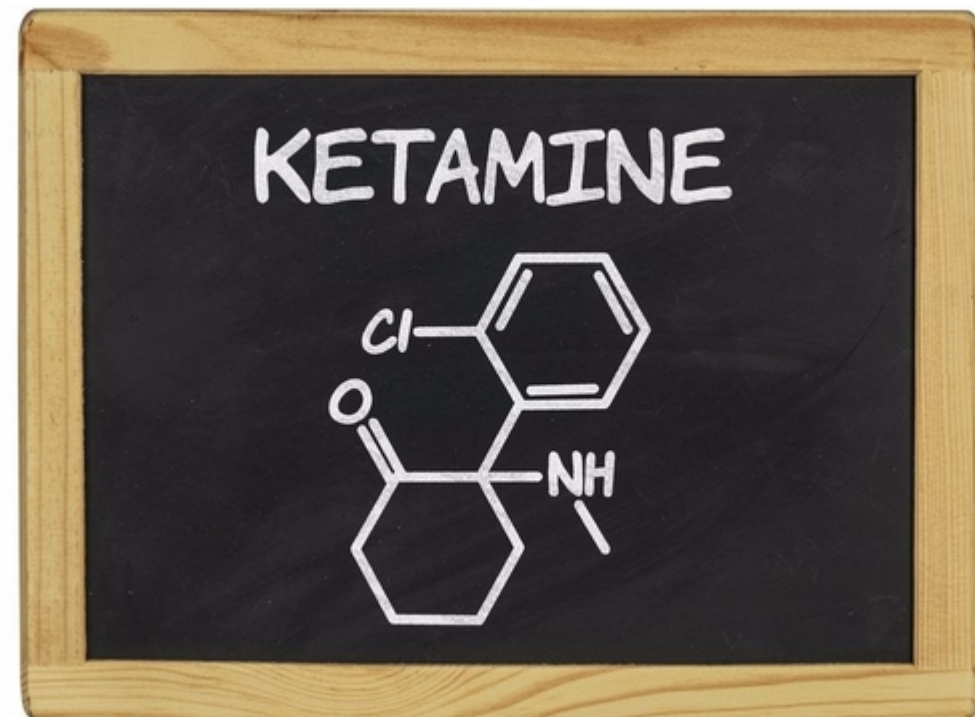
# Nihon Kohden Polysomnography



# MECTA 5000Q Electroconvulsive Stimulator







# MUSE



# Virtual Reality



# VOCERA Staff Communications



# Nihon Kohden Vital Sign Monitoring





# Cerner Millennium EHR



Brooks, Henri DOB: 05/27/55 Age: 54 Years MRN: 006-024 Sex: Male RPH: Chest Pain-Other

**Problems** (3 active) (+/-) (-)

- Diabetes mellitus - adult onset 2000
- Diabetes mellitus without complication 2000
- MRSA

**Allergies** (2 active) (+/-) (+) Add

- penicillin rash
- Shellfish allergy Hives

**Medications** (22 active) (+/-) (+) Add Refill All

- Rx: albuterol 2.5mg 2PM qPR
- Rx: albuterol 2.5mg 2PM qPR
- Hx: Lasix 10 mg/ml oral liquid 3xL PO Once Daily
- Hx: Isoniazid 300 mg 3xL PO Once Daily
- Hx: metformin 500 mg 3xL PO BID
- Hx: omega-3 polyunsaturated fatty acids PO
- Hx: Inderal 30 mg 3xL PO BID

**Past Medical** (+) (+/-) (+) Add

- Alteration in comfort: pain 2005 - 2006
- Back pain 2005 - 2006
- Chest pain 2000 - 2006
- Total knee replacement (3L 3R)

**Procedures** (2) (+/-) (+) Add

- Appendectomy, for ruptured appendix with abscess or generalized peritonitis 1987
- Repair, diaphragmatic hernia (esophageal hernia); trans thoracic 2002

**Family** (3) (+/-) (+) Add

- Mother: Breast cancer, Cataract
- Father: Hypercholesterolemia, Cancer of prostate, Heart Disease, CHF - Congestive heart failure
- Brother: Cancer of colon

**Vitals & Measurements** (Last 2 years) (+/-) (+) Add

	Latest Result	Previous Result(s)
T:	133.6 12 days ago	137.5 12 days ago
BP:	120/156 12 days ago	126/60 12 days ago
HR:	86 12 days ago	70 12 days ago
RR:	124 12 days ago	112 12 days ago
WT:	115 12 days ago	92.00 12 days ago
BMI:	26.59 12 days ago	27.46 12 days ago
Pain:	NA	--

**General Labs** (Last 2 years)

	Latest Result	Previous Result(s)
Hgb:	111.0 12 days ago	15.0 12 days ago
K+:	4.5 12 days ago	4.0 12 days ago
Cr:	5 12 days ago	1.0 12 days ago
Glucose:	1295 12 days ago	1470 12 days ago
HbA1c:	17.0 12 days ago	18.0 12 days ago
LDL:	127 12 days ago	133 12 days ago

**Health Maintenance** (9 Overdue) (2 Due) (+/-) (+) Add

- Prostate Cancer Screening 10/1/09
- Colonial Screening 10/04/10

**Immunizations** (4) (+/-) (+) Add

- hepatitis B vaccine 05/04/08
- influenza virus vaccine 05/02/08
- measles/mumps/rubella virus vaccine 02/02/08
- tetanus/diphtheria/tetanus 02/02/08

**Visits** (5 previous) (3 future)

Status	Date	Type	Location	Visit Reason
Post	05/25/09	Emergency	BW ED	Chest Pain-Other
Post	02/27/09	Inpatient	GI	
Post	02/04/09	Inpatient	BW Hospital	
Post	02/03/08	Inpatient	BW Hospital	Nausea
Post	08/01/07	Outpatient	BW Hospital	Nausea

**Social** (7) (+/-) (+) Add

- Alcohol: Low Risk
- Exercise: Occasional exercise
- Home/Environment: No Risk
- Nutrition/Health: Low Risk
- Sexual: Low Risk
- Substance Abuse: Denies Substance Abuse
- Tobacco: Denies Tobacco Use

**Overdue Quality Measures**

**New Order Entry** (+/-) (+) Add

Meds Labs Imaging Billing Other

- albuterol 2.5 mg, 2PM, 2PM qPR
- amoxicillin 500 mg PO, TID
- Augmentin 500 mg oral tablet 3xL PO, TID
- albuterol 2.5 mg PO, Once Daily
- levabuterol 0.63 mg/7 ml inhalation solution 3xL PO, 2PM, TID
- penicillin V potassium 250 mg PO, qPR
- Zosyn 1.25 g 3xL qPR

**Scratch Pad**

Select Order

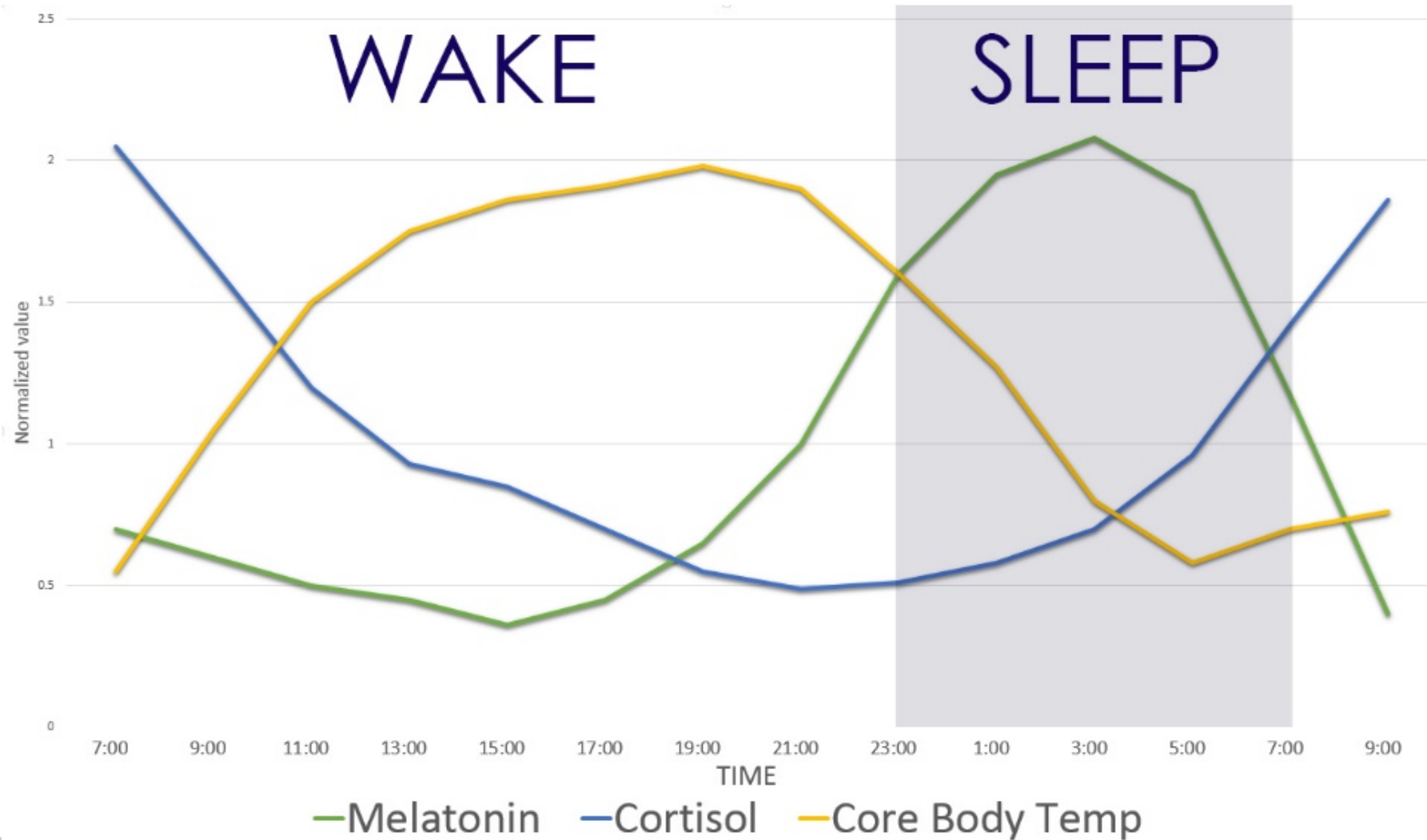
No Orders on Scratch Pad

Search Order Submit for Signature

**Outstanding Orders**

This component is not yet available

# CIRCADIAN RHYTHMS

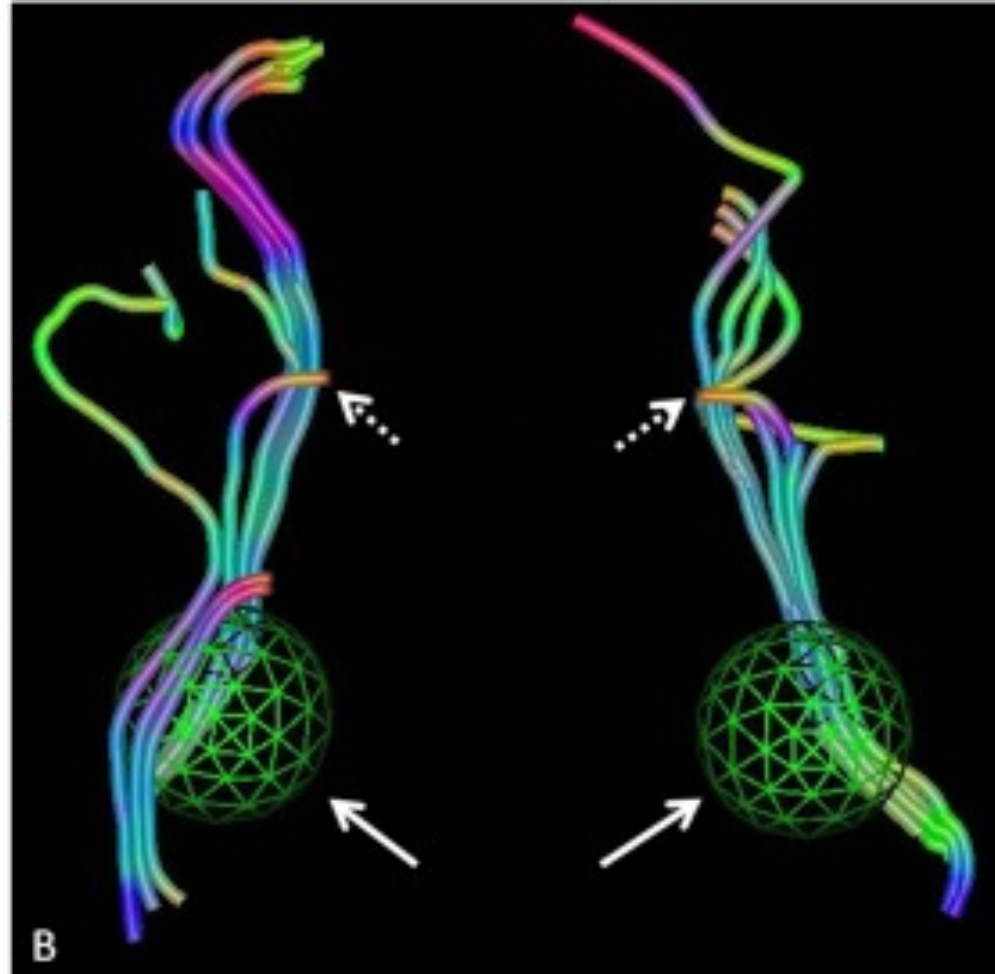
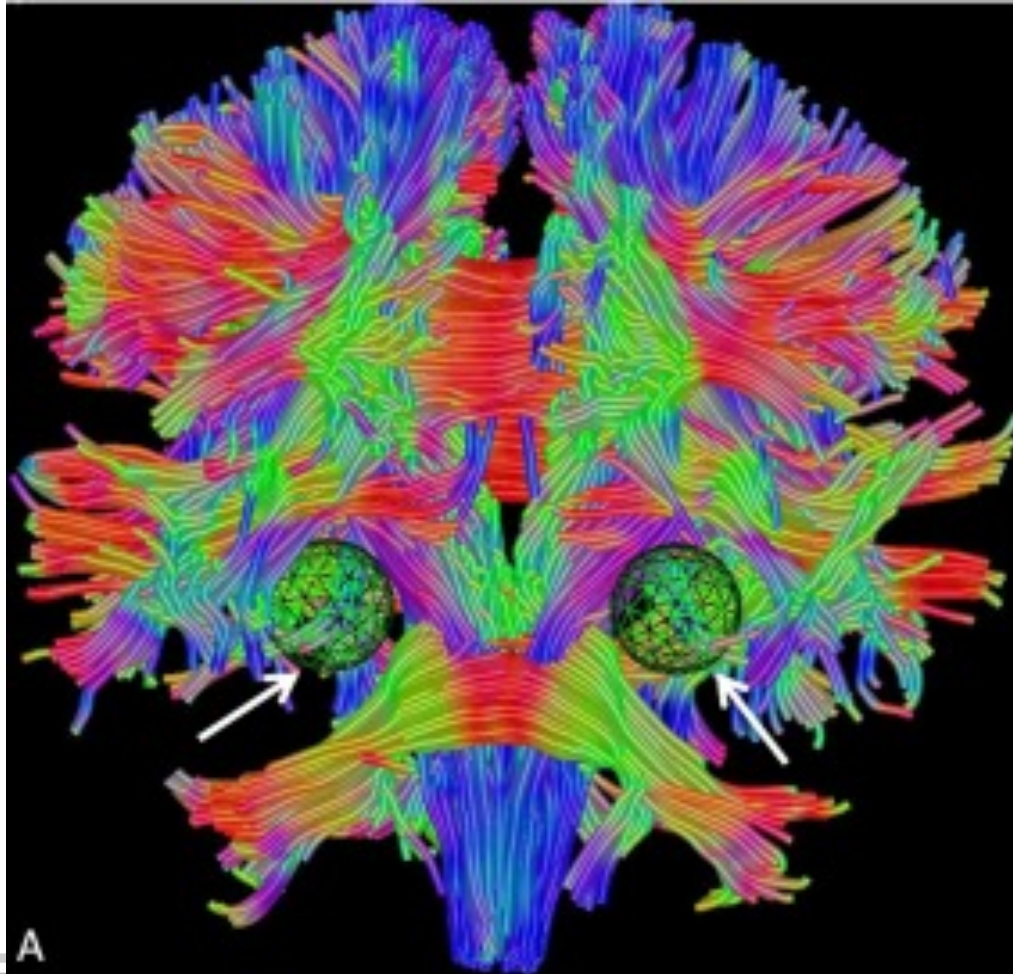


# Tunable Lighting

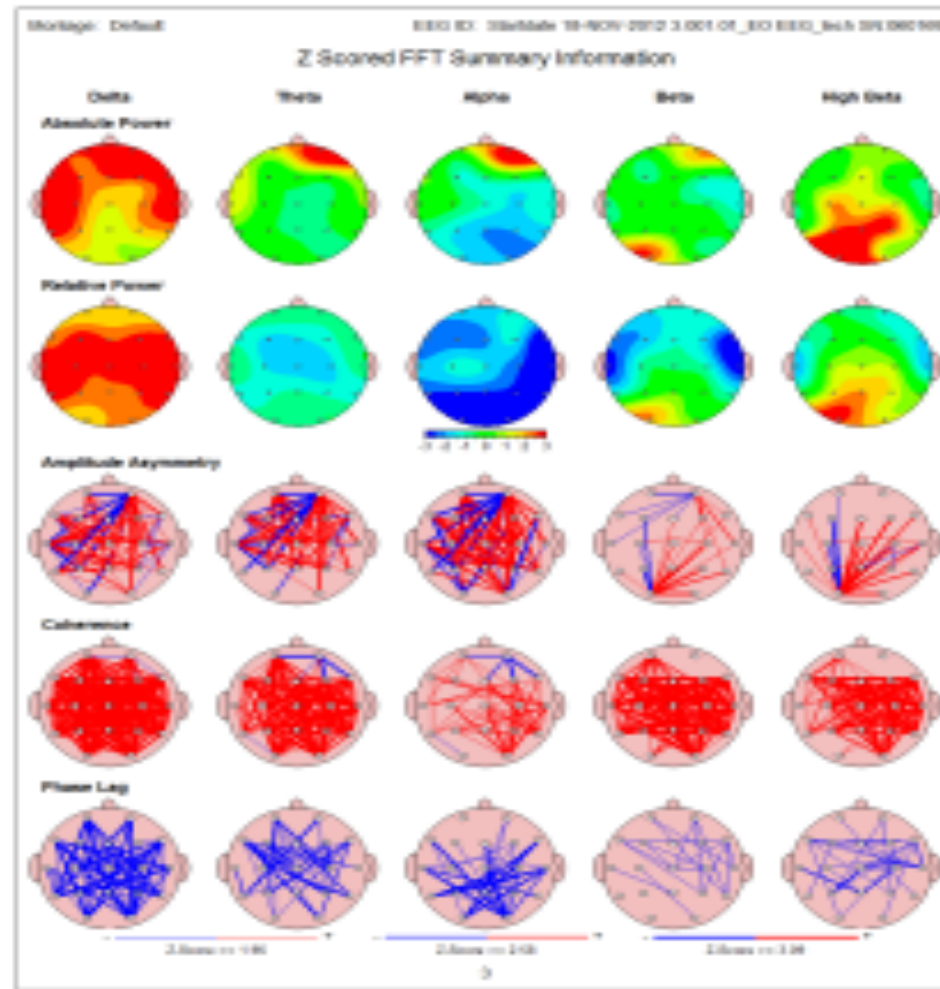




# Advanced Imaging at CHE



# BEAM: Brain Electrical Activity Mapping





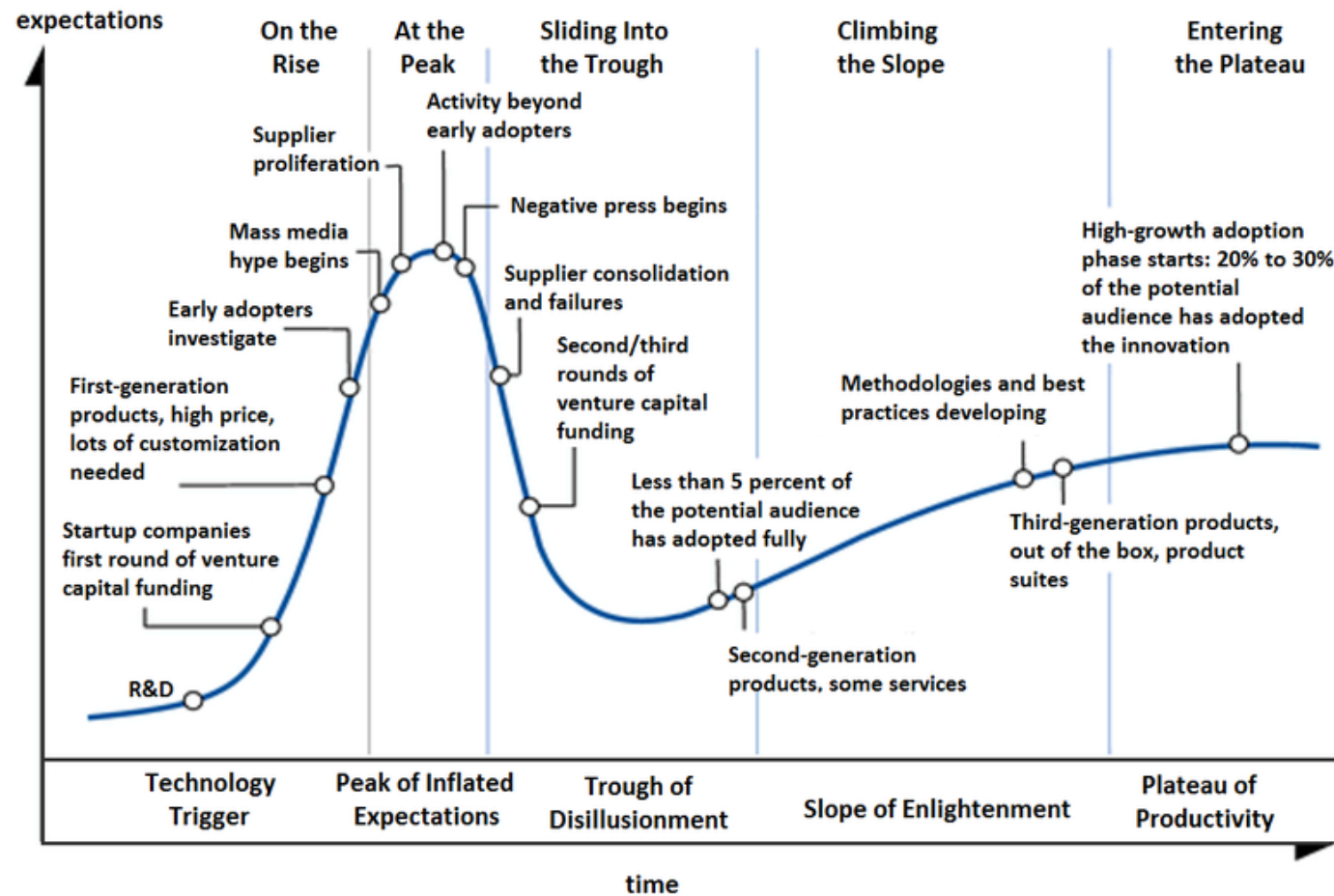
# The Near Future

# Roy Amara



- We tend to overestimate the amount of change in the short run and under estimate change in the long run.

# Roy Amara's Law



# 5G



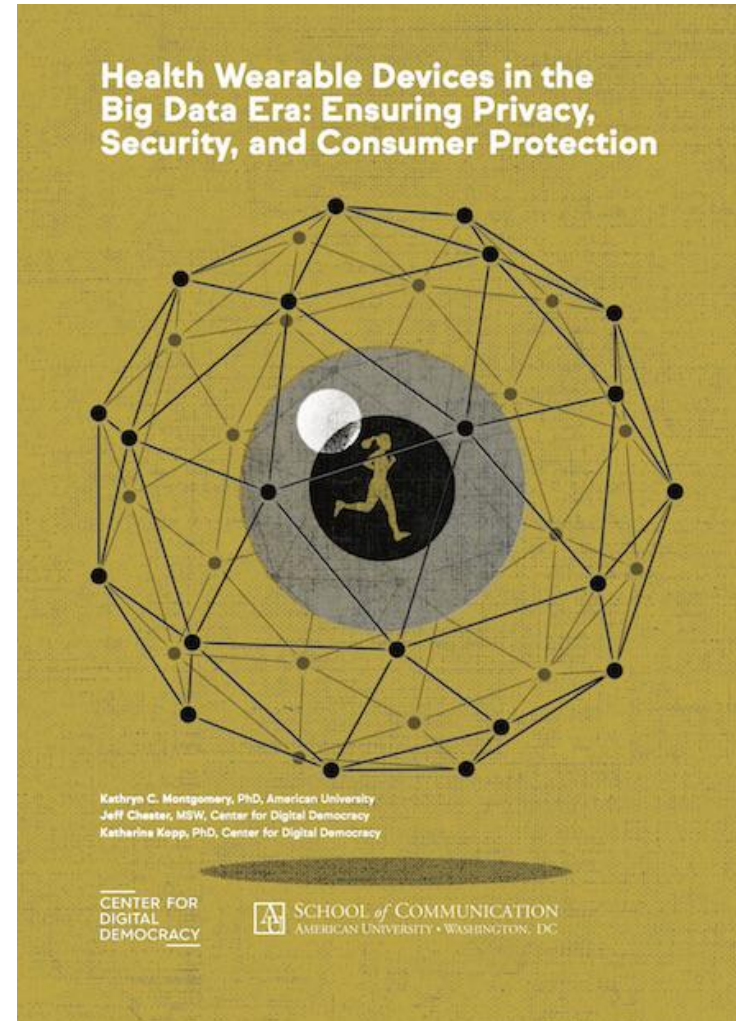
- 20 gigabyte/second; whole Blue Ray movie (25-50 GB) in three seconds
- Sub millisecond latency; essentially instantaneously enabling autonomous vehicles
- Control of remote devices
- Much lower power requirements



# Augmented Reality



# The Internet of Things





# Applications of “Big Data”



## Takeaways

### ***Suicide Risk:***

An opt-in risk assessment and intervention routing system ALREADY exists. We just need to deploy this at scale, through the responsible interface with medical practitioners and social workers.

### ***Mass Shootings:***

Public surveillance and risk prediction, that ALSO protects personal rights IS possible through proper training. One that enables law enforcement and community preservation, where citizens are innocent before proven guilty.

### ***Insider Threat:***

Agencies can incorporate motive models into their behavioral characterizations, rather than be blindsided.

### ***Funding:***

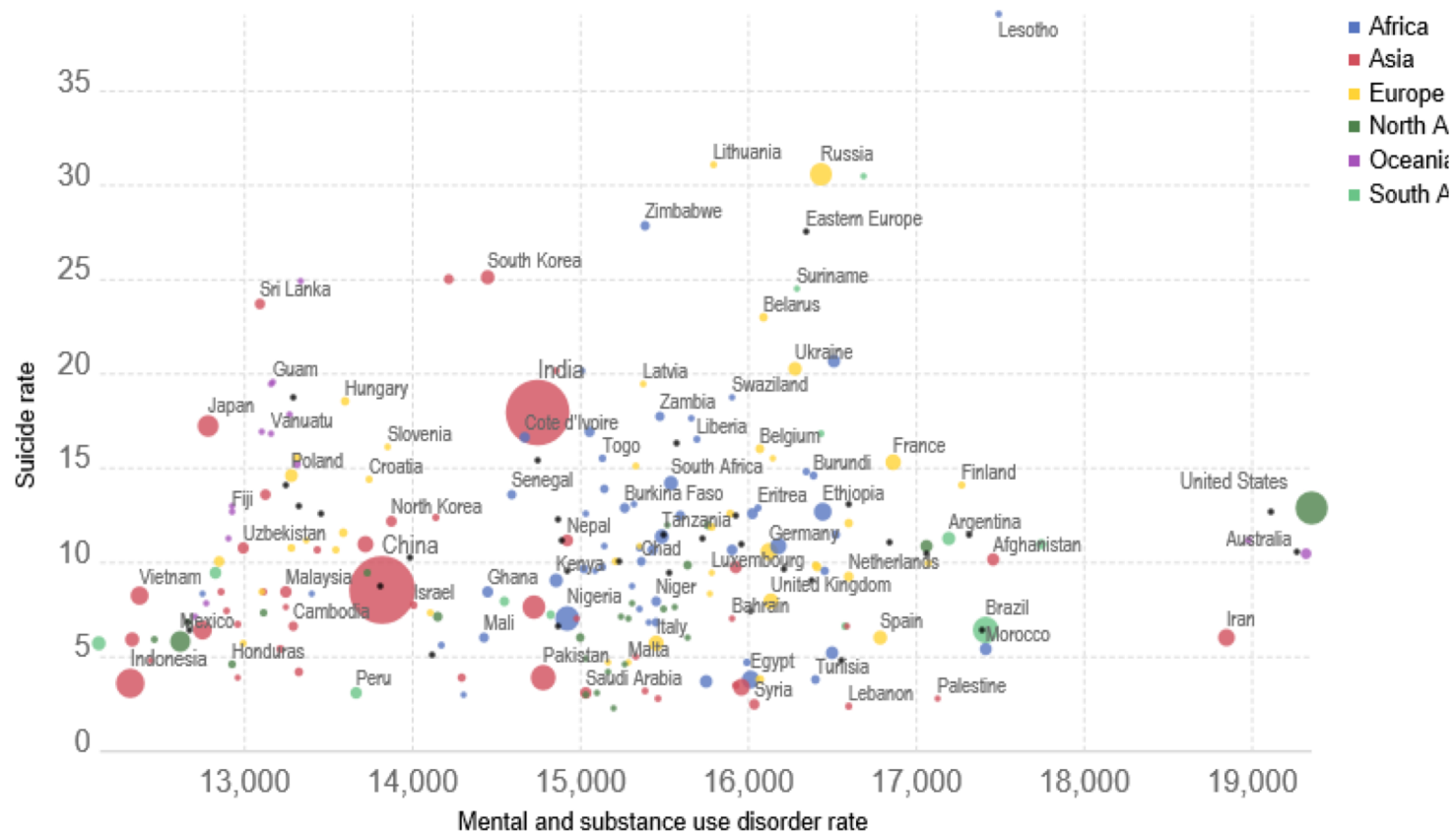
No government agency has an existing mandate to rise to the challenge.

# Suicide as an Epidemiological Example

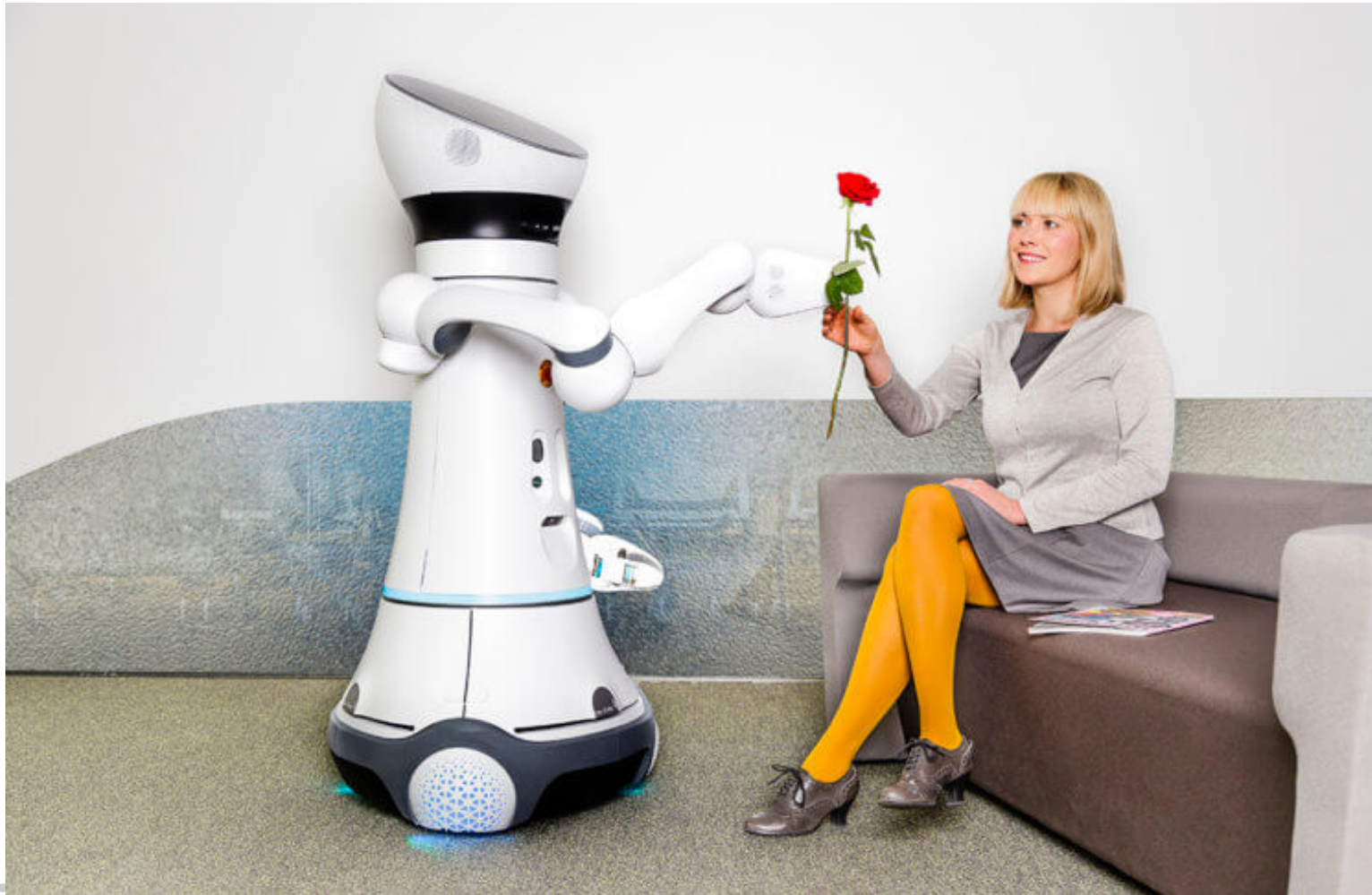


## Suicide death rates vs. prevalence of mental and substance use disorders, 2016

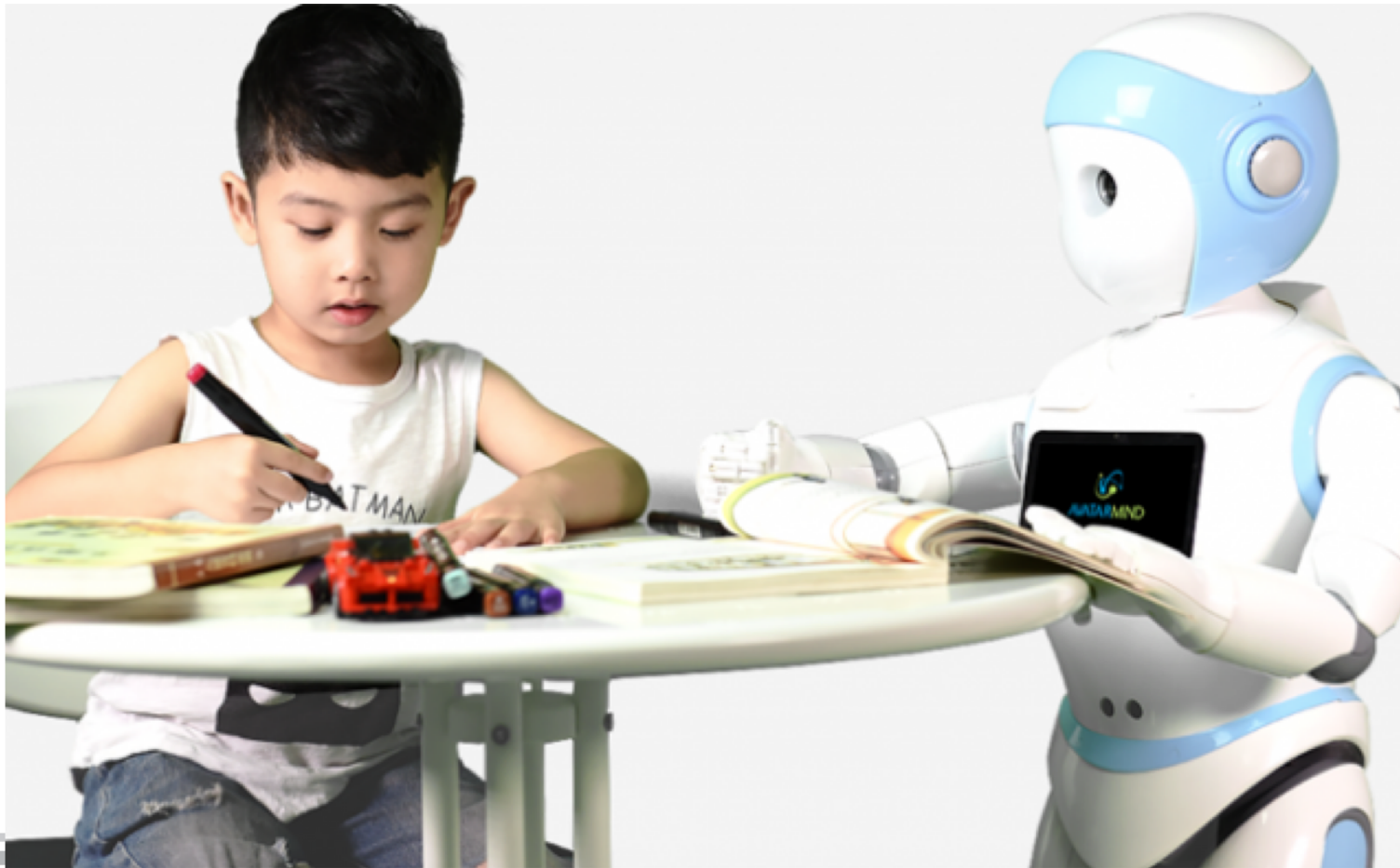
Age-standardized suicide death rates, measured per 100,000 individuals versus rates of mental and substance use disorders per 100,000 individuals. This includes depression, anxiety, bipolar, eating disorders, alcohol or drug use disorders, and schizophrenia.



# Robotic Companions



# Robotic Therapists



# Robotic Attendants

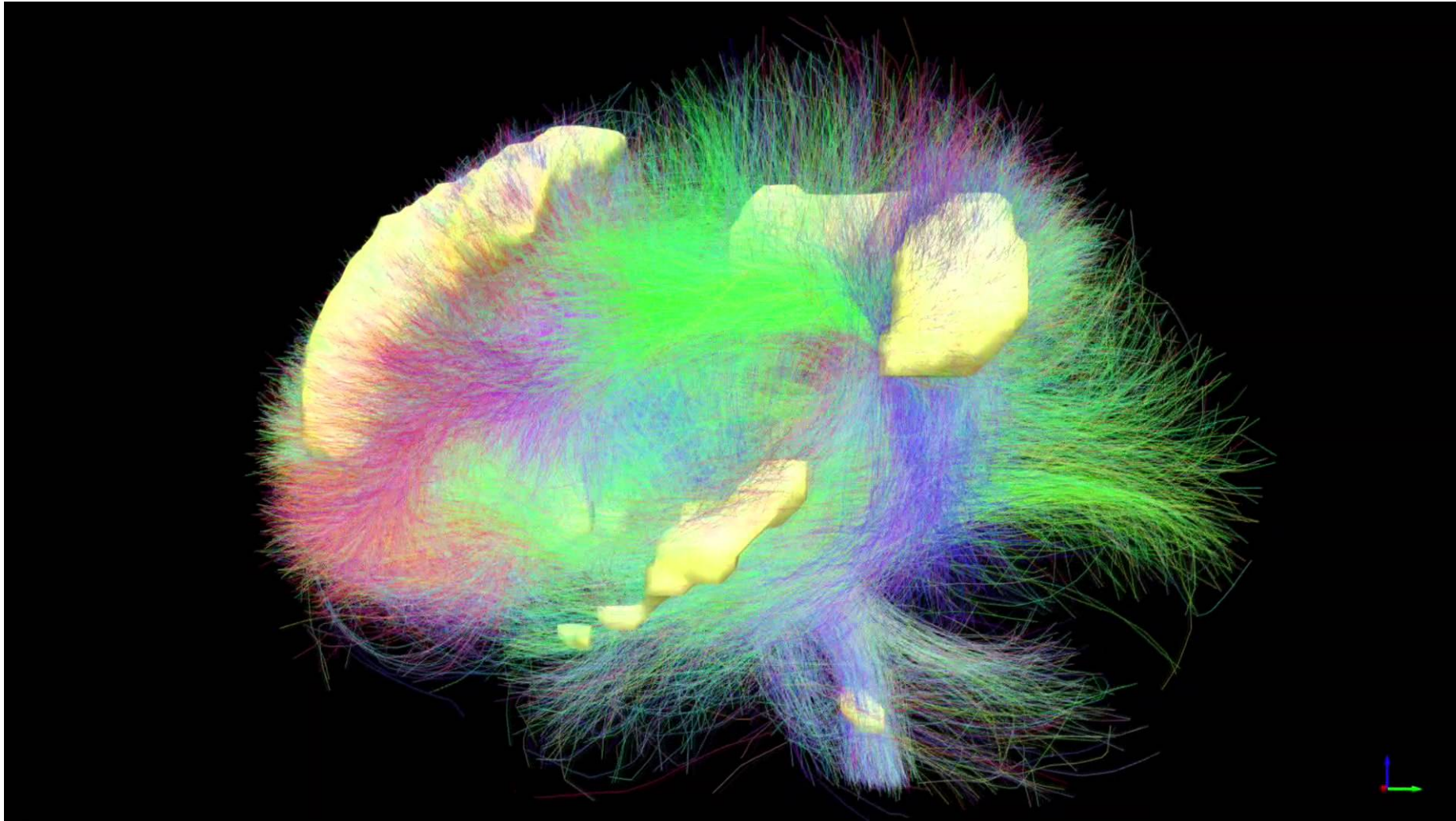




# Magnetoencephalography

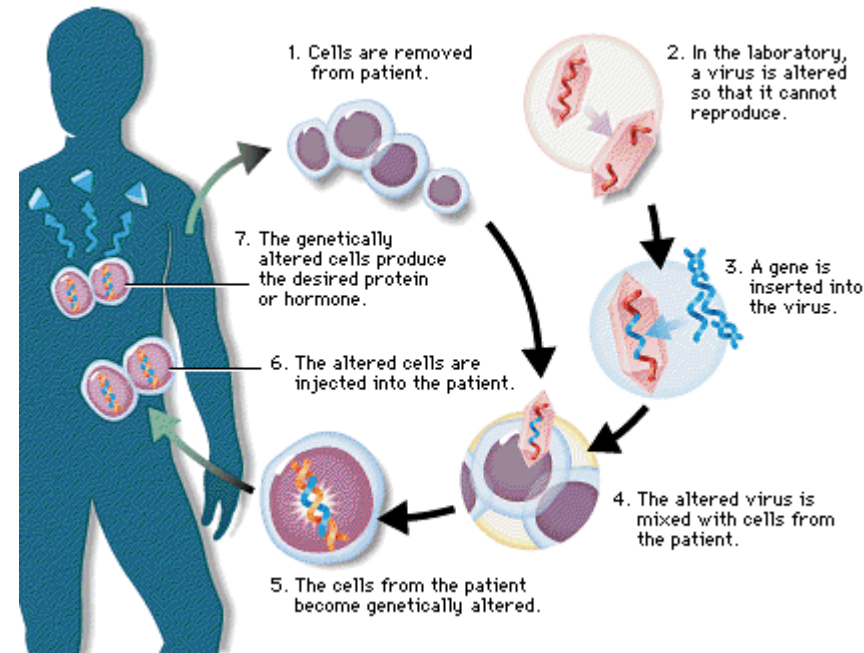
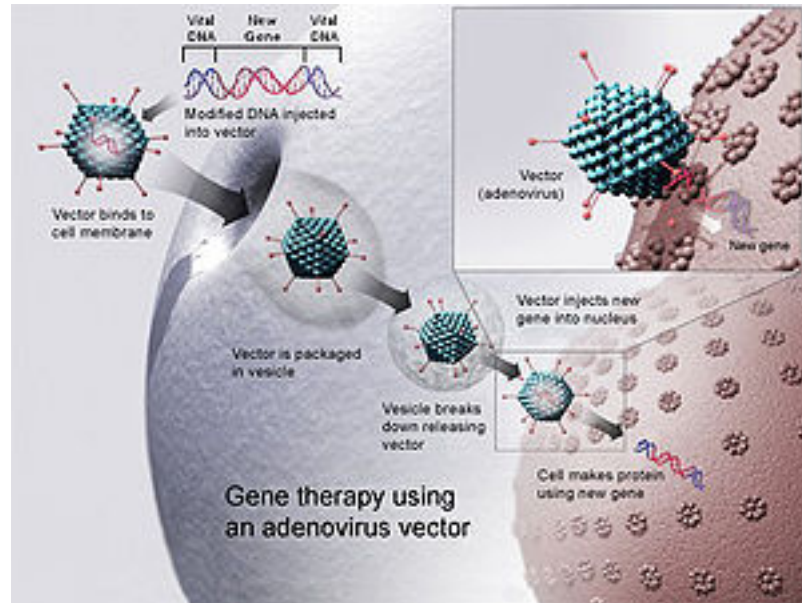


# The Connectome



Viral Barcoding  
Cold Spring Harbor  
Laboratory

# Gene Therapy and Epigenetics





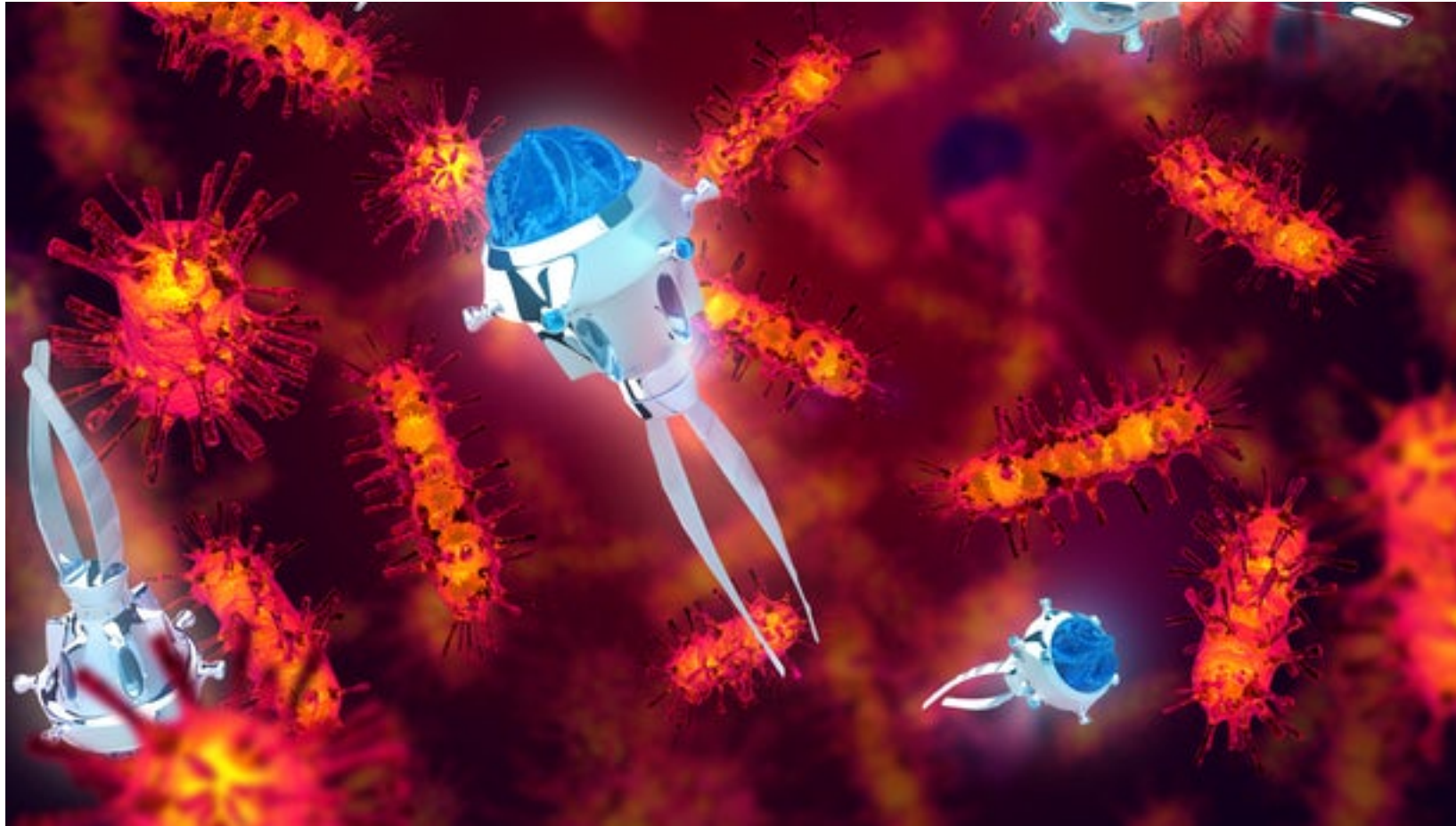
# Gamma Knife





# The “Far” Future

# Nanometer Technology



# AI and the Singularity



Ray Kurzweil

Google's Director of  
Engineering

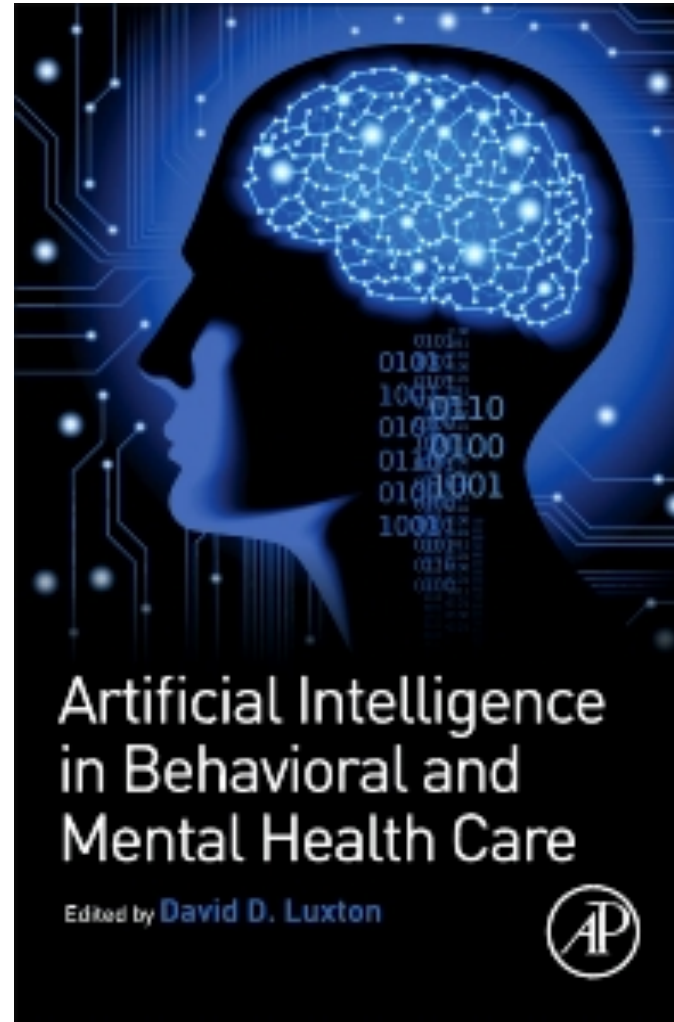
AI will equal human  
intelligence by 2045

Masayoshi Son

Softbank CEO

Super intelligent machines  
by 2047

Deep Learning Neural Networks  
achieving new milestones routinely

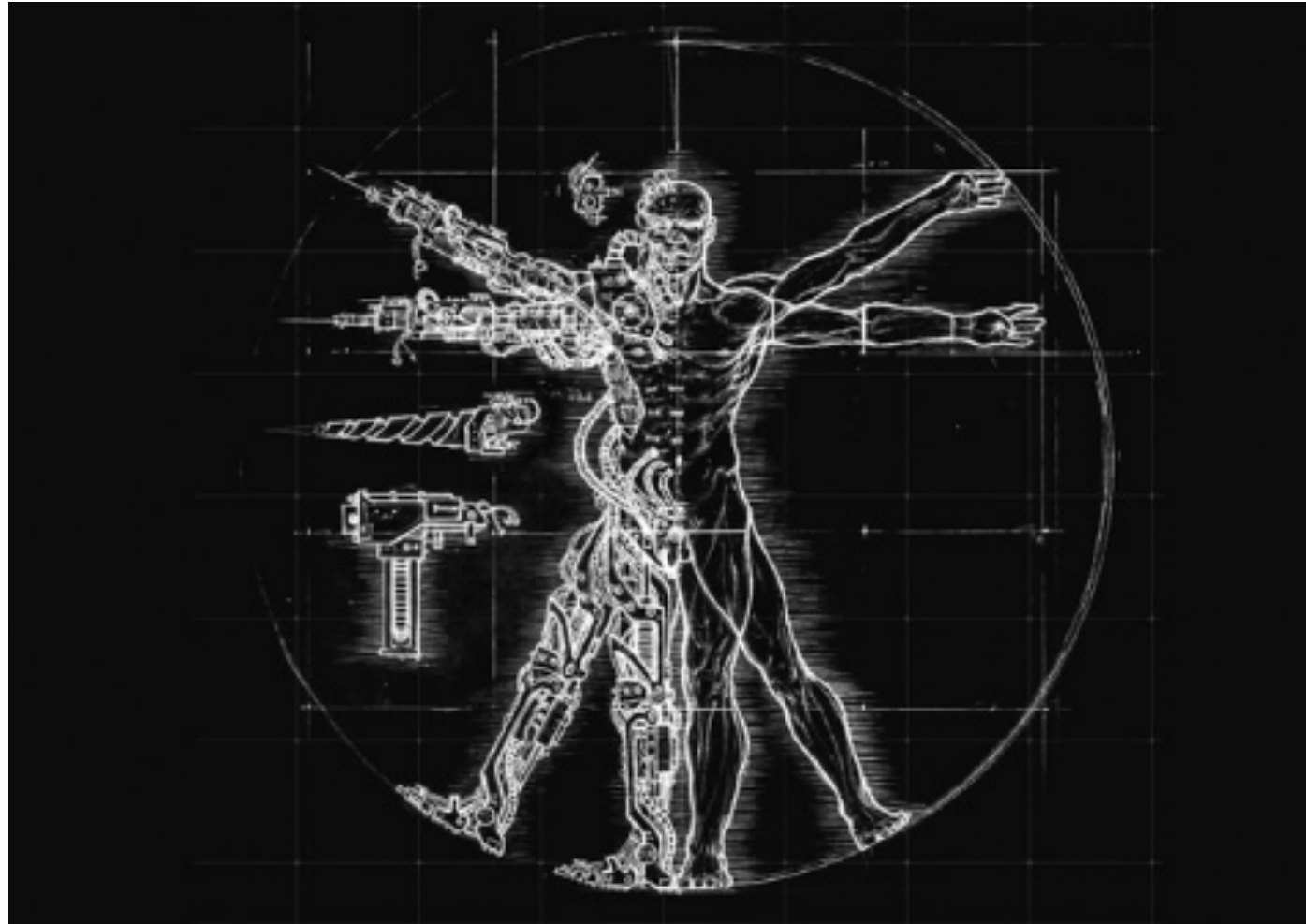




# Repairing Quorra



# Human/Machine Neural Interfaces





# This is Not Science Fiction



## Invasive and Non-Invasive Neural Interfaces: Forecasts and Applications 2018-2028

*Brain machine interfaces and brain computer interfaces*

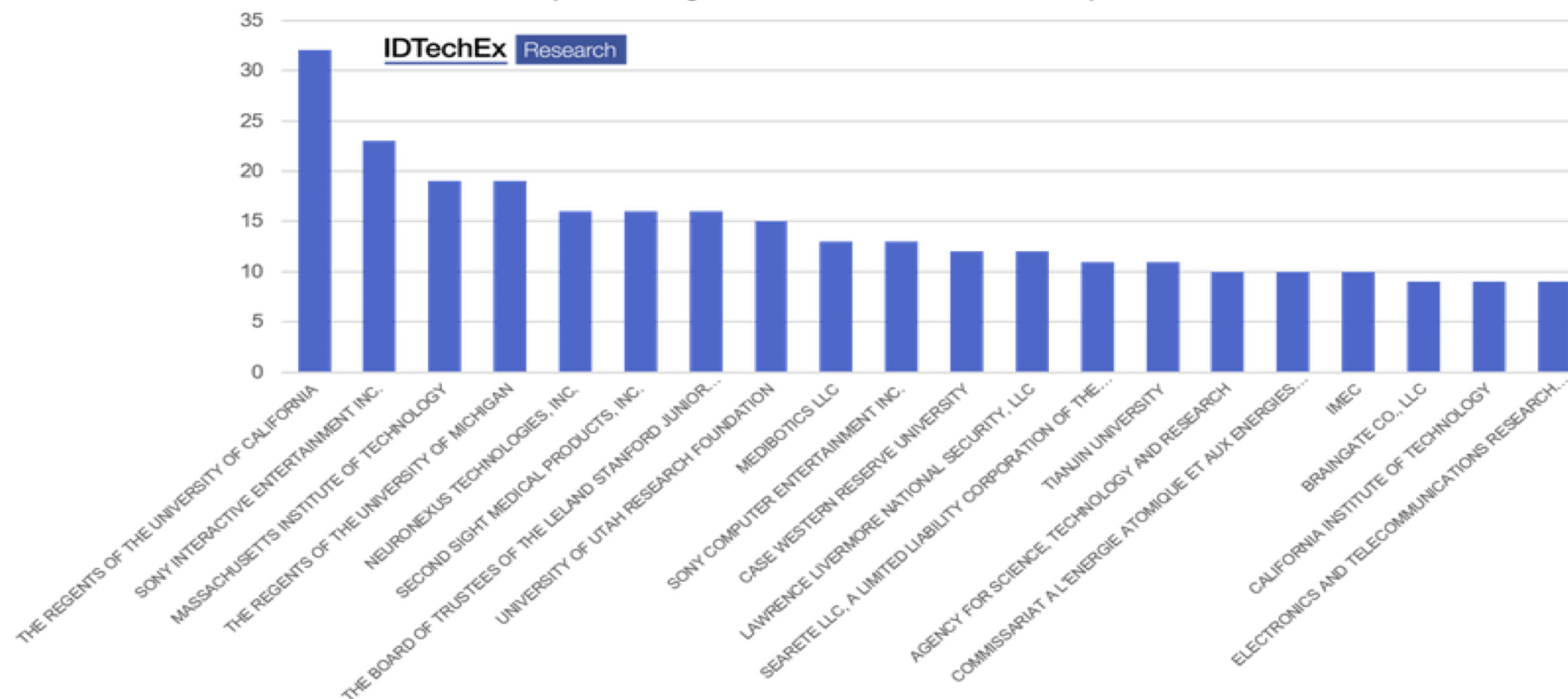
IDTechEx Research



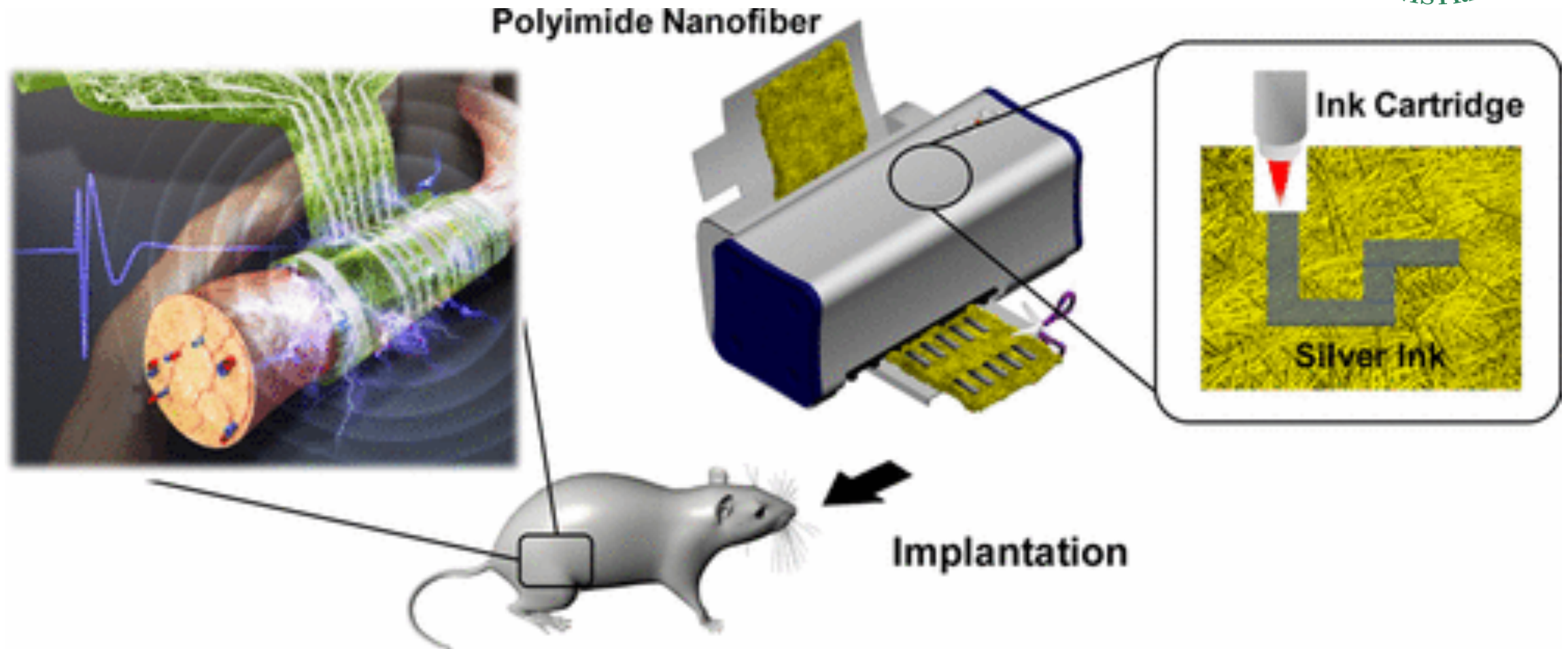
# It's Coming Faster Than We Can Imagine



Top 20 assignees for "neural interface" patents



# Nanofiber Neural Interface Electrode





# Spinal Stimulation





# Yin and/or Yang???



# Or Simply Fashion?



Would an  
implantable neural  
interface from Apple  
have the same cache  
as an iPhone?

# One Final Thought...



(Bill Watterson)

izquotes.com

# Philosopher Hobb(e)s

