



Creating an Age of Abundance: The Power & Implications of Exponential Change

Peter H. Diamandis, MD





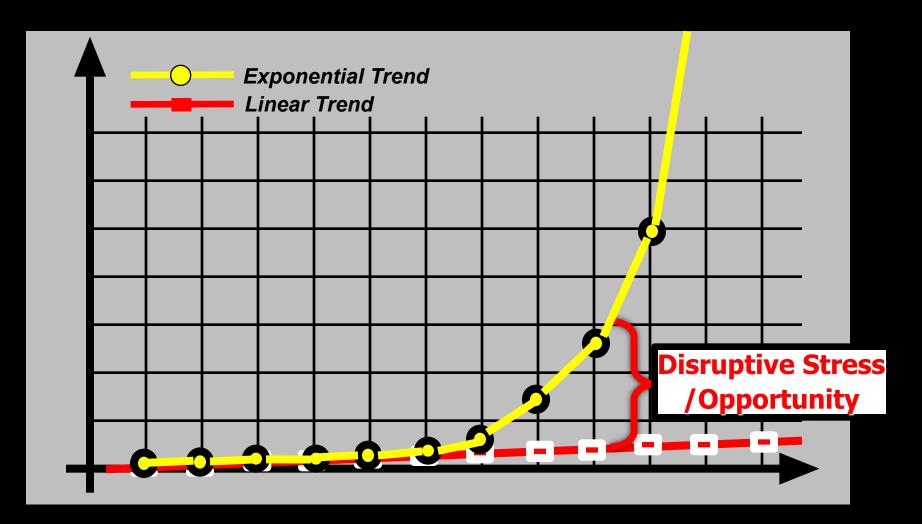
We are living during the most extraordinary time in human history



Human development over 150,000+ years...



EXPONENTIAL + GLOBAL



LINEAR --> EXPONENTIAL







1996

2012

April 2012

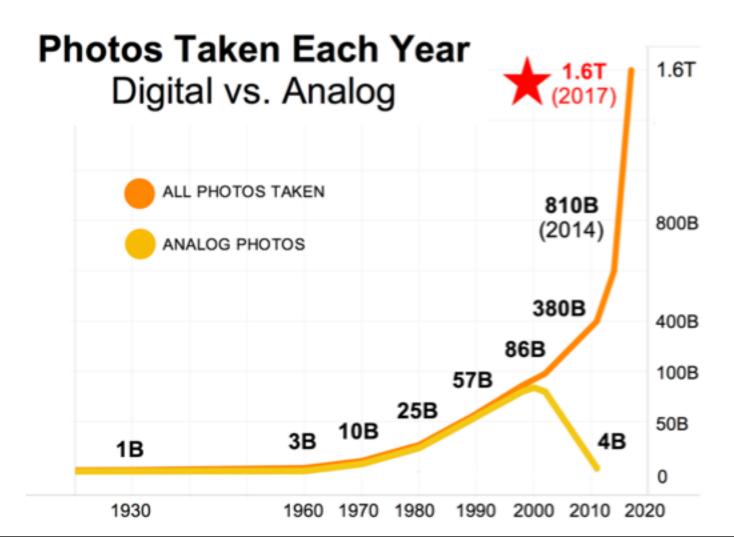
MarketCap: \$28B Bankrupt MarketCap: \$1B

Employees: **140,000**

Employees: **17,000**

Employees: 13

"The New Kodak Moment"

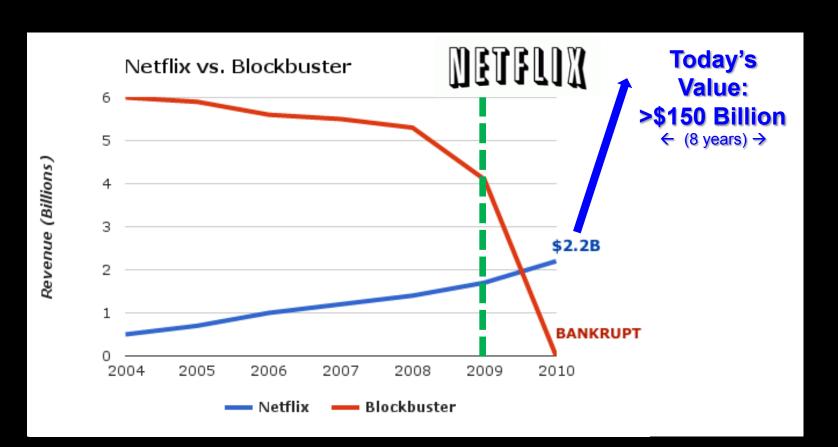




\$100 BILLION 1 BILLION

OVER \$100 BILLION, REACHING 1 BILLION MONTHLY ACTIVE USERS IN JUNE 2018

LINEAR --> EXPONENTIAL



"Neither RedBox nor Netflix are even on the radar screen in terms of competition."

- Jim Keyes, CEO, Blockbuster, Dec'08

HOW FAST CAN THINGS CHANGE?

<u>COMPANY </u>
--

Sears \$14.3B

JCPenney \$18.1B

NORDSTROM \$12.4B

KOHL'S \$24.2B

★MOCYS \$24.2B

\$28.4B

O TARGET \$51.3B

Walmart > \$214.0B

amazon \$17.5B

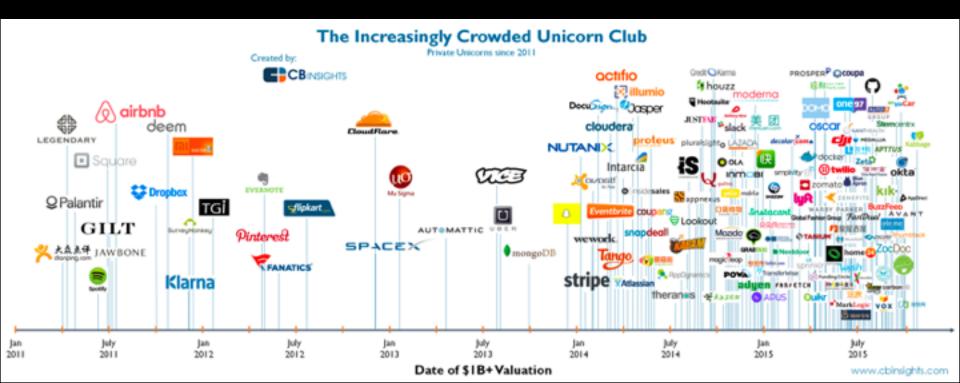
HOW FAST CAN THINGS CHANGE?

COMPANY	VALUE (2006)	VALUE (2016	<u>% Change</u>
sears	\$14.3B	\$0.9B	94%
JCPenney	\$18.1B	\$1.7B	90%
NORDSTROM	\$12.4B	\$7.7B	38%
KOHĽS	\$24.2B	\$7.1B	71%
*macys	\$24.2B	\$7.1B	71%
BEST	\$28.4B	\$18.4B	41%
O TARGET	\$51.3B	\$31.7B	38%
Walmart >'<	\$214.0B	\$243.9B	15%
amazon	\$17.5B	\$474B	>\$820B

Source: Yahoo Finance & visualcapitalist.com

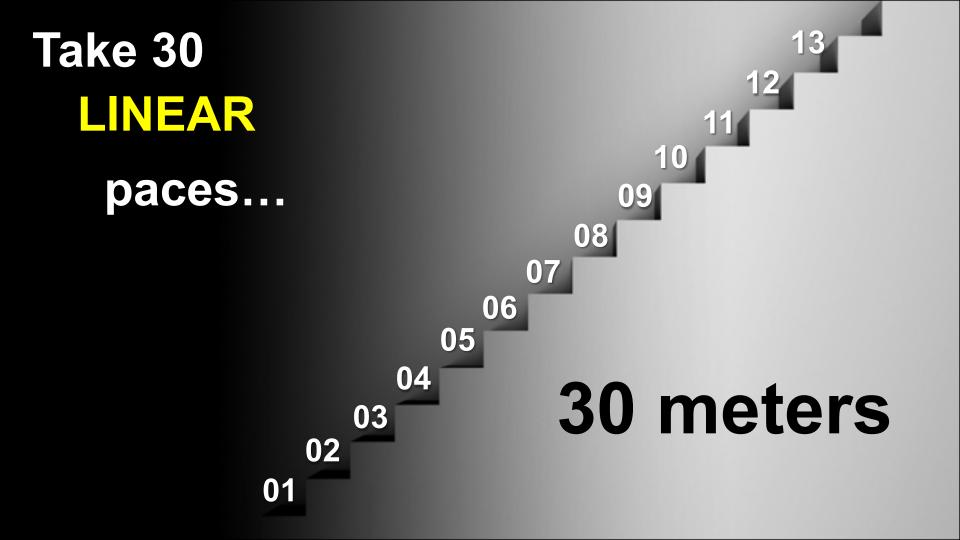
"I've got an Idea!"

→ "I run a \$Billion company."

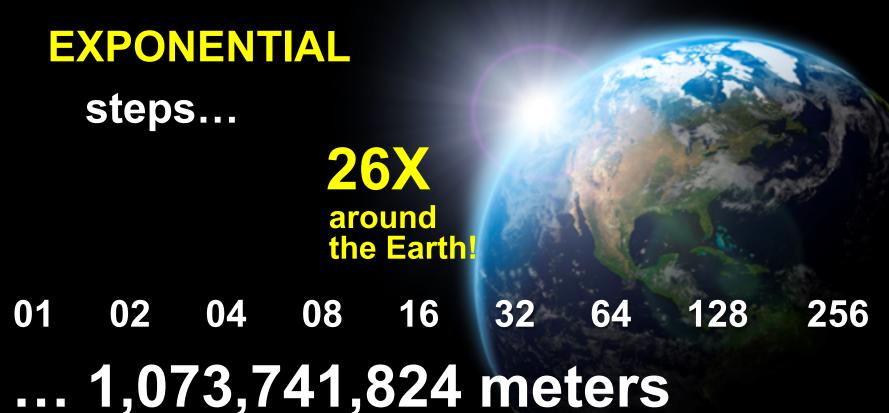








Take 30



Moore's Law



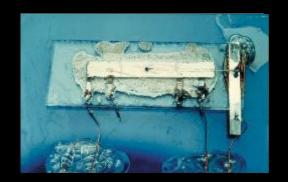
1965 Publication:

"# of transistors doubled every year from between 1958 until 1965."

Moore's Law has lasted 50+ years...

Integrated Circuits

1958: 2 Transistors



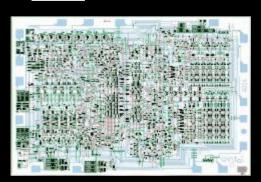
Transistor Count: ½ inch

Gate Process Length:

Speed:

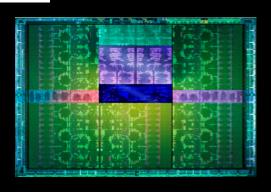
Cost Of A Transistor:

1971: Intel 4004



2,300 Transistors 10.000 Nanometers 740 KHz (.00074 GHz) ≈ \$1 (1968)

2018: Intel Core i9-8950HK



> 7 **Billion** Transistors*

14 Nanometers

4.80 GHz

≈\$.0000024

← 6.5K (faster) & 4.2M (cheaper) → 27+ Billion-fold improvement (47 yrs.)

* This is an estimate, as Intel no longer discloses transistor count



2005





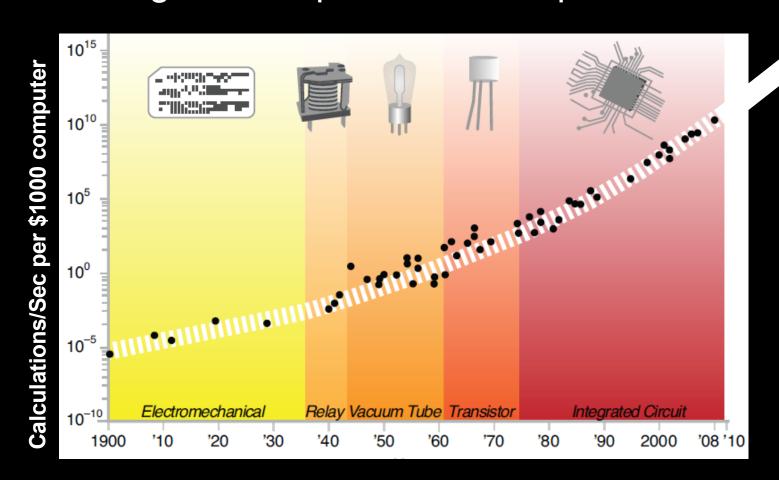
← A 10 Trillion-fold Improvement →

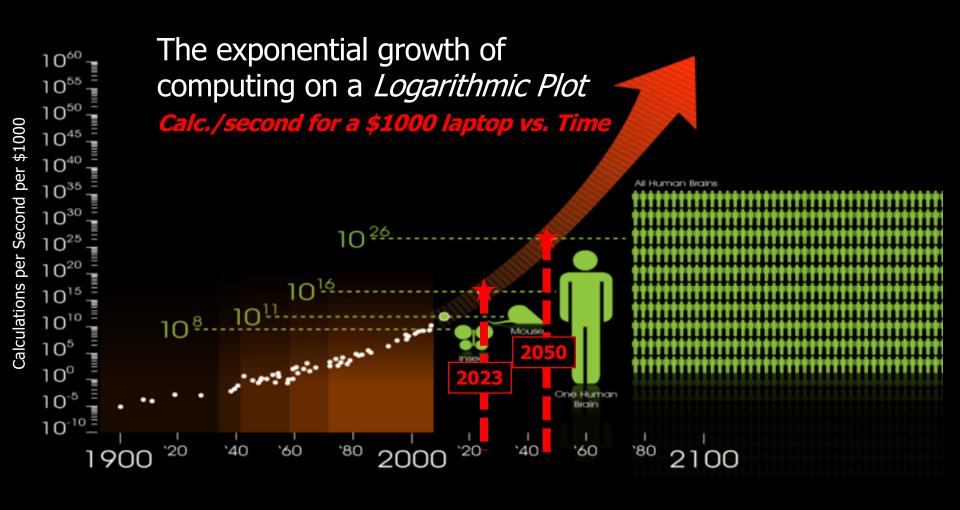
IBM 350 for IBM 305 RAMAC

128 Mbytes - \$99

128 Gbytes \$9

5 Paradigms of Exponential Computational Growth





Convergence → New Biz Models & Ecosystems

Networks & Sensors Synthetic Biology Faster, **New Business Robotics** Cheaper, Models & **3D Printing** Computing VR & AR **Ecosystems** Power **Artificial Intelligence Blockchain**

Implications of Exponentials (Scarcity -> Abundance)

(6D's Framework)

Creating Abundance



"Technology can take that which was scarce, and make it Abundant.."

Creating Abundance

What do you think of as scarce?

- 1. Energy 5. Time
- 2. Water 6. Money
- 3. Health 7. Expertise
- 4. Learning 8. Resources





16 million tons of rare earth oxides discovered – enough for the world's batteries, cell phones and electric cars for *hundreds of years*.

6D's Exponential Framework

Democratize Demonetize Dematerialized Disruptive <u>D</u>eceptive

<u>Digitized</u>
(Information Tech)





Demonetization



U B E R amazon.com



Tax Figets

Boo'(Stores

Long Distance



Research/Libraries

craigslist

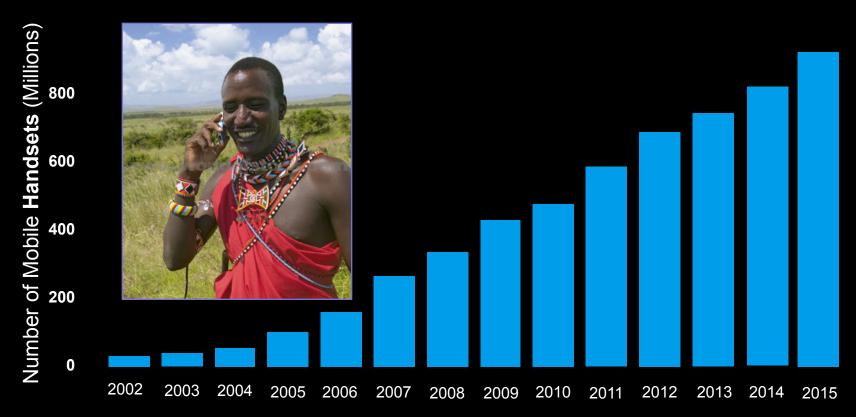
Classifieds



Hotel Chains

Democratization

African Mobile Phone Growth: > 1B in 2017

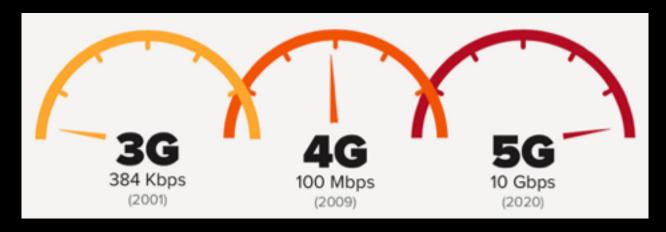


Implications of Exponentials

(Connecting The World)

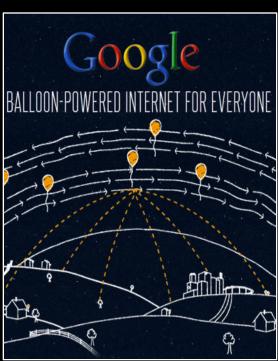
"Connecting the Globe..."

THE 5G 1. Testing in 2019 2. Deployment in 2020 WORLD 3. 10 - 100 Gbps speeds



"Explosion of Networks..."



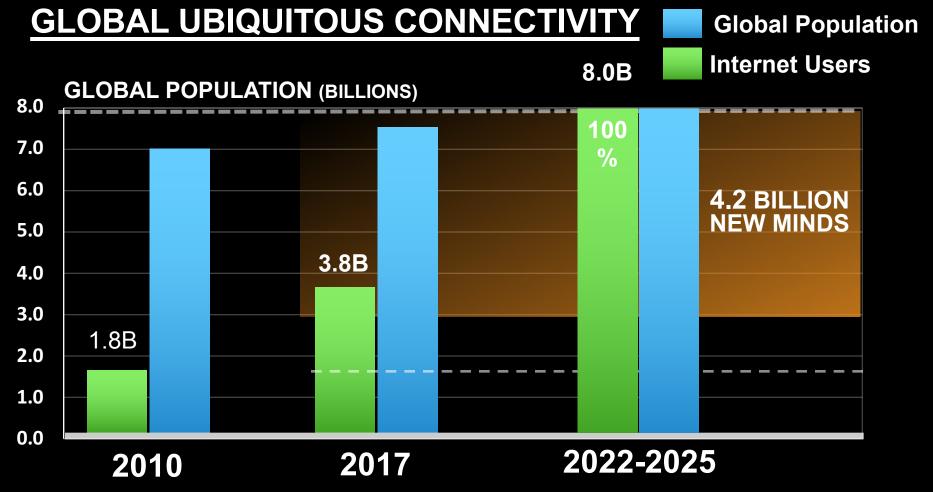




SPACEX GLOBAL INTERNET @ 1 Gb/sec 4,425 "STARLINK" SATELLITES (in 2019)



SpaceX plans <u>additional 7,500 satellites</u> in a lower orbit to boost capacity.



What will 4+ Billion New Minds...

create

discover

consume

desire

invent

...Tens of trillions of annual PP ...Greatest period of Innovation (ever)

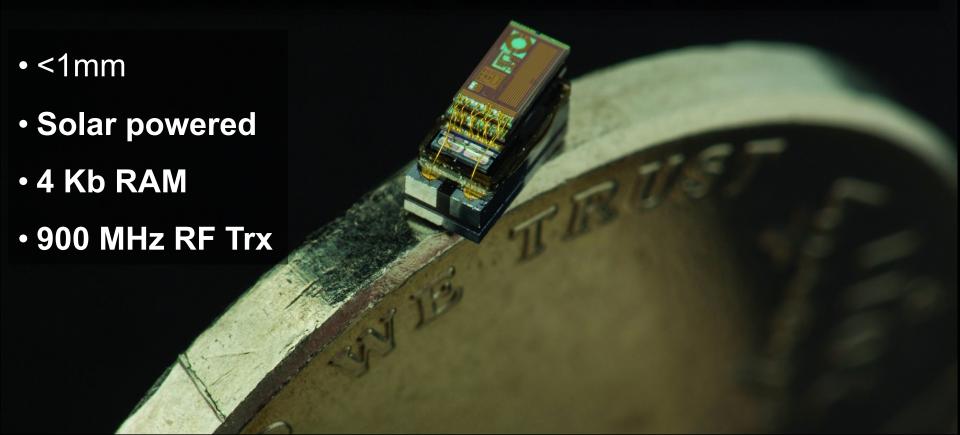
It's not just people being connected...

The Internet of Everything.

- 2020: > 50 Billion devices & 1 Trillion Sensors
- 2030: > 500 Billion devices & 100 Trillion Sensors

"A future of perfect knowledge, you can know anything you want, anytime, anywhere...."

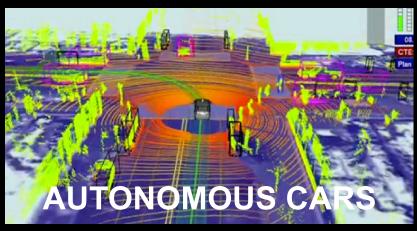
SMART DUST TO SENSE, STORE AND COMMUNICATE DATA ON DEMAND



Know Anything, Anytime, Anywhere









Implications of Exponentials

(Robotics & Transportation)







Paradigm Change: Robotics











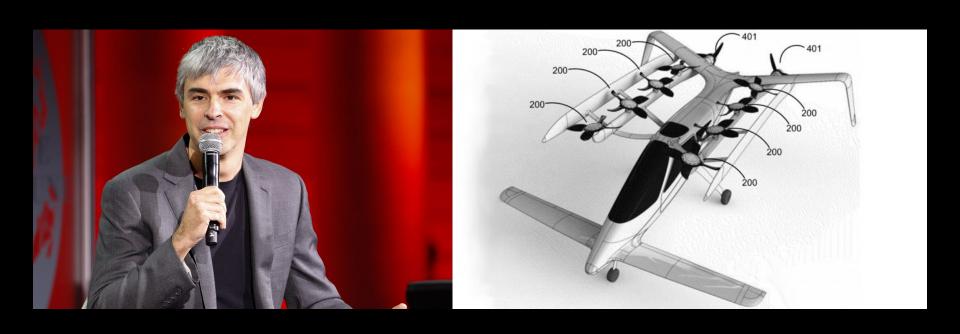
Waymo will deploy 20,000 electric Jaguar i-Pace vehicles by 2020. Compared to its current fleet of 600 self-driving Chrysler minivans

GM AUTONOMOUS CAR WITHOUT STEERING WHEEL OR PEDALS BY 2019



Experts Predict Death of Car Ownership in mid-late 2020's

LARRY PAGE FUNDING FLYING CARS



AIRBUS TESTS ELECTRIC-POWERED FLYING TAXI (2018)





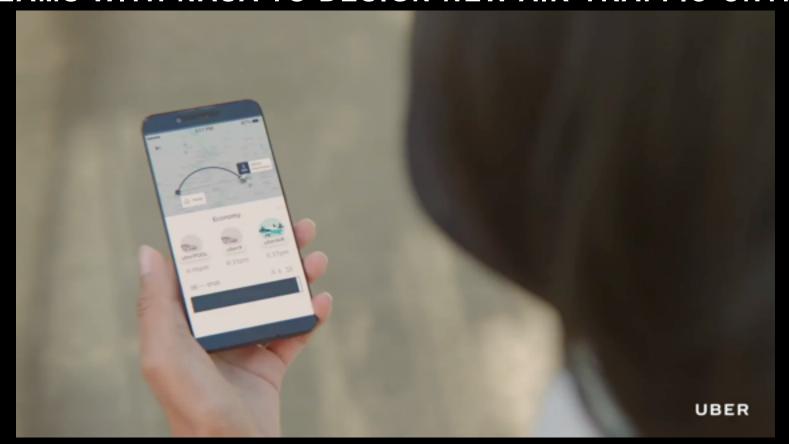
"BELL" ENTERS AIR TAXI RACE



In addition to AIRBUS and BELL, BOEING & EMBRAER & UBER... & 20 Startups.

>>\$1Billion invested to date.

UBERAIR: CLOSER THAN YOU THINK TEAMS WITH NASA TO DESIGN NEW AIR-TRAFFIC-CNTRL







VIRGIN HYPERLOOP ONE BREAKS 240MPH RECORD AND UNVEILS VISION 2030 POD





ANA XPRIZE

- \$10 Million Prize Purse
- Transmit your Senses & action to a Robotic Avatar.
- Disaster relief, health assistance
- 340+ Teams from 37 countries

Sponsor: ALL NIPPON AIRWAYS (ANA)

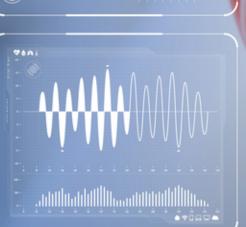


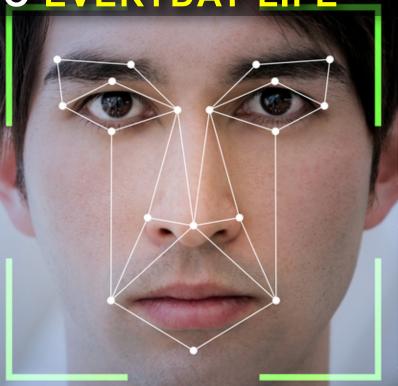
DEEPMIND BUILDS ALPHAGO ZERO, AN AI THAT LEARNS FROM SCRATCH



FACE++ IS INTEGRATING FACIAL RECOGNITION SOFTWARE INTO EVERYDAY LIFE







China can identify any of their 1.3 Billion Citizens in less than 3 seconds.

MEET 'AVA', AUTODESK'S VIRTUAL ASSISTANT AN EMPATHIC 'DIGITAL HUMAN'



GOOGLE DUPLEX AI / Personal Assistant



GOOGLE'S A.I. BUILT AN A.I. THAT OUTPERFORMS ANY MADE BY HUMANS



The A.I. was 82.7% accurate at predicting images – 1.2% better than any previous results.

Was also 4% more efficient than any preexisting human-built image recognition A.I.'s

AI MORE ACCURATELY PREDICTS IF DEFENDANTS ARE A FLIGHT RISK



Algorithm uses data from hundreds of thousands of NYC cases to predict if defendants should be granted bail, without any racial bias

FDA APPROVES ALGORITHM TO PREDICT SUDDEN DEATH (RESPIRATORY & HEART ATTACKS).



Implications of Exponentials



"Making 100 Years old, the new 60"



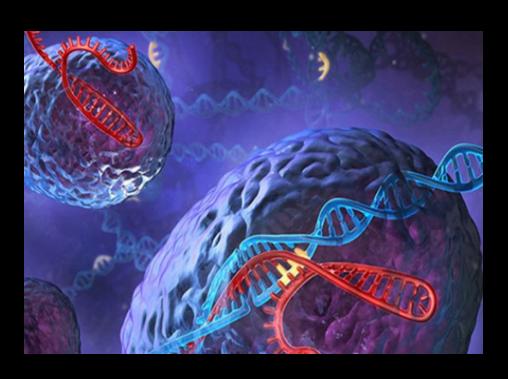


- Stem Cell replenishment (Celularity)
- Senolytic Medicines (Unity Bio)
- New Organs (United Therapeutics)
- mRNA (Moderna)
- Vaccines (United Neurosciences)
- GDF-11 (Elevian)
- Crisper/Gene Therapy (Editas)
- wnt Pathway (Samumed)

"Longevity Escape Velocity"

ILLUMINA: A \$100 GENOME IN 1 HOUR

CRISPR 2.0 CAN CHANGE A SINGLE NUCLEOTIDE, EASILY, ACCURATELY



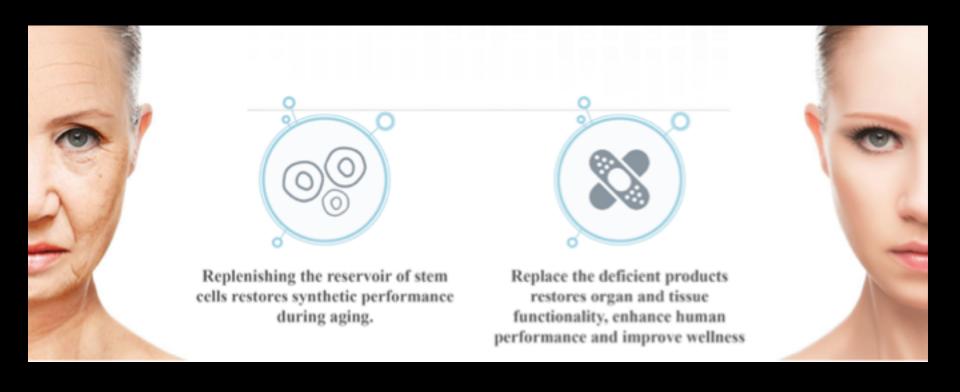
MIT & Harvard have discovered new "single base editing".

32,000 out of 50,000 diseases are caused by single-point mutations.

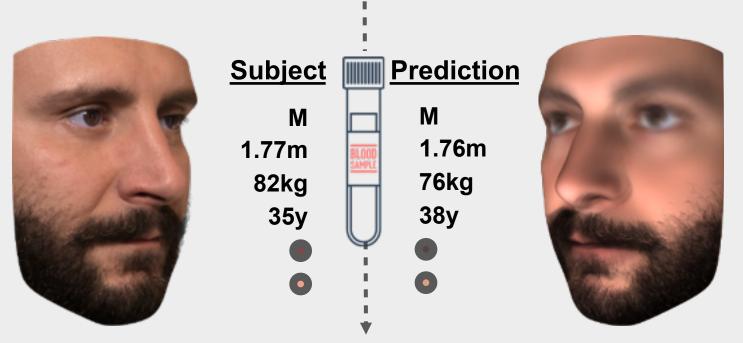




RECHARGING THE REGENERATIVE ENGINE



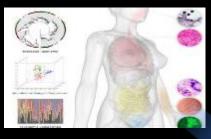
Your Genome Predicts your Medical Future Example: HLI FACE PROJECT



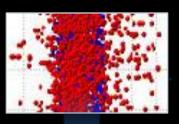
Dr. Riccardo Sabatini

Integrate Large-Dimensional Digital Data

Microbiome



Metabolomics



Full-body MRI



Human Genome



Millions/Integrated Health Records

Phenotype Data



Machine Learning/Data Mining

HEALTH NUCLEUS DATA CAPTURE

Collected
Heath Data
(6 hour visit)

OVER AN 8 HOUR DAY

1. WHOLE BODY

- MRI (Musculoskeletal/ Lipid Analysis)
- MRI (Organ Specific RSI)
- In Body Biometrics
- Over 70 Laboratory Diagnostic Tests
- 3D Forensic Imaging

2. SEQUENCING

- Whole Genome
- Metabolome
- Microbiome

3. BRAIN

- NeuroQuant® Brain MRI
- 3D T2 Brain MRI
- Diffusion MRI
- Neurocognitive Testing
- Quant. Gait Analysis

4. PULMONOLOGY

- Pulmonary Function
- Testing

5. CARDIO-Vascular

- Echo (2D, 3D, 4D)
- ECG
- CT Scan (Coronary Calcium Scoring)
- 2 Week Ambulatory Rhythm Testing

Results in the first 1200 Patients

HLI – HEALTH NUCLEUS (HNX) VISIT

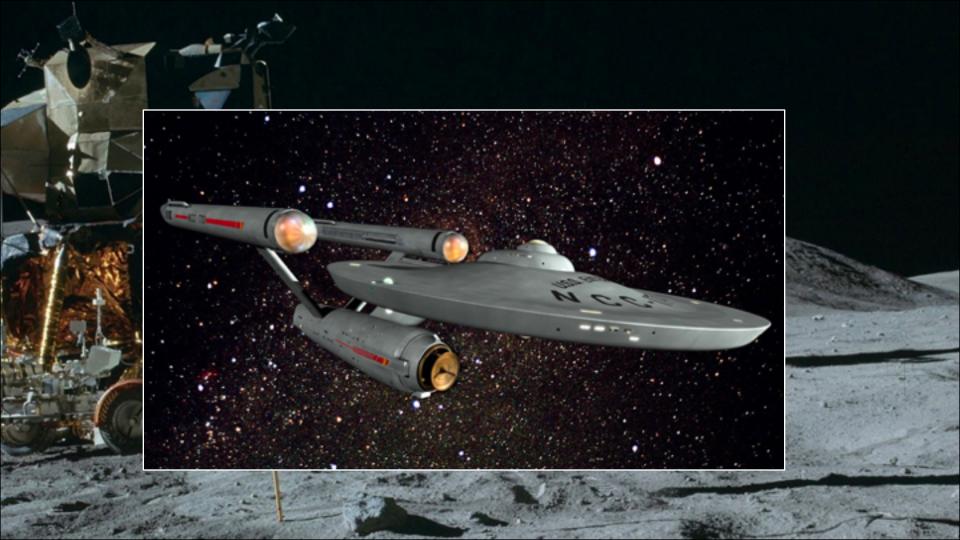
- 3 Hours
- San Diego (other locations next year)
- \$4,950 (1st Visit)
- \$2,950 (Annual Visit thereafter)

Interested?:

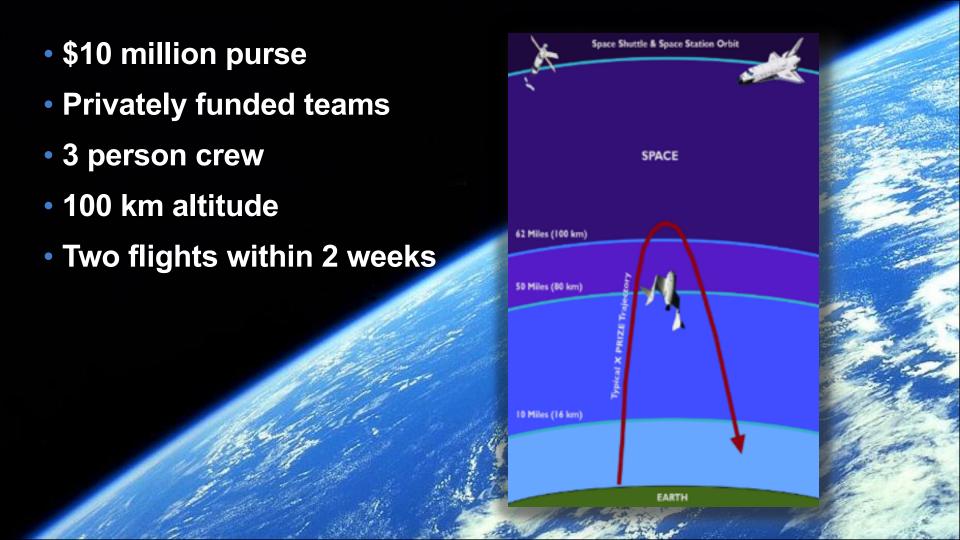
www.HealthNucleusVIP.com

Implications of Exponentials

(Crowd Sourcing Solutions)







WINNING THE ANSARI X PRIZE



ARCA



Space Transport

- 26 Teams
- From 7 Nations
- Spending > \$100 million



DaVinci Project



Canadian Arrow



Rocketplane



Armadillo Aerospace



StarChaser



Pablo DeLeon



Scaled Composites



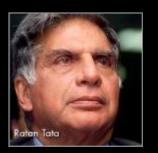




Board of Trustees & Benefactors



LARRY PAGE, CEO, Google



RATAN TATA Chairman, Tata Group



ARIANNA HUFFINGTON
Thrive Global



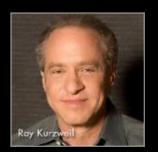
Dr. ANOUSHEH ANSARI Astronaut & CEO



JAMES CAMERON Filmmaker/Explorer



DEAN KAMEN, CEO, DEKA Research



RAY KURZWEIL Inventor & Futurist



ELON MUSK CEO, Tesla & SpaceX



JIM GIANOPULOS Chairman/CEO, FOX



WENDY SCHMIDT Schmidt Family Fndtn



LUNAR XPRIZE

IMPACT PROGRAMS

- Google awarded \$6.25 Million in Milestone and Diversity Prizes.
- \$30M purse drove \$300 million raised in Investment, Sponsorship & government Contracts
- Aerospace jobs created in India, Malaysia, Hungary & Israel.
- Major STEM education outreach







BARBARA BUSH FOUNDATION XPRIZE



- \$7 Million Prize Purse
- Develop mobile applications that focus on adults reading at or below a 3rd Grade level.
- Increase literacy a full grade within 12 months.
- Single largest Adult Literacy program in the **US for native speakers of English & Spanish**
- 109 registered teams

Sponsor: BARBARA BUSH FOUNDATION & DOLLAR GENERAL LITERACY FOUNDATION







- \$20 Million Prize Purse
- Convert the most CO₂ emissions from coal and natural gas plants into products with the <u>highest net value</u> i.e. building materials, alternative fuels
- 47 teams registered from 7 countries
- 10 finalist teams (April 9, 2018)
- Final testing June 2019 Feb 2020 in Wyoming and Alberta plants
- Competition ends March 2020

Sponsors: NRG ENERGY & COSIA

OCEAN DISCOVERY PRIZE®

- \$7 Million Prize Purse to map the Ocean Floor
- Map 500 Sq. Km in 24 hrs @ 2,000 & 4,000 meters depth
- Launch from shore or air
- Produce high res bathymetric map & chemical or bio signal source
- 32 teams registered from 22 countries
- 9 finalist teams announced (March 2018)

Sponsor: SHELL (\$6 million) & NOAA (\$1 million)







- \$1.75 Million Prize Purse
- Extract a minimum of 2,000 liters of water per day from the atmosphere
- Using 100% renewable energy
- Cost <2 cents per liter
- 98 teams registered (25 countries)
- 5 finalist teams remain (4 countries)





Implications of

Exponentials

(Abundance)



ABUNDANCE:

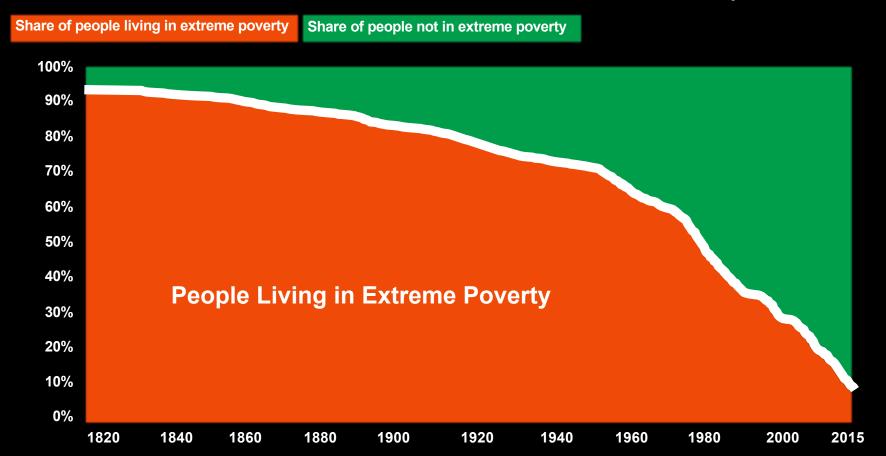
The Future Is Better Than You Think

"Why are you so positive about the future? Don't you watch the news?"

Evidence for Abundance

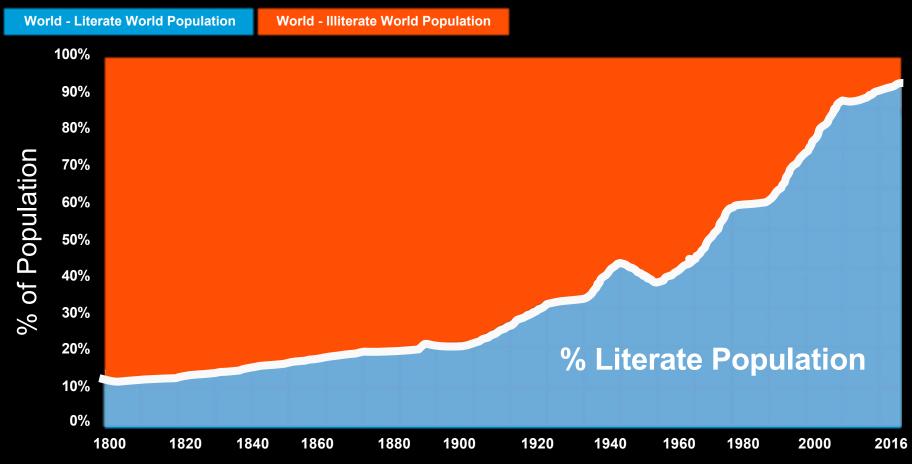
- (1) Global Income
- (2) Lifespan
- (3) Food
- (4) Energy
- (5) Transportation
- (6) Communications

% OF WORLD POP. LIVING IN EXTREME POVERTY (1820 – 2015)



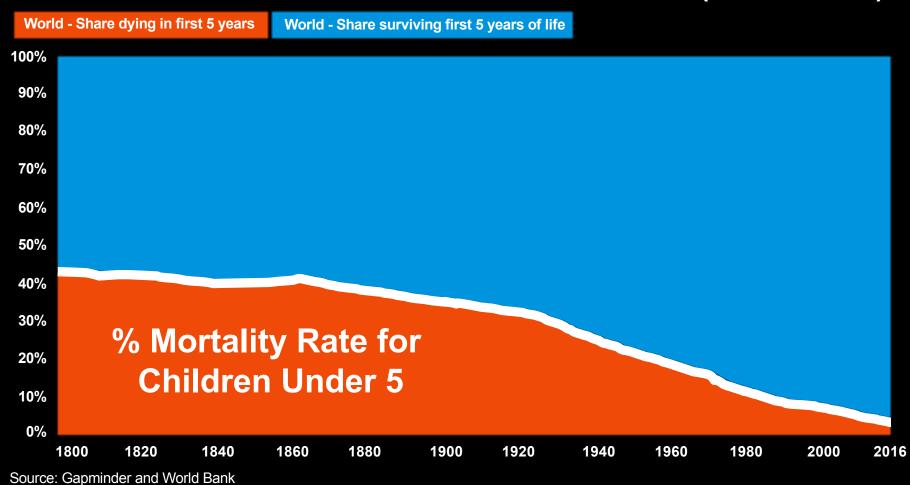
Source: World Poverty in Absolute numbers, Max Roser, World Bank

LITERATE AND ILLITERATE WORLD POPULATION (1800 – 2016)

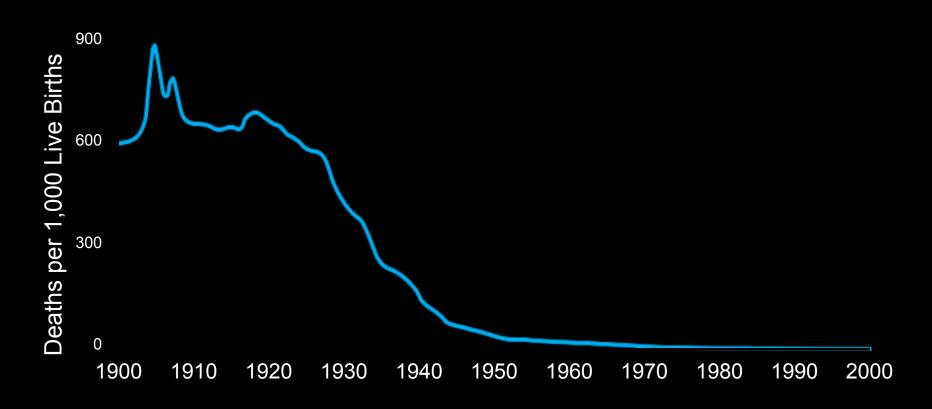


Source: Literate World Population (Our World in Data based on OECD & UNESCO)

GLOBAL CHILD MORTALITY – FIRST 5 YEARS (1800 – 2016)

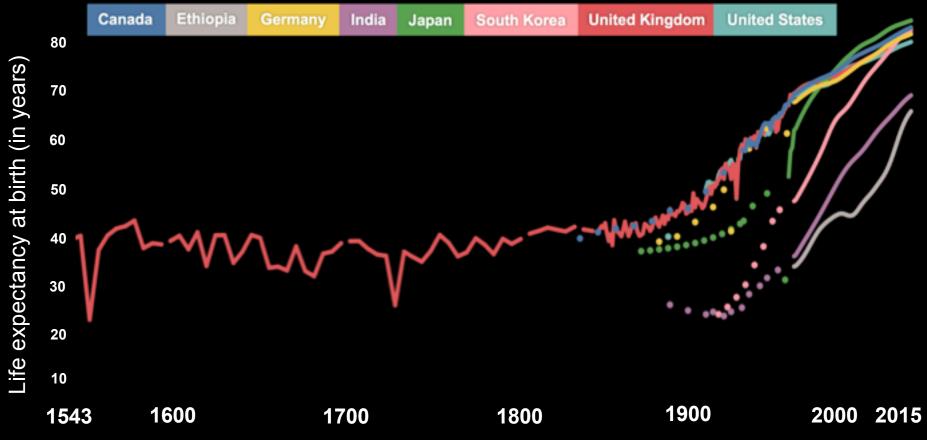


MATERNAL MORTALITY RATES



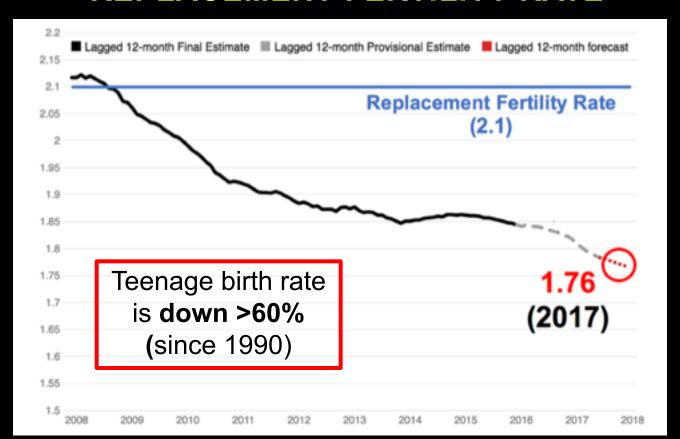
Source: Historical Statistics of the United States, Series B-148; and Health, United States, 1998, Table 45.

GLOBAL AVERAGE LIFE EXPECTANCY (1543 – 2015)

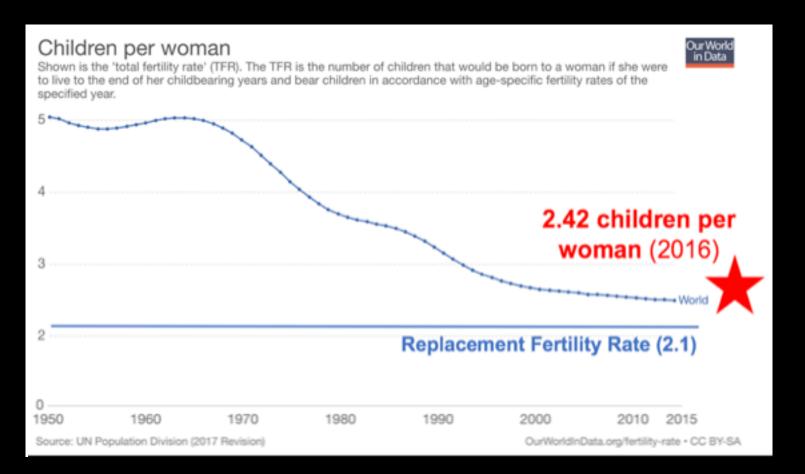


Source: https://ourworldindata.org/life-expectancy/

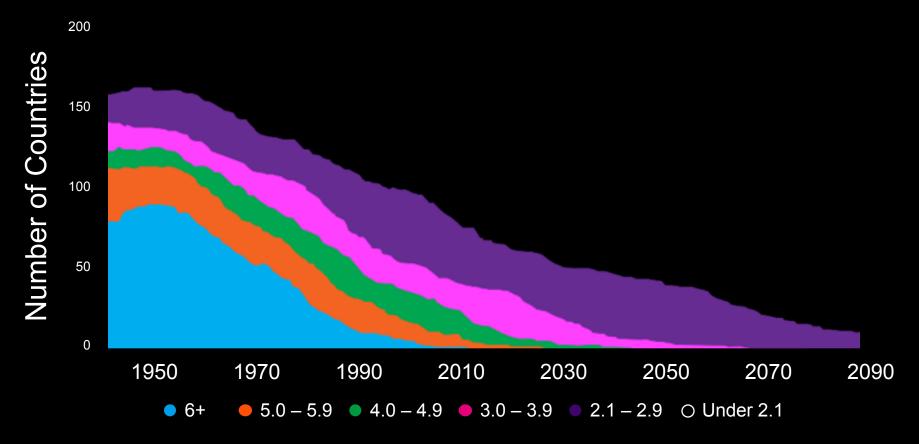
U.S. TOTAL FERTILITY RATE DROPPED TO 0.34 BELOW REPLACEMENT FERTILITY RATE



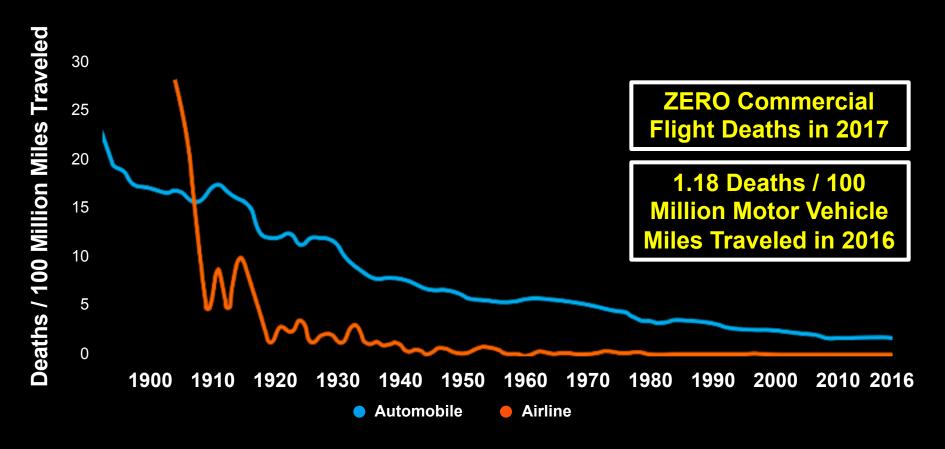
GLOBAL TOTAL FERTILITY RATE STEADILY DECLINING



GLOBAL REDUCTION IN CHILDREN PER FAMILY

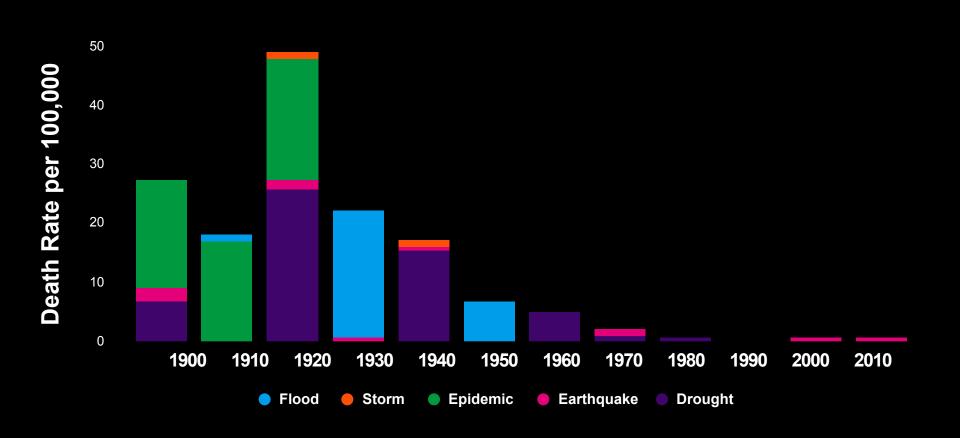


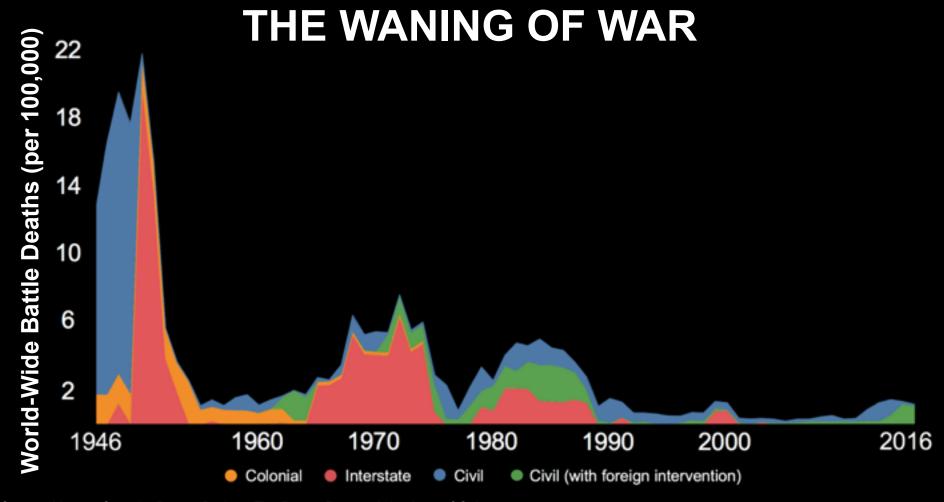
AUTOMOBILE & AIRLINE FATALITY RATES



Source: National Highway Traffic Safety Administration

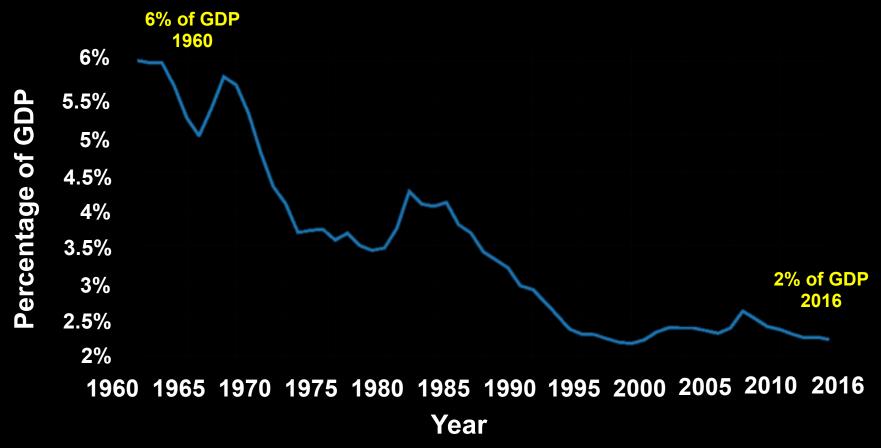
GLOBAL DEATH RATE FROM NATURAL CATASTROPHES





Source: Human Security Report Project, The Peace Research Institute of Oslo

DECREASING MILITARY EXPENDITURE



Source: Stockholm International Peace Research Institute



FAREED'S TAKE

Auto sales are up; unemployment is down



POLICE RESPONSE, SHOWING KINSEY LYING IN THE STREET, HIS HANDS UI FAREED ZAKARIA GPS

Why?

Why now?

Exponential Growth of Technologies & Tools

If you'd like a copy of my PPT slides, send an email to...

slides@diamandis.com



For a copy of these slides send an email to:

slides@diamandis.com

www.SingularityU.org

www.xprize.org

www.Diamandis.com