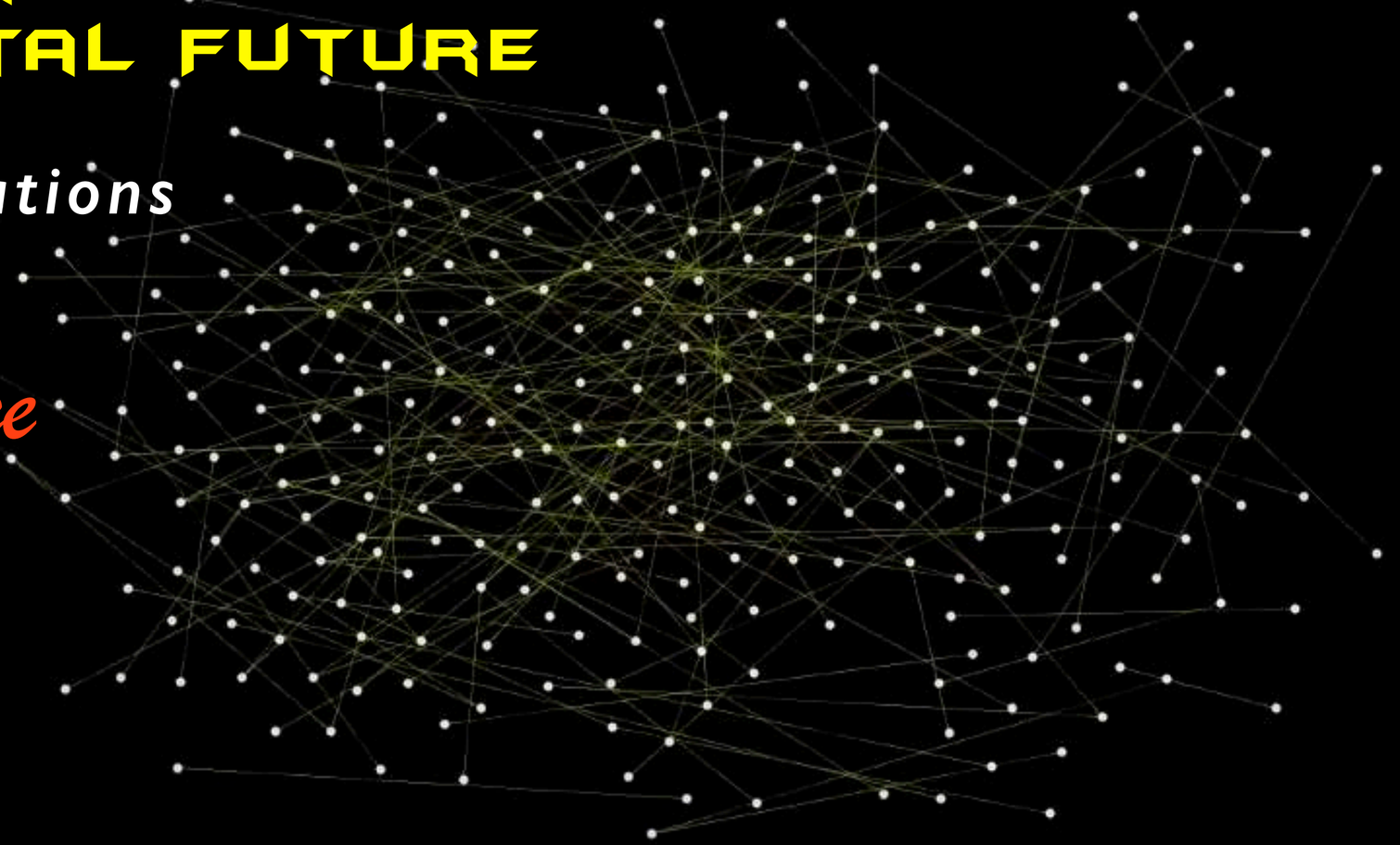
A GLOBAL LENS
ON OUR DIGITAL FUTURE

The wider implications



Peter Cochrane

cochrane.org.uk
ca-global.biz

Migrating from a slow static to a fast dynamic world - complexity the norm - uncertainty and emergent behaviours

COCHRANE associates

University of Hertfordshire

COMPLEXITY RULES

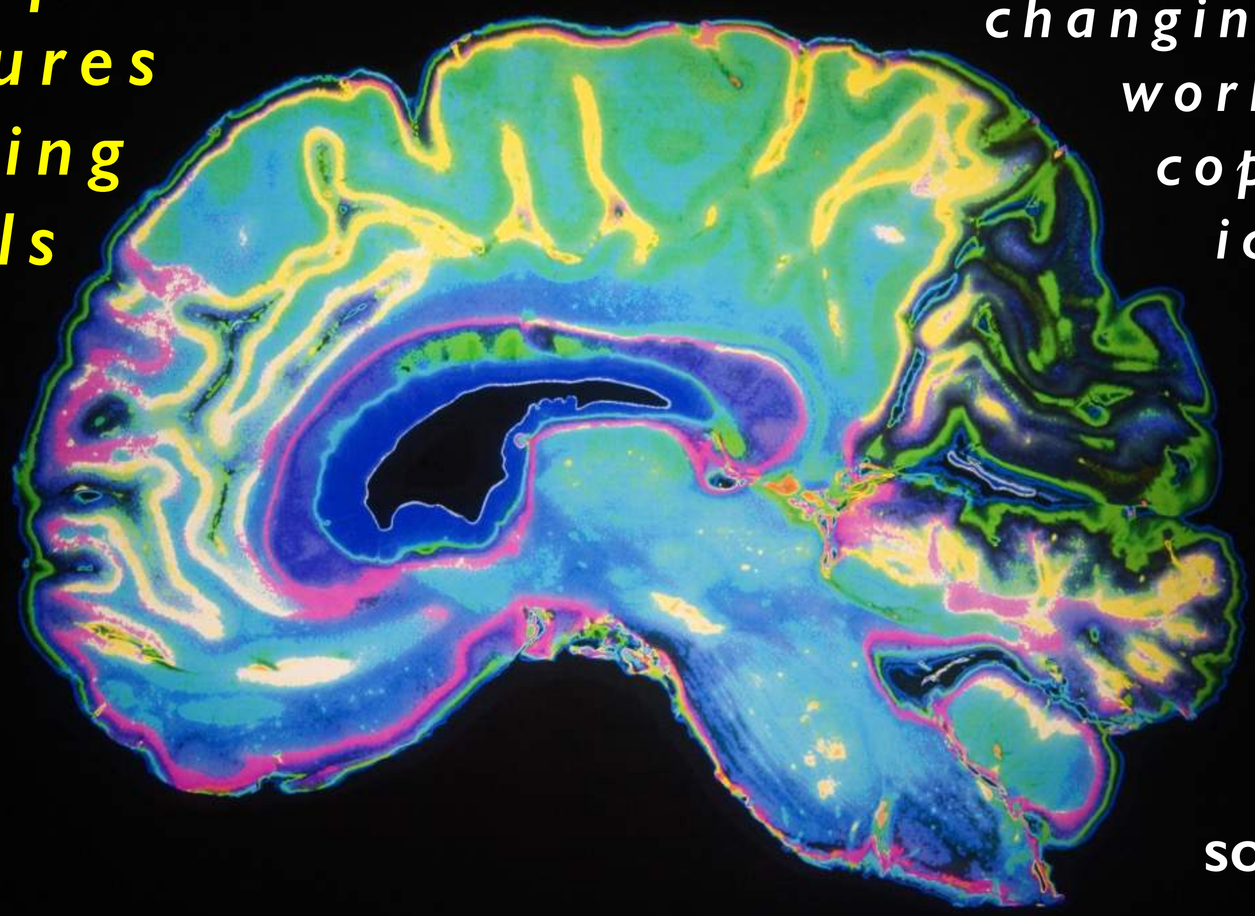
Bits and Atoms flow to meet our needs

Without atom & bit flow nothing works - economies societies fold

Emergent Behaviours Dominant

A TYRANNY OF SIMPLE

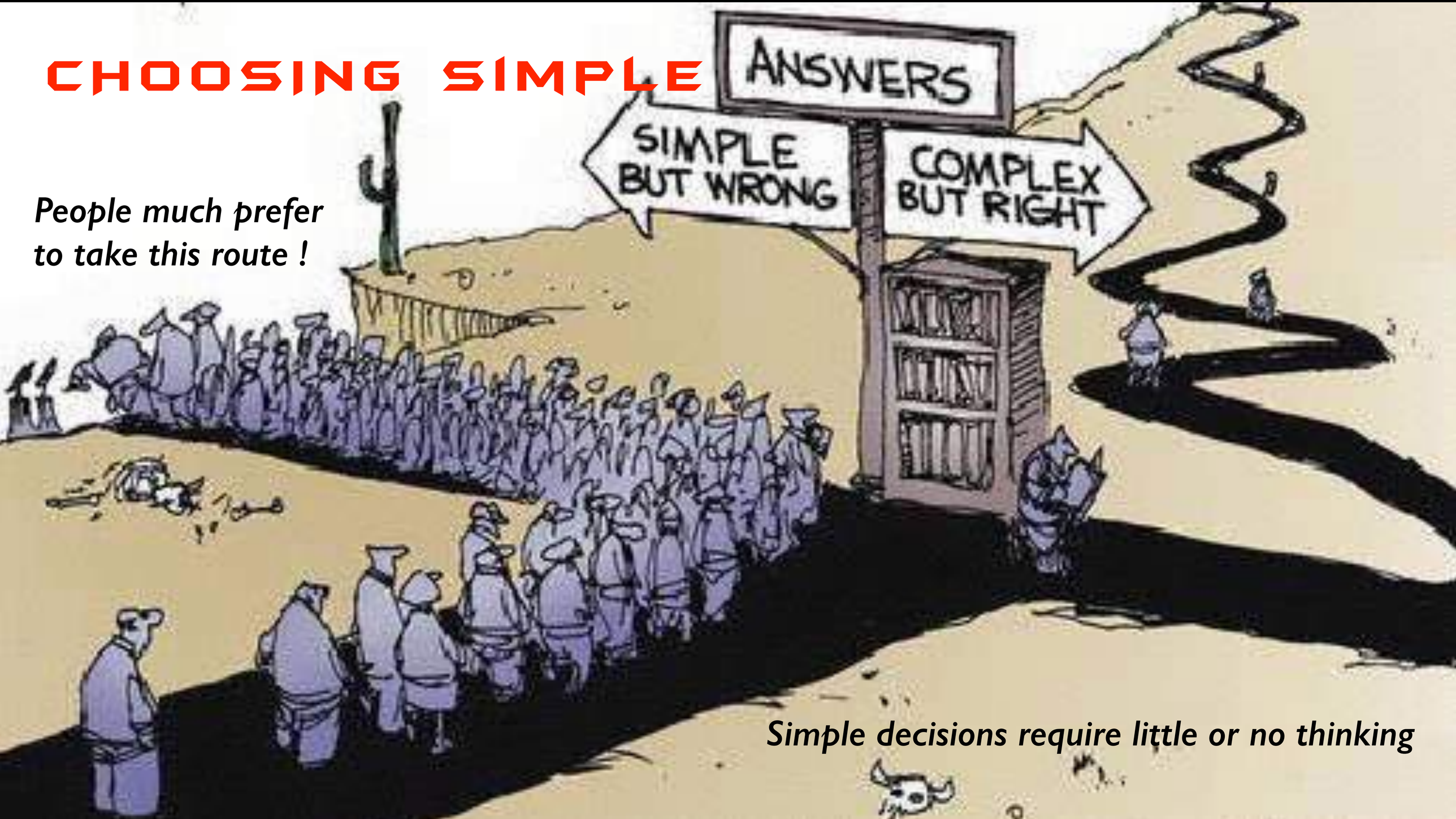
- *Assumptions*
- *Measures*
- *Thinking*
- *Models*
- *Data*



Evolved for an slow changing analogue world - we can cope with 3-7 ideas at the same time

"There are lots of simple solutions to complex problems and they are all wrong"

CHOOSING SIMPLE



People much prefer to take this route !

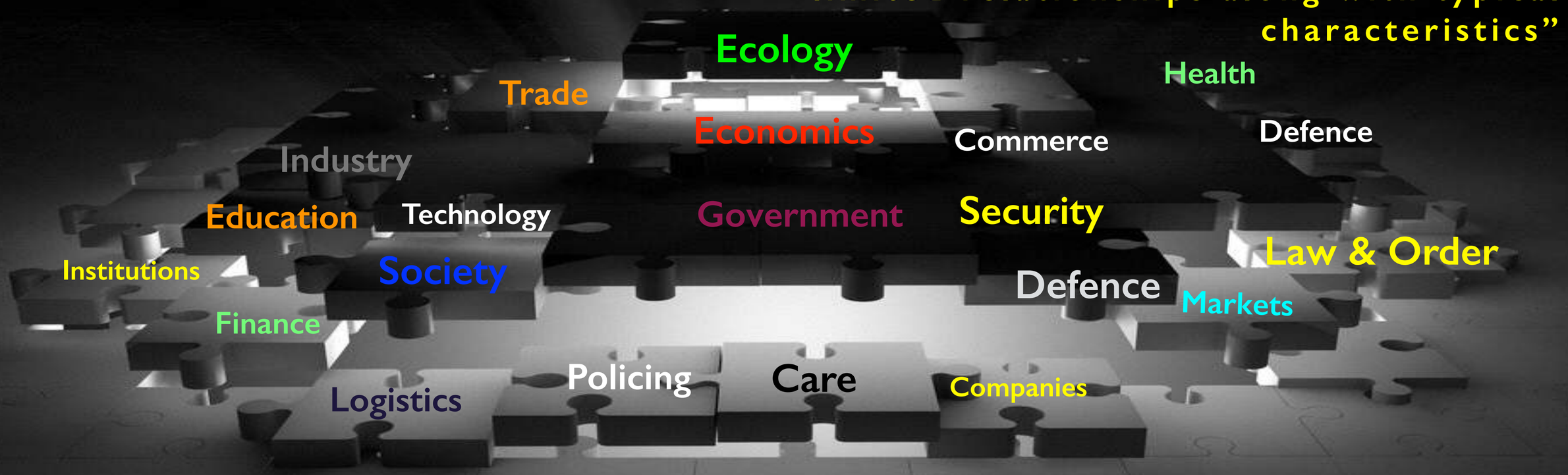
Simple decisions require little or no thinking

DEPENDENCY JIGSAW

We have no model or understanding

"We have exceeded the bounds of our Math Frameworks and computer modelling is the only tool we have"

"Sometimes we might observe or infer some limited relationships along with typical characteristics"



EFFICIENCY

The enemy of resilience

- A prime limiter of company change
- A threat to longevity

freedom
time
space
resources
to change

SUSTAINABILITY

Only possible with networking

A Green Agenda needs:

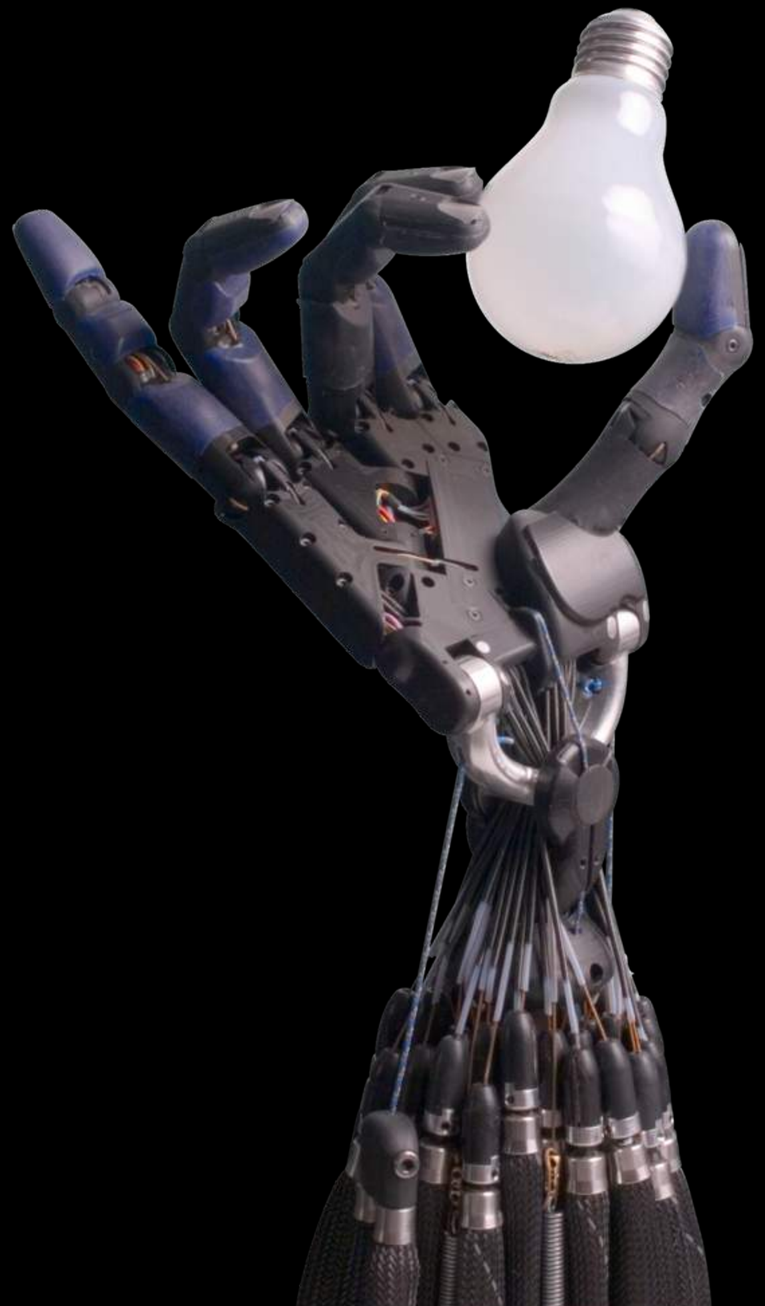
AI	*Effective Energy Storage*
IoT	*New fabri… …odes*
BioTech	*N… …dels*
NonT…	*… …on*
S…	*…delling*
Br…	*…rtable Supply*
Aut…	*Decision Support*
Connectivity	*Causal Learning*
Networking	*War Gaming*
Globalisation	*Workable R^4*
Smart Societies	*++++*

NEW VALUE GENERATION

Reuse
Reduce
Recycle
…purpose

FAR TOO SIMPLISTIC

Continuing to do what we have always done,
but far more efficiently,
is not going to work !

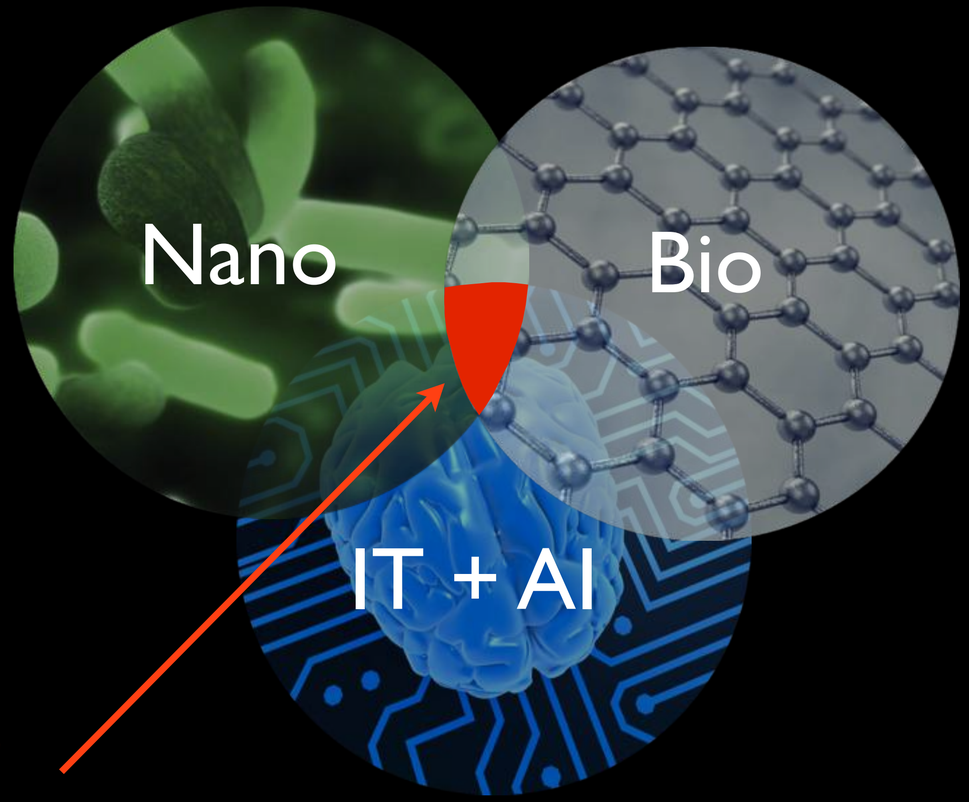


Neither is changing all the lightbulbs... recycling or so called green energy....

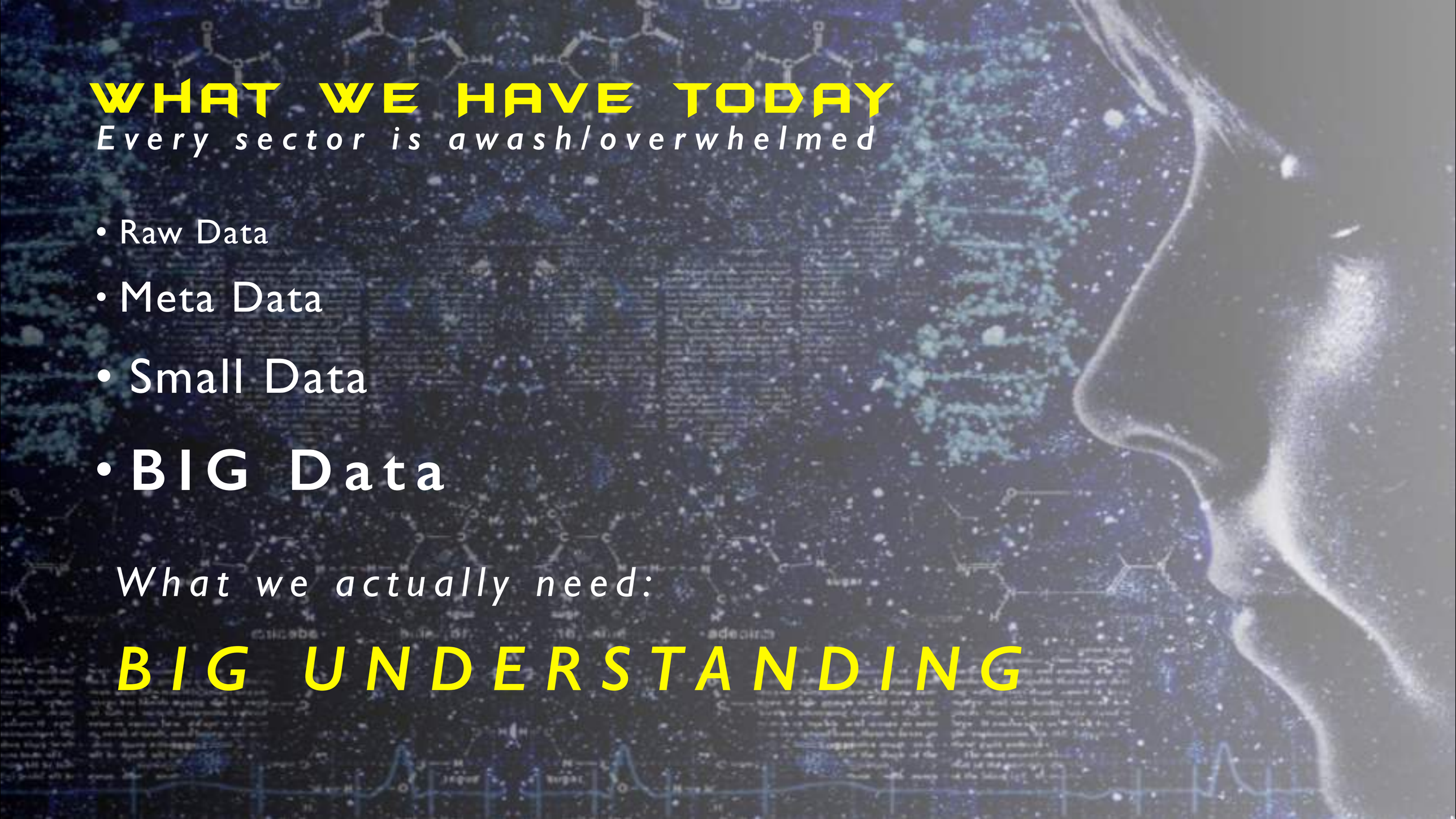
...we have to think and act in radically different ways...

OUR FUTURE HINGES NEW TECH

It starts with material science/new process managed by AI



This is where all the real action is going to be



WHAT WE HAVE TODAY

Every sector is awash/overwhelmed

- Raw Data
- Meta Data
- Small Data
- **BIG Data**

What we actually need:

BIG UNDERSTANDING

HALF LIFE OF KNOWLEDGE

Most of what we know & understand is wrong

CONFESSION

Never read another book

A new book is published every 13 s

A professional paper every 13 ms

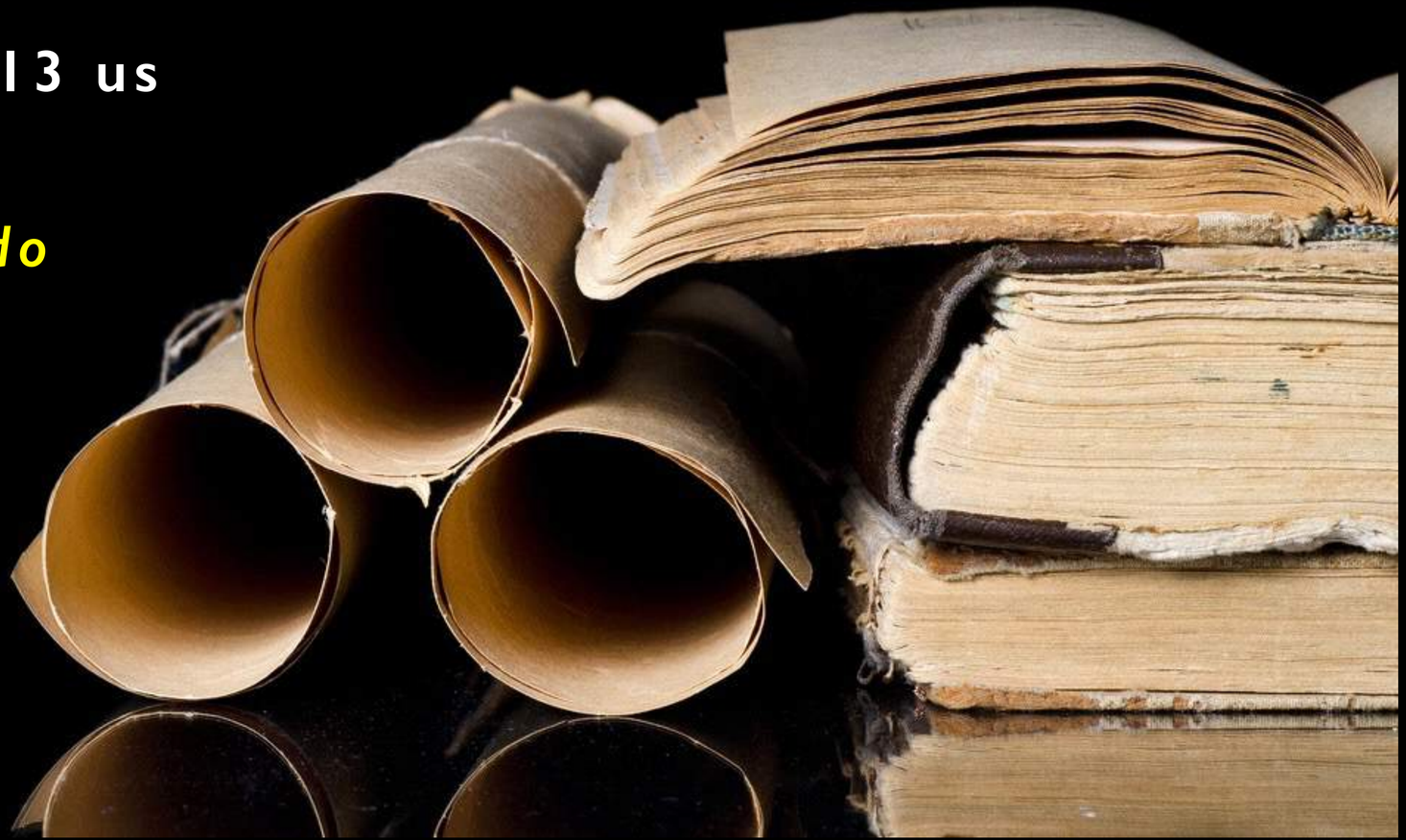
An interesting post every 13 us

Which should I read - how do I choose ??

I need help !

You need help !

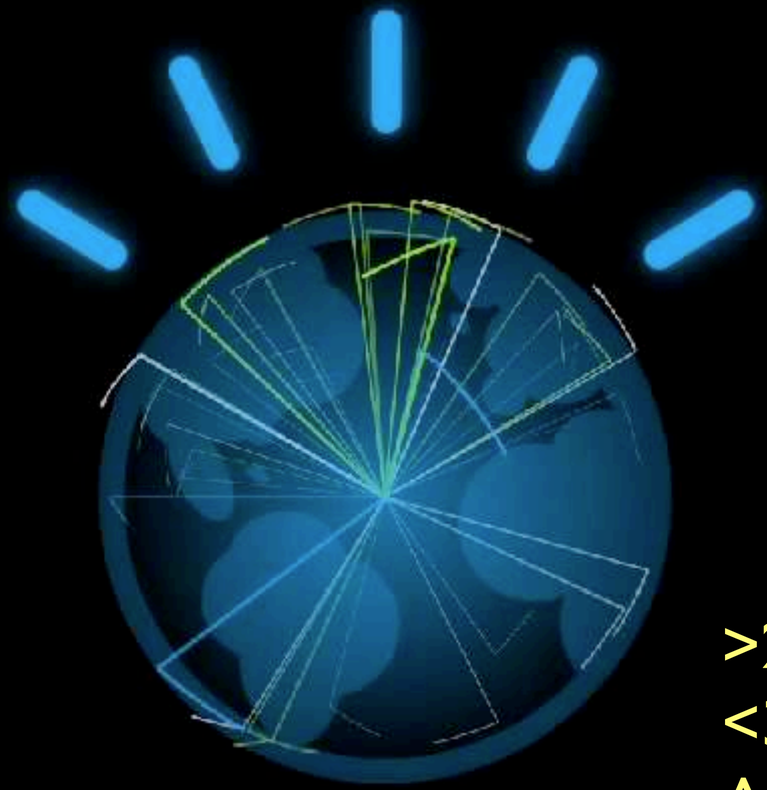
Technology can help ?



IBM Debating Technologies

The sale of violent video games to minors should be banned

No human resource can do this !



PRO

>20M texts available
<3M selected for analysis
Argument abstracted pro - con

TRUTH & WISDOM

Increasingly transitory not fixed

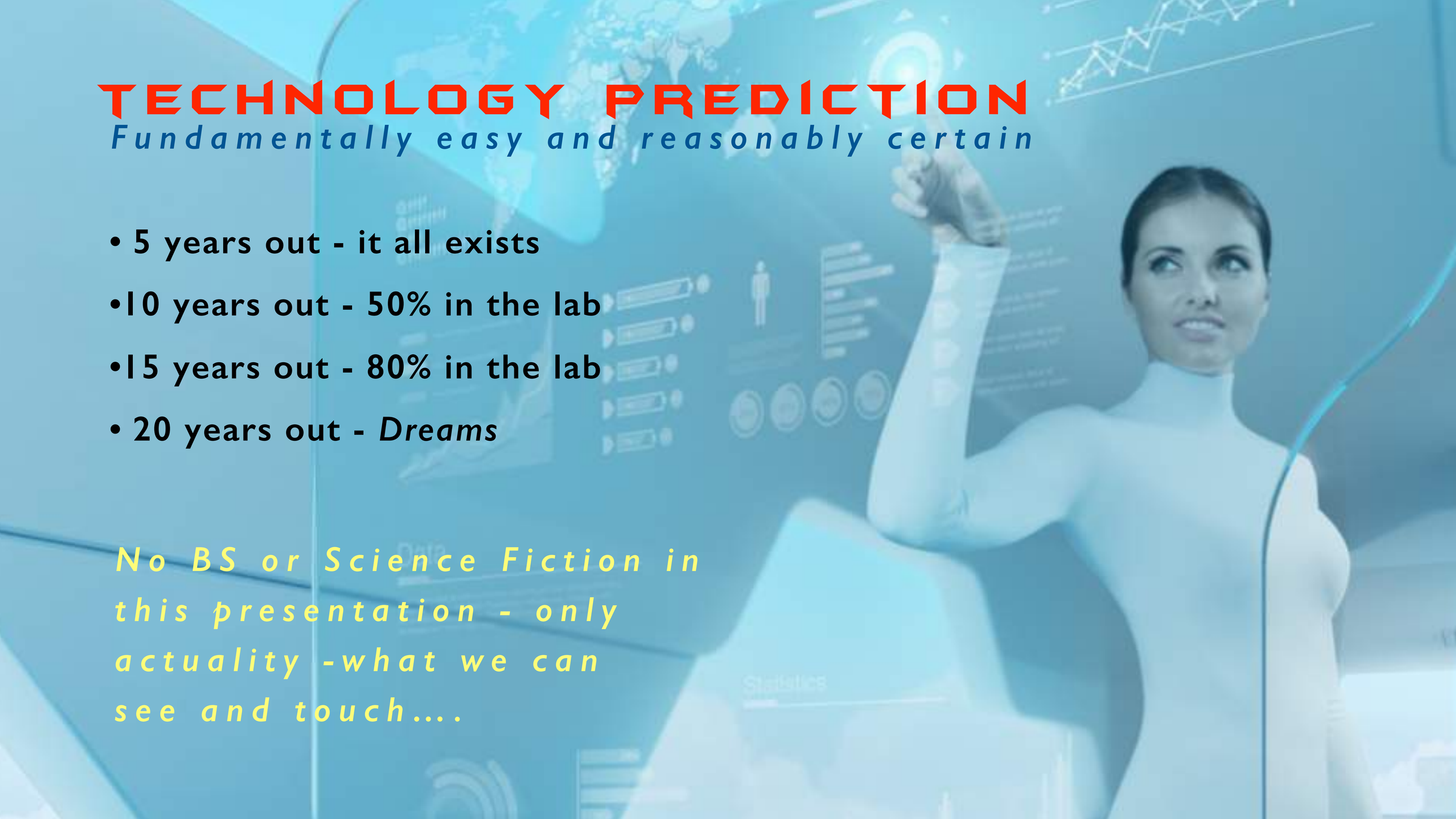
COMING SOON
The Truth Engine
A correlating
aggregation machine
able to dynamically gauge
correctness of propositions,
statements, and facts...

TECHNOLOGY PREDICTION

Fundamentally easy and reasonably certain

- 5 years out - it all exists
- 10 years out - 50% in the lab
- 15 years out - 80% in the lab
- 20 years out - *Dreams*

No BS or Science Fiction in this presentation - only actuality -what we can see and touch....



THE BIGGER CHALLENGE

Predicting what customers will do with tech and when

They gave up privacy
Outsourced security
Google everything
Continually adapt
Share everything
Ignore the rules
Violate policies
Never call IT
Adopt early
Adapt fast
Open XX

Self educate
Rely on apps
Self organise
Prefere BMOB
Embrace BYOD
Bandwidth hungry
Connectivity a right
Habitual networkers
Do their own support
Change jobs by project
Regard freedom essential

AUGMENTED REALITY 1995

Remote medical procedures + high tech maintenance + repairs

Tele-Surgery Ipswich to

Dublin and the USA +

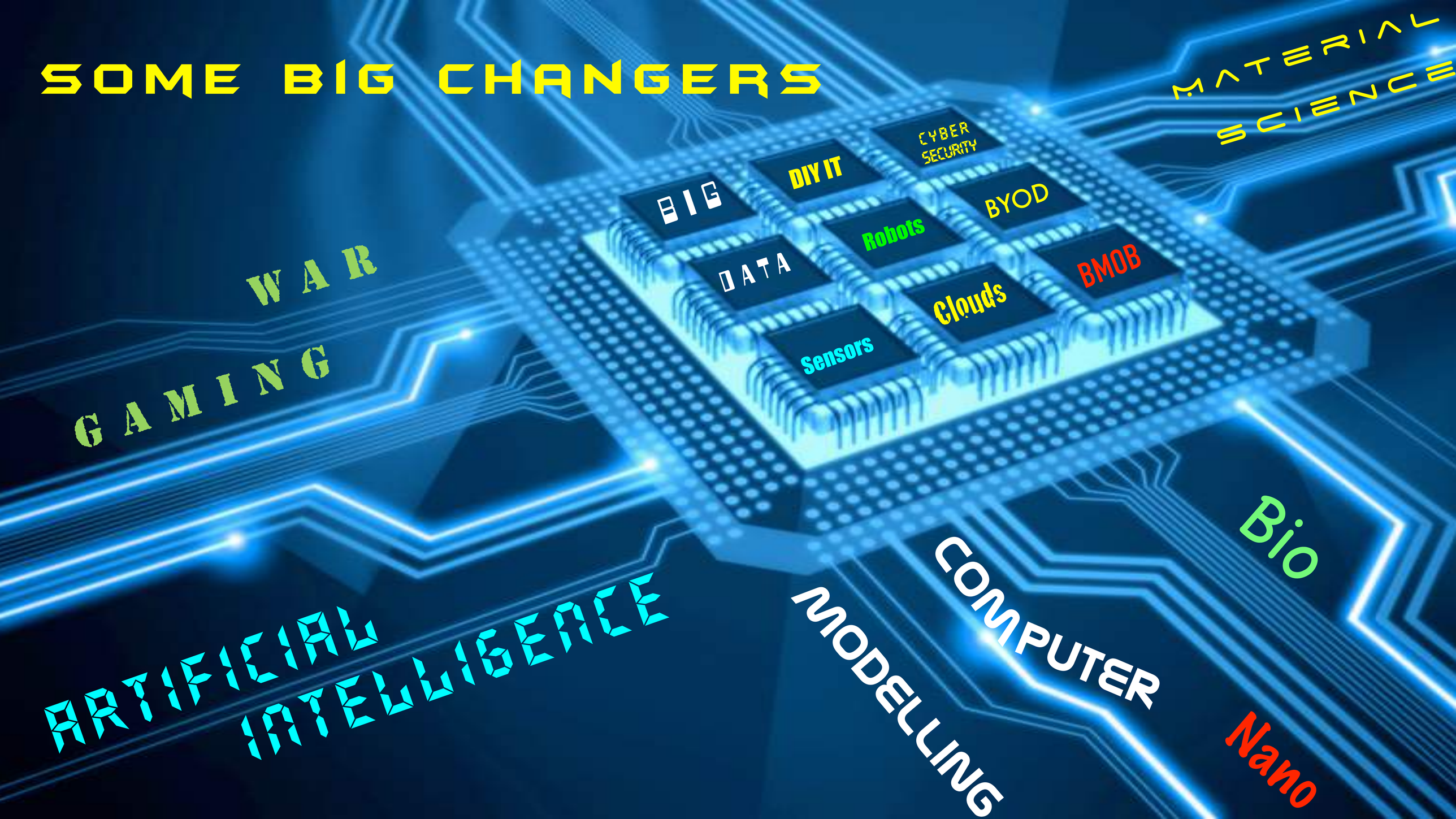
DoD military take up

The motivations

- training became impossible

- who was going to be liable ?

SOME BIG CHANGERS



NO GOING BACK

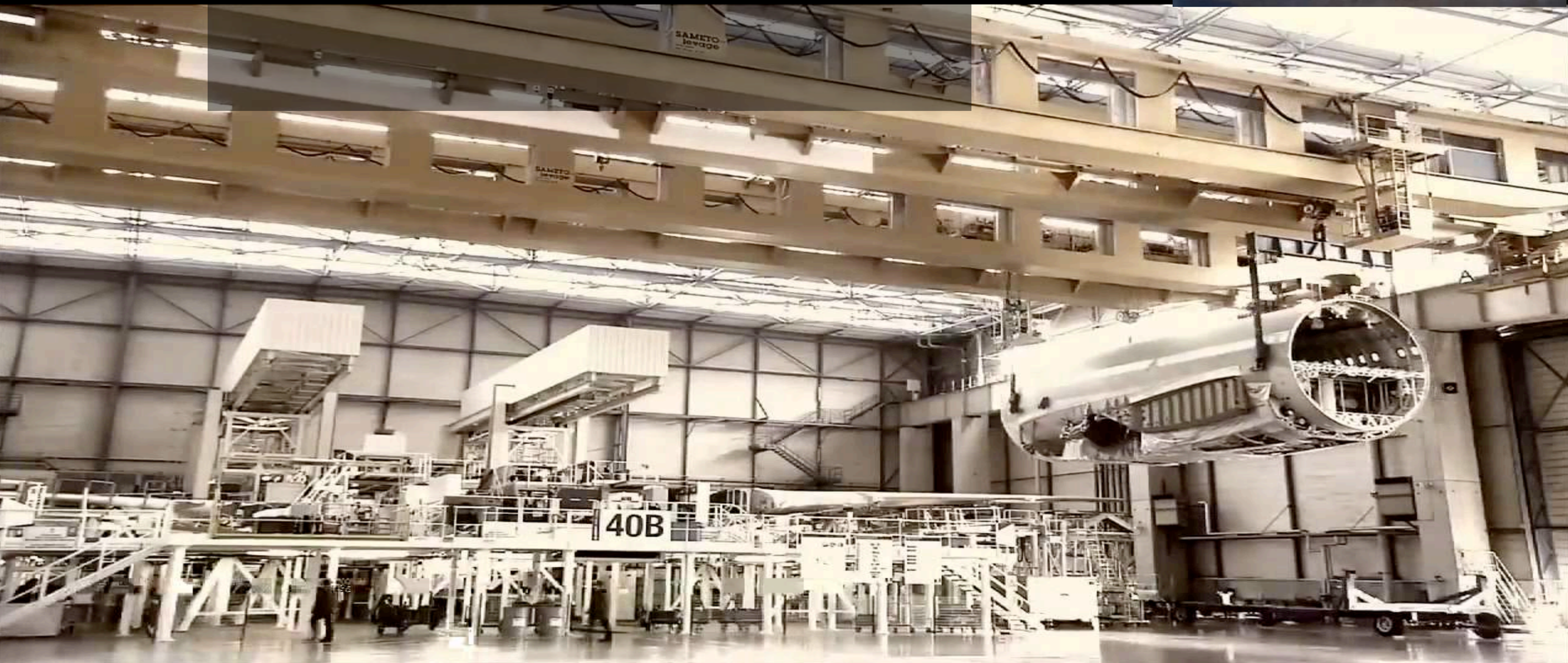
Technology is like a ratchet

No machines
- no food !

NO GOING BACK

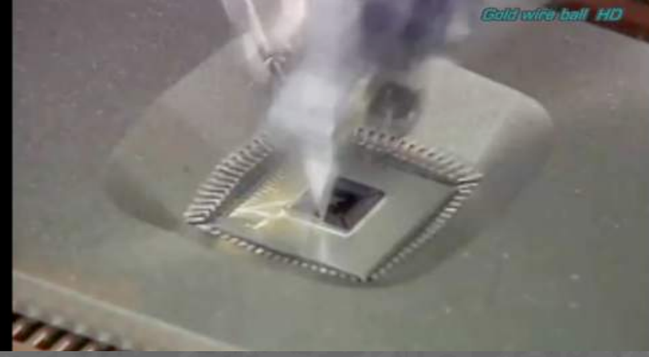
Our dependancy is total

Machines make all our complex products



MACHINES BUILD MACHINES

Humans cannot do any of this



Scanning Electron Microscope

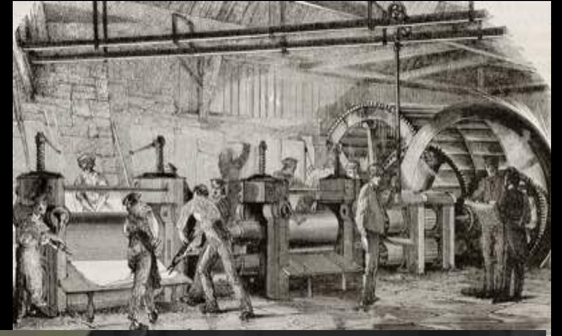
1 millimeter

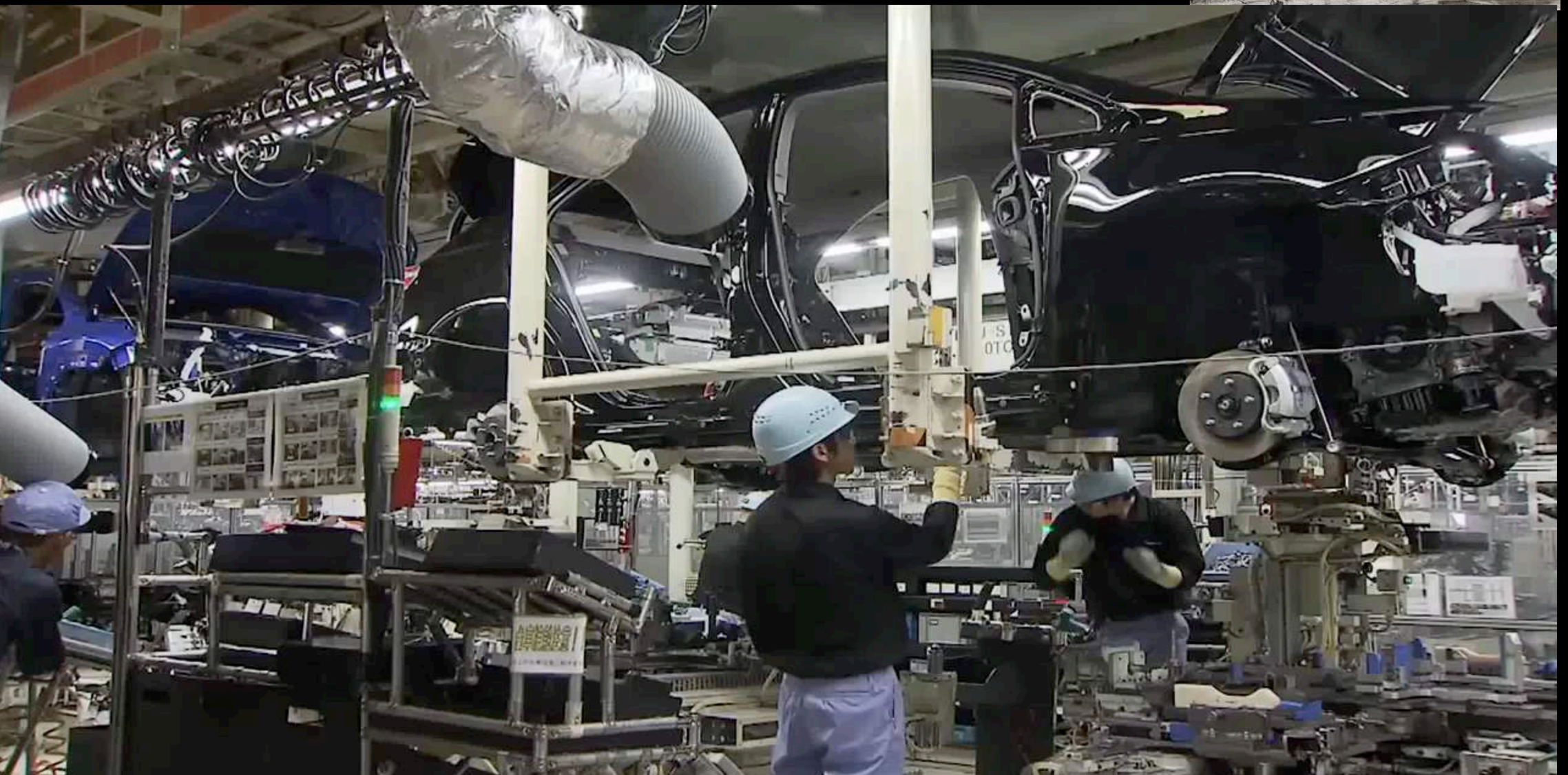
We have never been so powerful and capable

WHY EMPLOY PEOPLE

They can do things that robots cannot

Humans often cheaper than robots

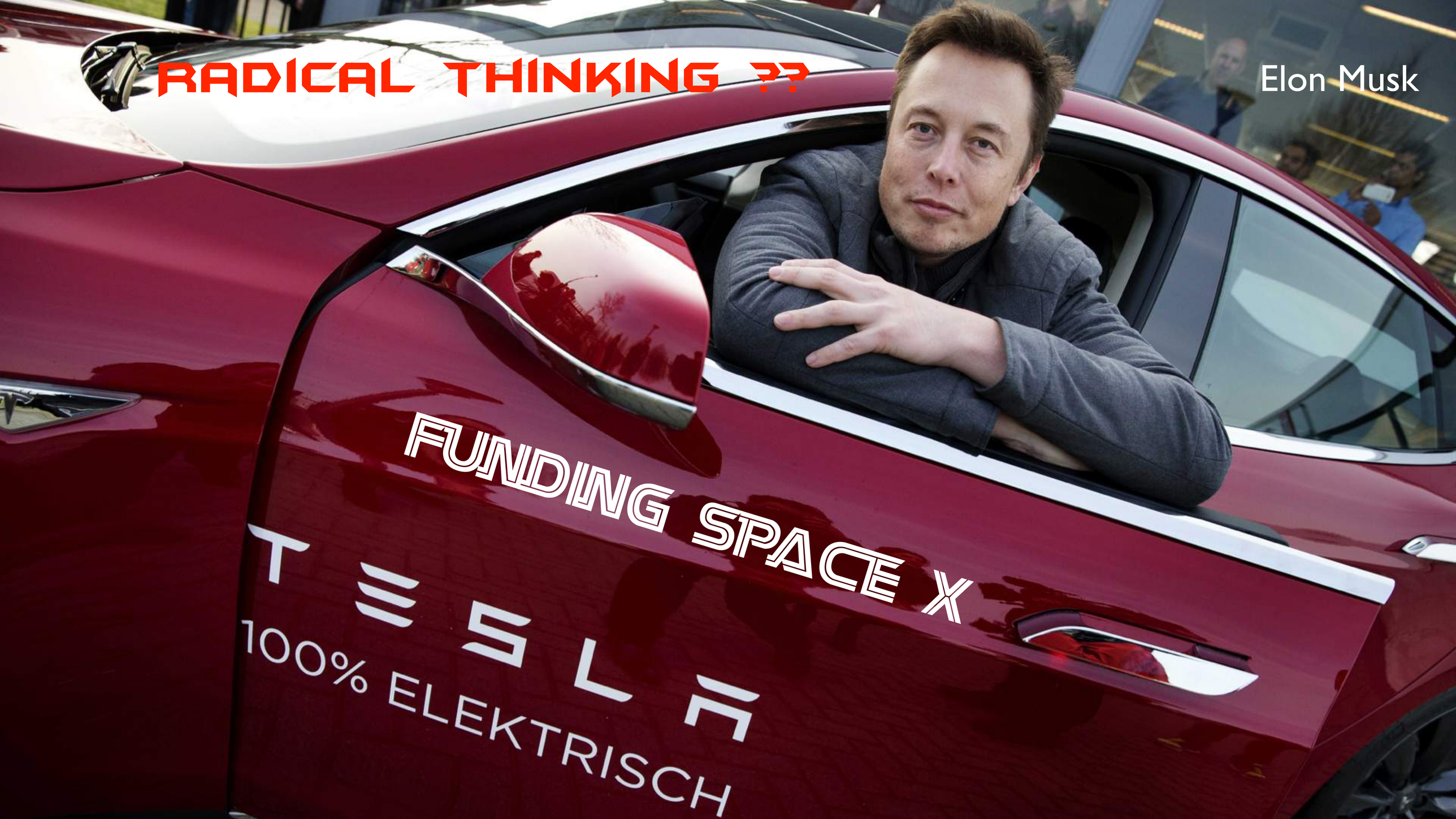




MANKIND V MACH
A done deal - little or
NO TECHNOLOGY EVER
REDUCED HUMAN EMPLOYMENT
TECHNOLOGY ALMOST
ALWAYS DISRUPTS
New
Novel
Creative

RADICAL THINKING ??

Elon Musk



RADICAL THINKING

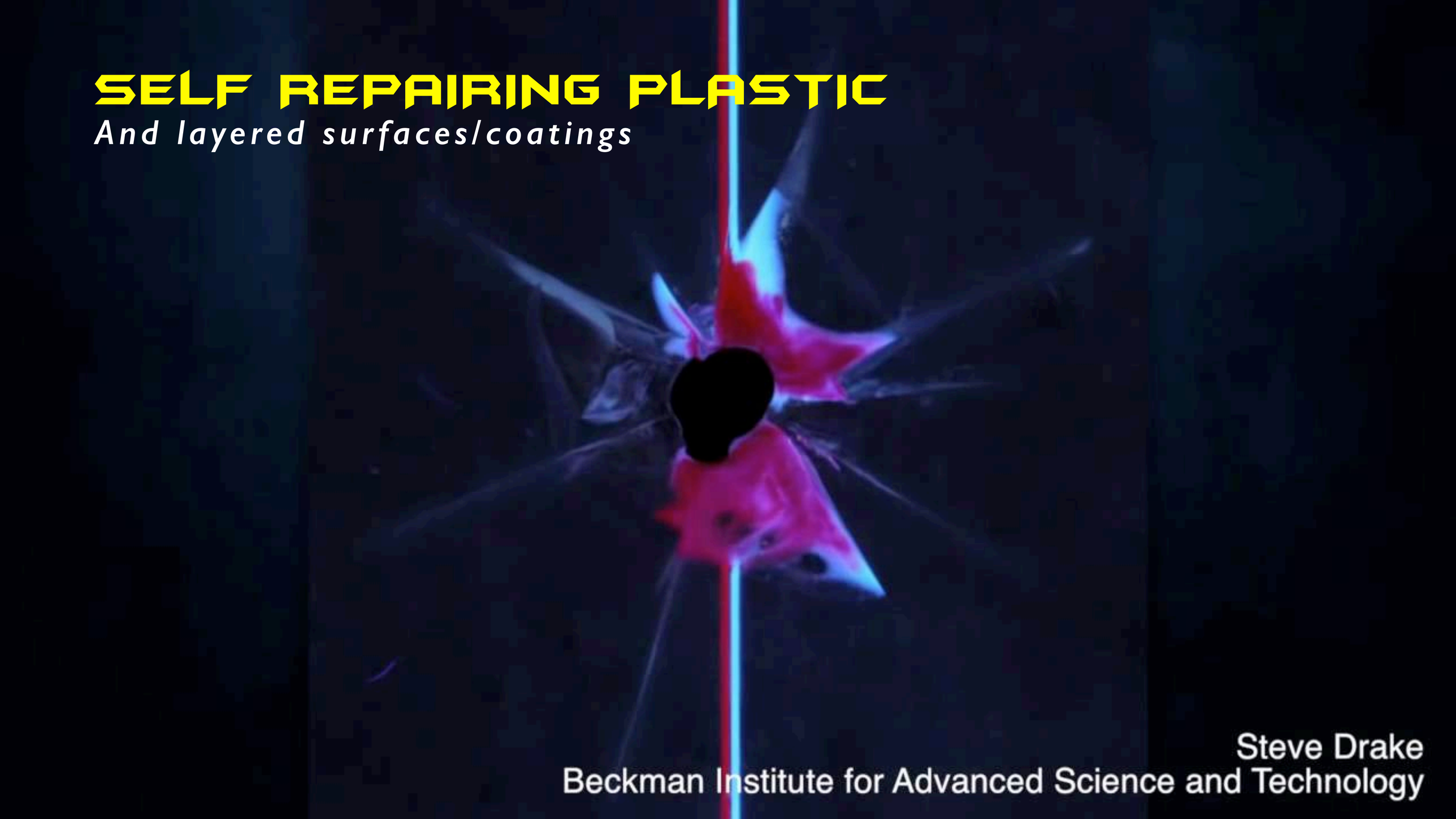
Transforming food production

HYDROPHOBIC COATINGS

Nothing sticks always dry and clean

SELF REPAIRING PLASTIC

And layered surfaces/coatings



Steve Drake
Beckman Institute for Advanced Science and Technology

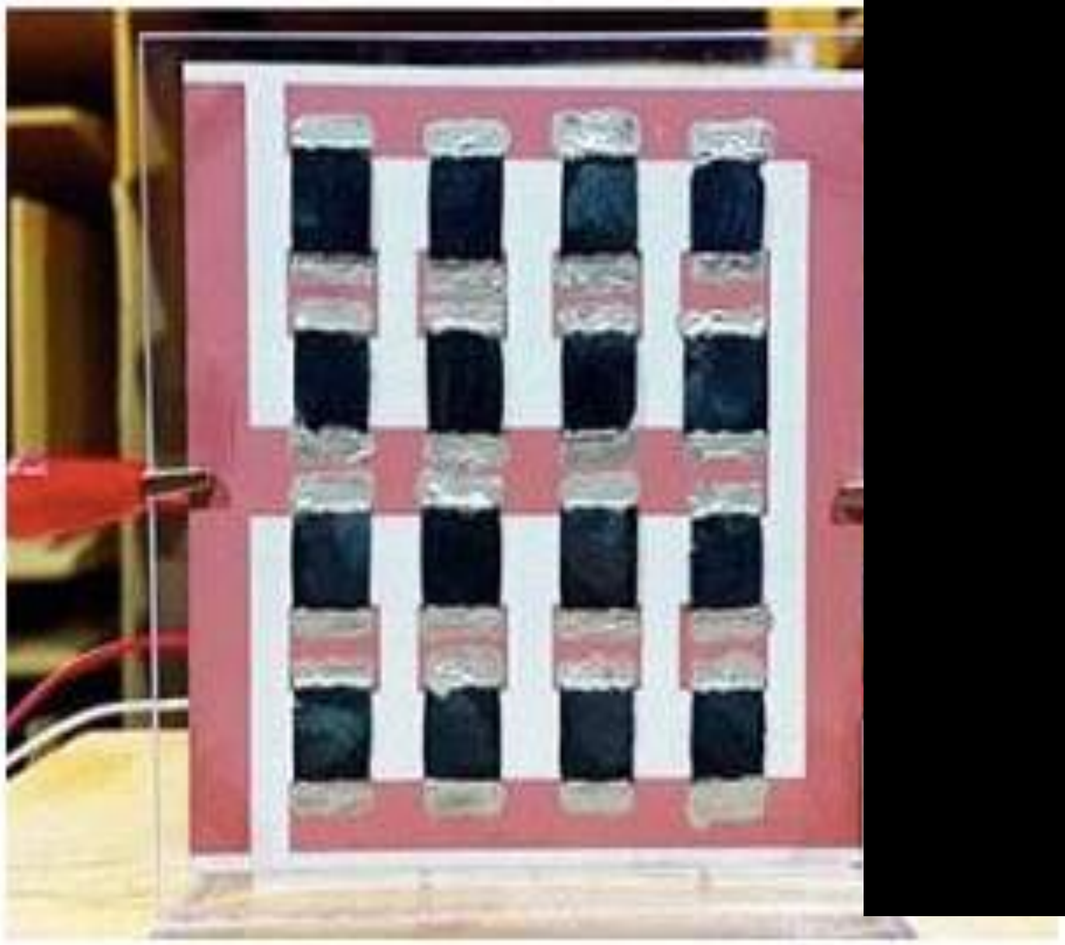
FEASIBLE ENGINEERING

Not possible yet - but certainly feasible

STOP PRESS ??

No moving parts

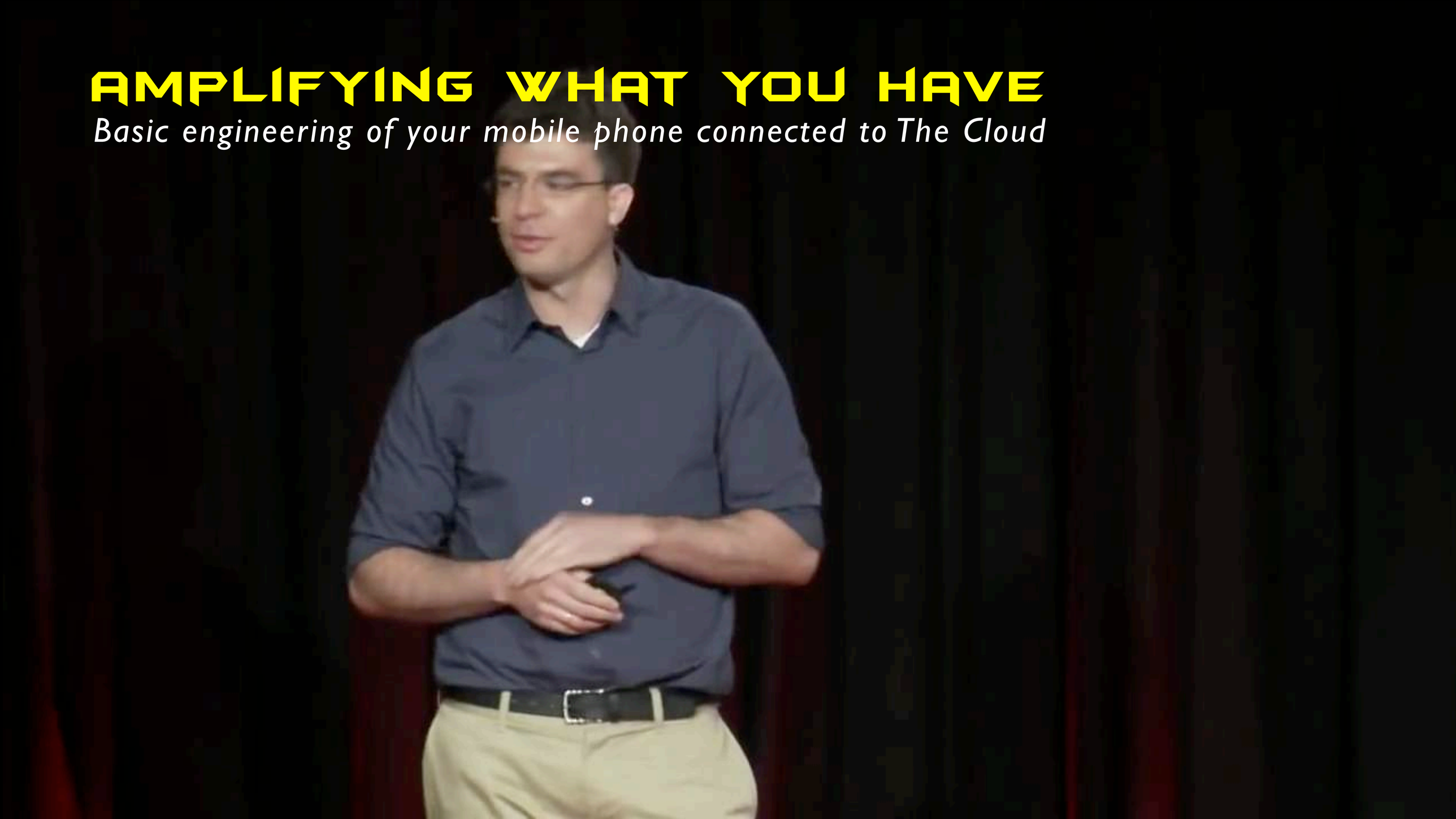
Nanotechnology News 13 September 2016



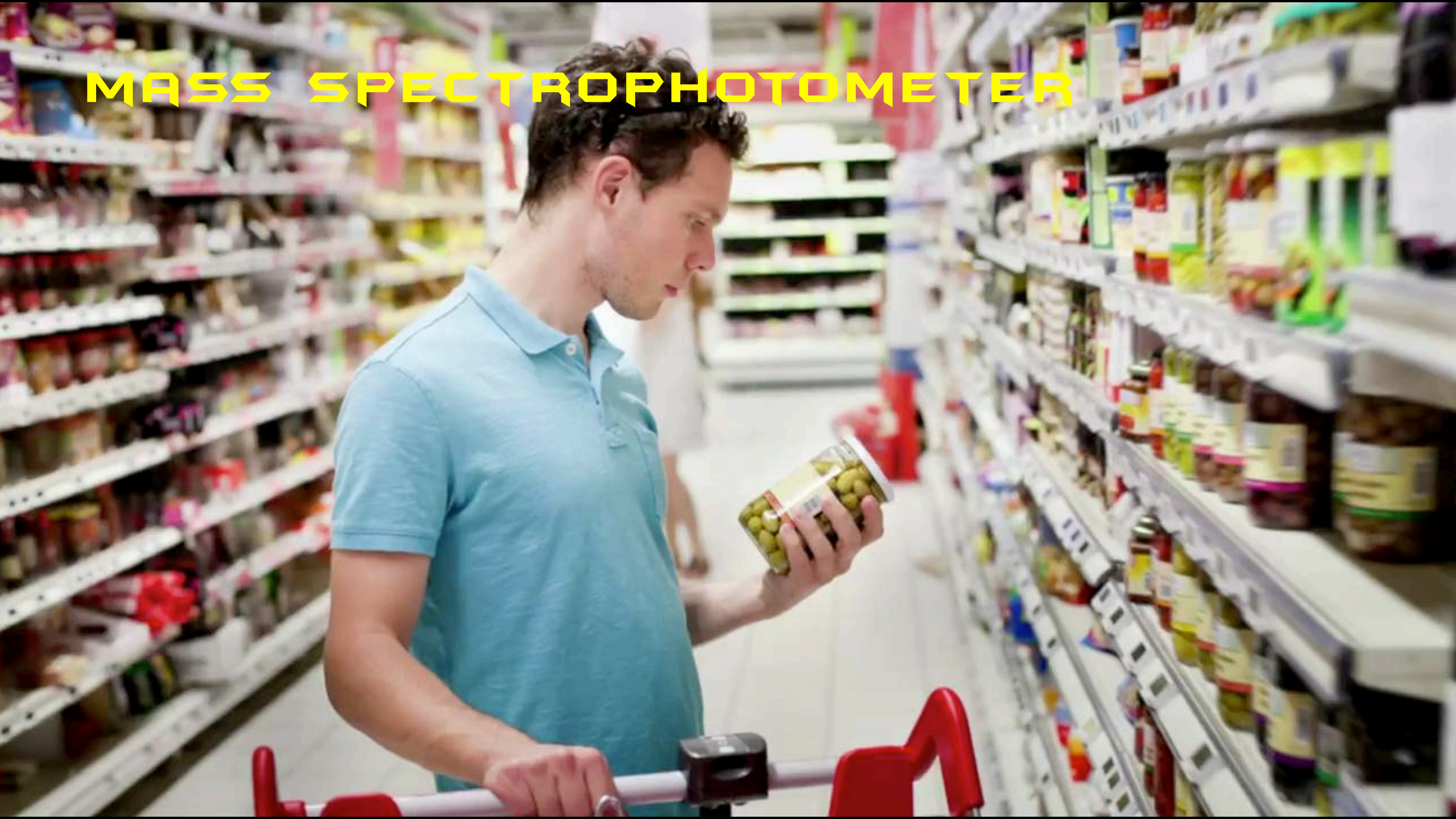
PRINTED WHEELS
High % material recovery

AMPLIFYING WHAT YOU HAVE

Basic engineering of your mobile phone connected to The Cloud



Motions magnified x30


MASS SPECTROPHOTOMETER

BURNS

...many die or become disabled through secondary infections...

RAPID HEAL

Life changing outcomes

OPEN HARDWARE - PRINTED FUNCTIONALITY

No assembly required - posting designs intend of shipping atoms

ALL PRINTED

…cost effective ??

PRINTED & PROGRAMMED PARTS

Vertebral Disc

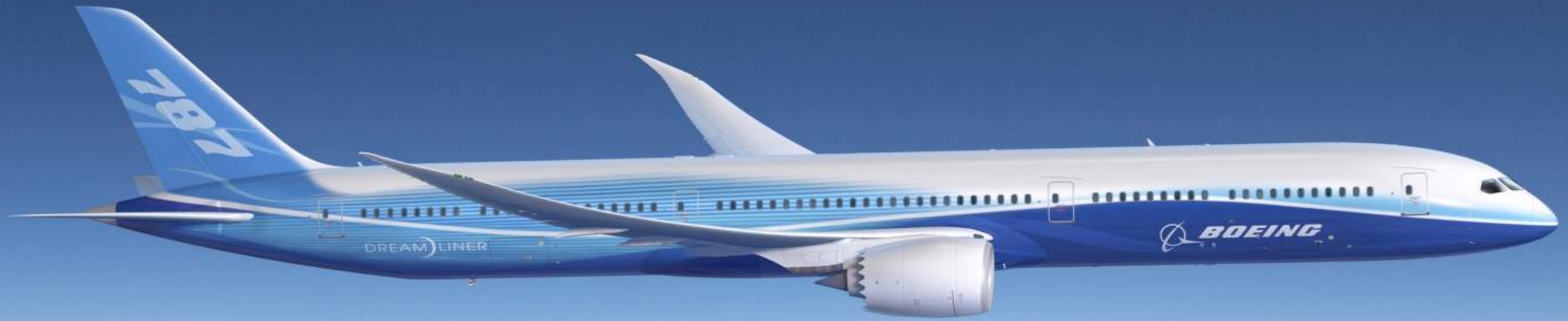
Injection Molded

Trachea

Breathing Lung

NO CASTING, PRESSING, MACHINING

BOEING 777 > 300 parts now printed



Industry 4.0 is about edging towards sustainable futures

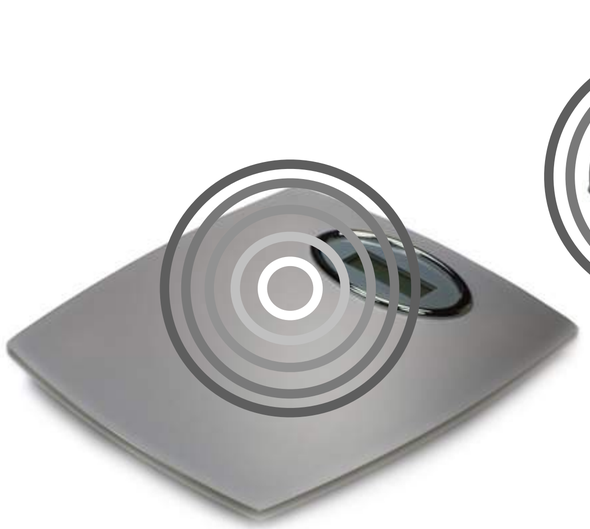
TREMORS
SuckIT and see!

DEVICE TO DEVICE

Small Data off line medical information

DEVICE TO PRODUCT

Monitoring the in:out and effect…small data off line



INTELLIGENT TOO ?
Nets and Clouds without infrastructure
3,4,5G nets
cannot support
the demands of
future traffic and
logistic networks…
but vehicle to vehicle
systems can…by providing
the most efficient and relevant
linking of users reporting their status
and sharing local/pertinent information

ATOMS & BITS
Service Info, Maps, Local Data,
Music, Movies, Games, Adverts

HIDDEN VALUE
In every operation & supply chain
Container
to Ship
Ship to
shore

AI - HUMAN CONFLICT OR COOPERATION

We need a symbiotic relationship and help…

IBM WATSON – JEOPARDY

General knowledge champion by 2011

IBM WATSON - IN MEDICINE

ROLLING OUT NOW

DIY Diagnosis and treatment

NEW TECH DESTROYS JOBS

Whilst changing the nature of work and employment

Lost in my lifetime:

Typists
Dockers
Milkman
Blacksmith
Secretaries
Drawing office
Xerox operator
Elevator operator
Computer operator
Telephone operator
Comptometer operator
Financial report writers
++++

Lost in your lifetime:

Testers
Tasters
Analysts
Advisors
Educators
Reporters
Strategists
Call centres
Report writers
Personal bankers
Personal assistants
Answering services

Investment bankers
Warehouse People
Personal Assistant
Tech support
Stock Trader
Receptionist
Forecasters
Train driver
Researcher
Journalist
Drivers
Pilots
++++

JOBS CREATED/ENHANCED

Jobs to come:

Material Programmer
Recycling Designers
Interface Designers
Machine Mediators
Wisdom Archivists
Genome Designer
Material Designer
Wisdom Monitors
Trouble Shooters
Nano-Engineers
Bio-Engineers
++++

3/4D Designer
Risk Profilers
Cyborg Engineer
Protein Designer
Crime Predictor
Digital Historian
Information Caretaker
Truth Engine Mediator
N-D Geometry Analyst
Component Repurposer
Genome-Protein Activators
++++

Jobs to Be enhanced:

Leader
Mentor
Fabricator
Geneticist
Generalist
Proteomist
Multi-designer
Problem solver
Longevity advisor
Big Data Analyst
Cellular programmer
Material programmer
++++

Complexity analysts
Security Experts
Entrepreneurs
Technologists
Consultants
Architects
Detectives
Designers
Engineers
Modellers
Scientists
Medics
++++

STOP PRESS

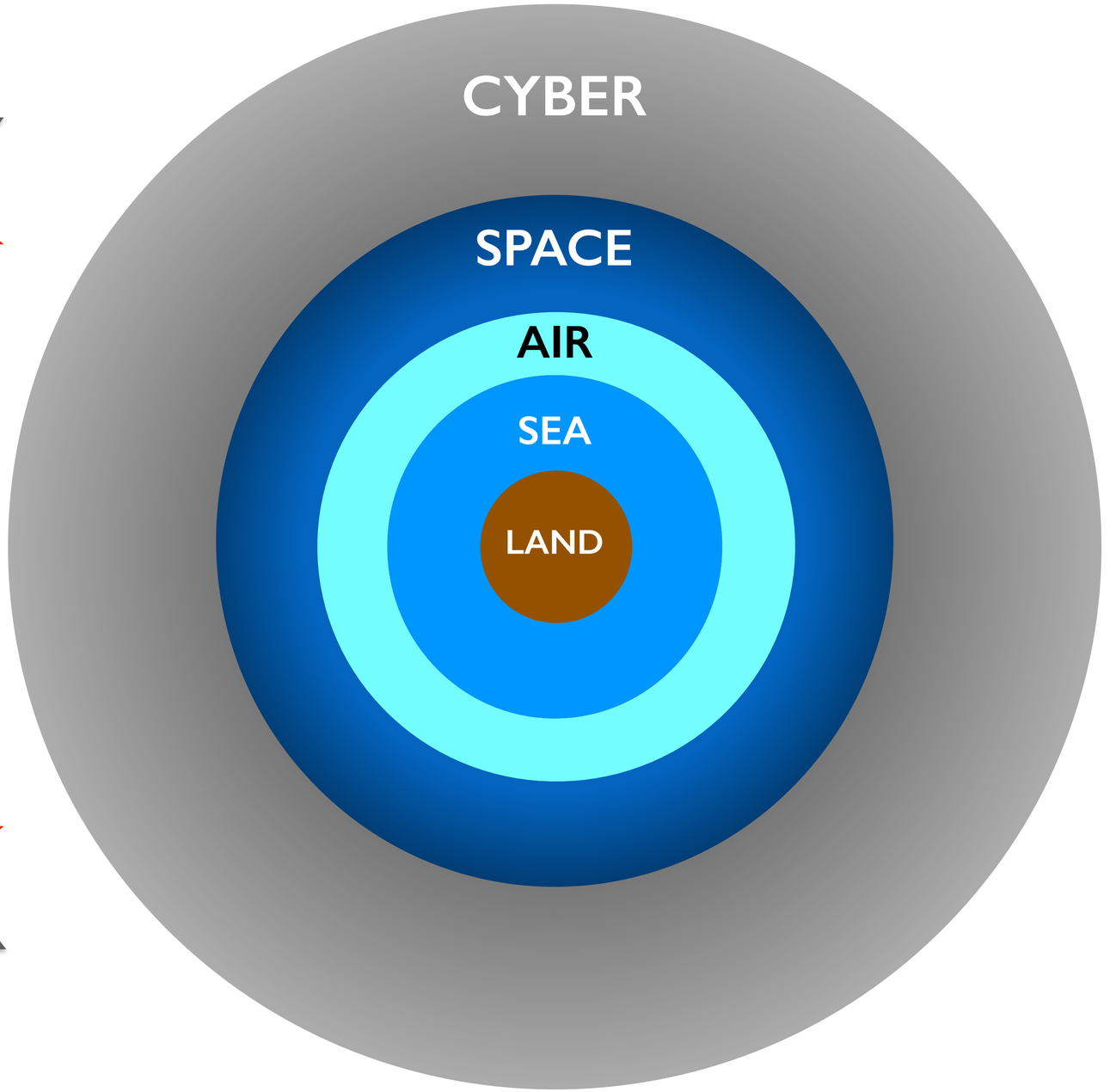
Defence domain moving to industry ?

The theatres and means of Warfare continually evolve, but governments do not have the necessary frameworks to deal with the growing Cyber Threat and it may fall upon industry to pick up that role

Dominated by Government Forces

The big defence challenge is to make safe all infrastructures, facilities and peoples from simultaneous and delayed attacks across any one or combination of theses domains

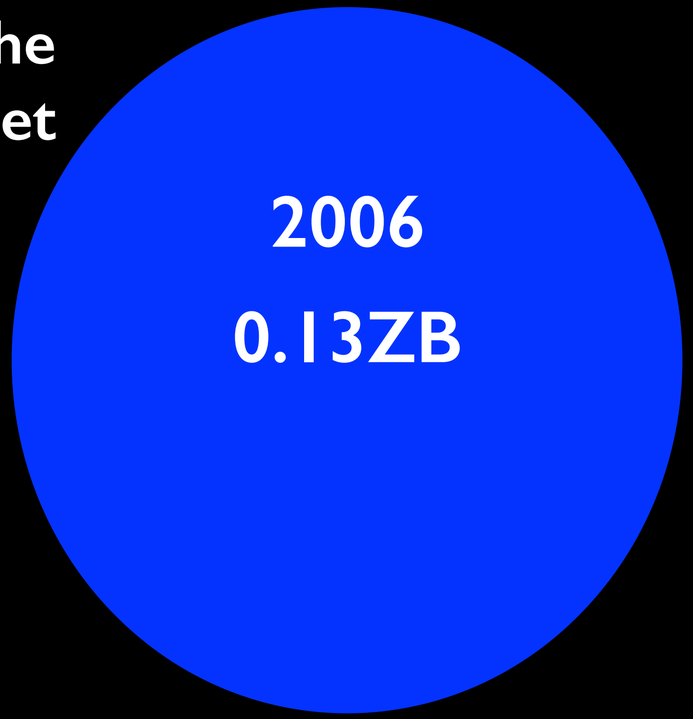
Dominated by Industry and Whitehats?



STORED INFORMATION GROWTH

IoT will accelerate this trend to promote ever more on device storage

Prognosis: IoT small data distributed storage may exceed the internet



2016
13ZB

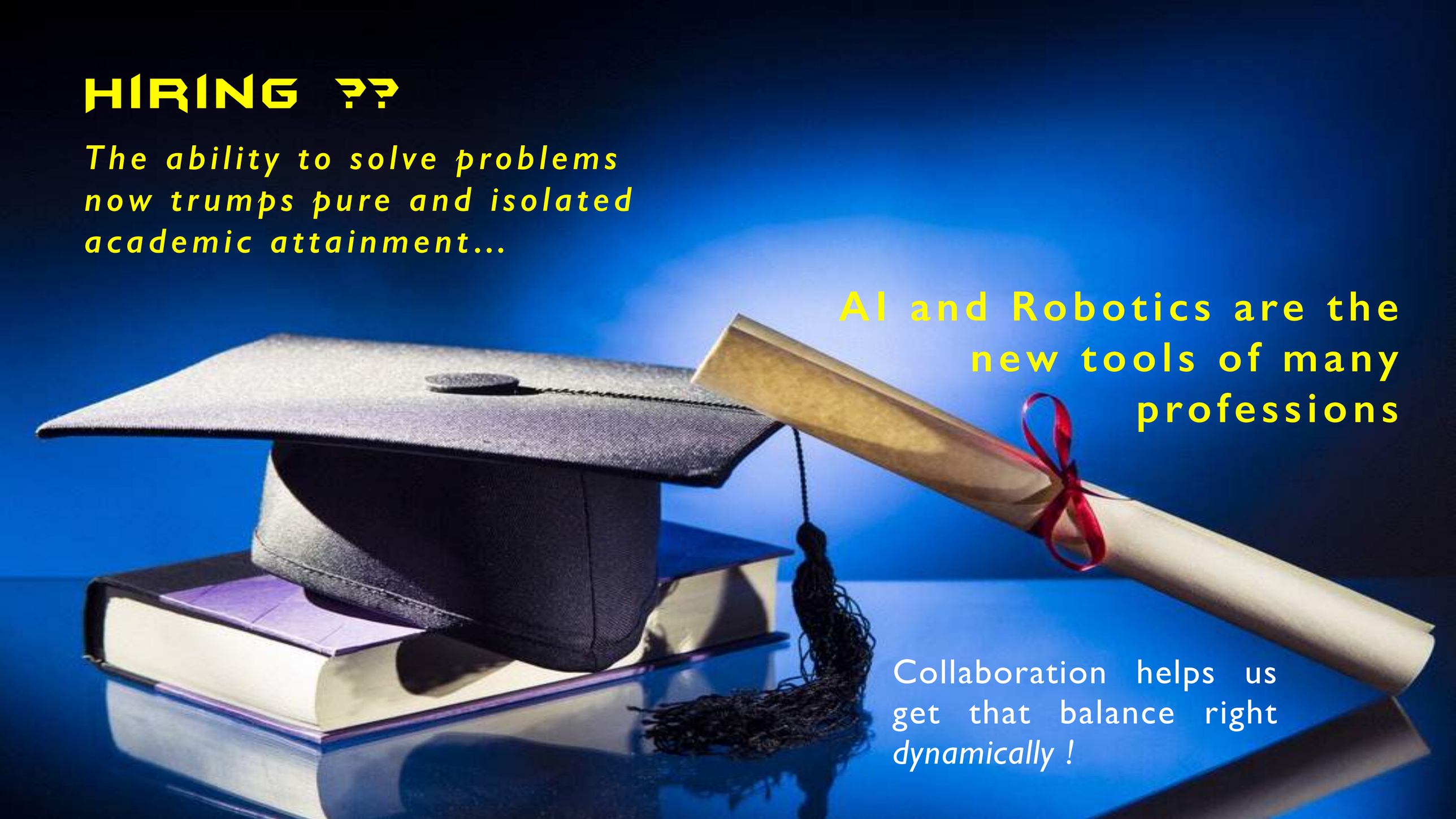
1986
I can't draw a dot small enough!!

1996
0.001ZB

ZetaByte = 10^{21} ExaB = 10^{18} PetaB = 10^{15} TeraB = 10^{12}

HIRING ??

The ability to solve problems now trumps pure and isolated academic attainment...

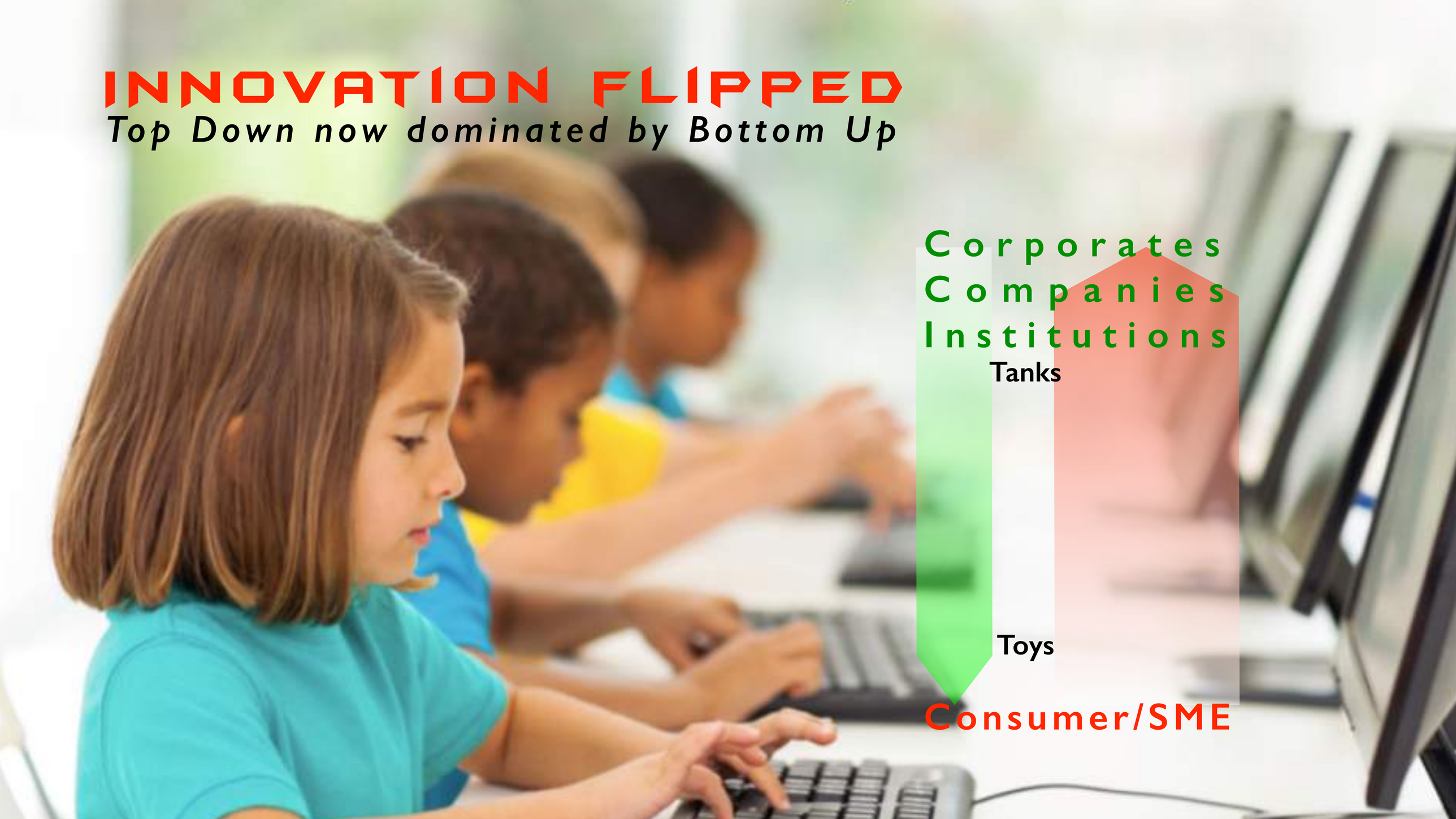


AI and Robotics are the new tools of many professions

Collaboration helps us get that balance right *dynamically !*

INNOVATION FLIPPED

Top Down now dominated by Bottom Up



THINKING ANEW

Attitudes & acceptance inverted

True or not this is the reality and people are doing their own thing - not obeying the rules, not following procedures, innovating and adapting on the fly…

RESIST OR ADAPT ?

In reality we have no choice

THE SURVIVAL OF THE MOST
ADAPTABLE

EVOLUTION

Thank You

ca-global.org

cochrane.org.uk

COCHRANE associates

University of Hertfordshire