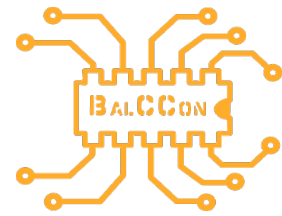
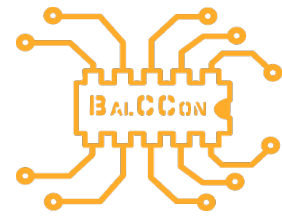


tl;dr

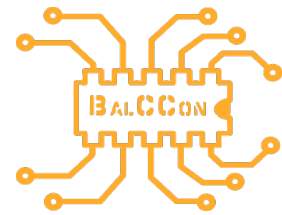


```
root@planetEarth:~$uptime
  up 4.54B years,  7.6B users,  load average: >9000
root@planetEarth:~$grep oops /var/log/syslog | wc
*** buffer overflow detected ***
root@planetEarth:~$man sustainability
  No manual entry for sustainability
root@planetEarth:~$firefox
https://stackoverflow.com/search?q=sustainability &
```

RTFM



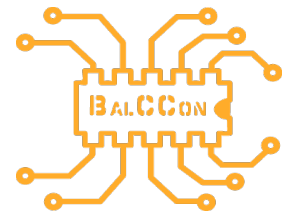
- Wave your hand if I speak too fast
- Feel free to ask **clarifying** questions
 - Accidental jargon / unclear concepts
- Discussion @15:15 in Pupin room
- Thank you for coming!



Sustainability challenge and the role of hackers

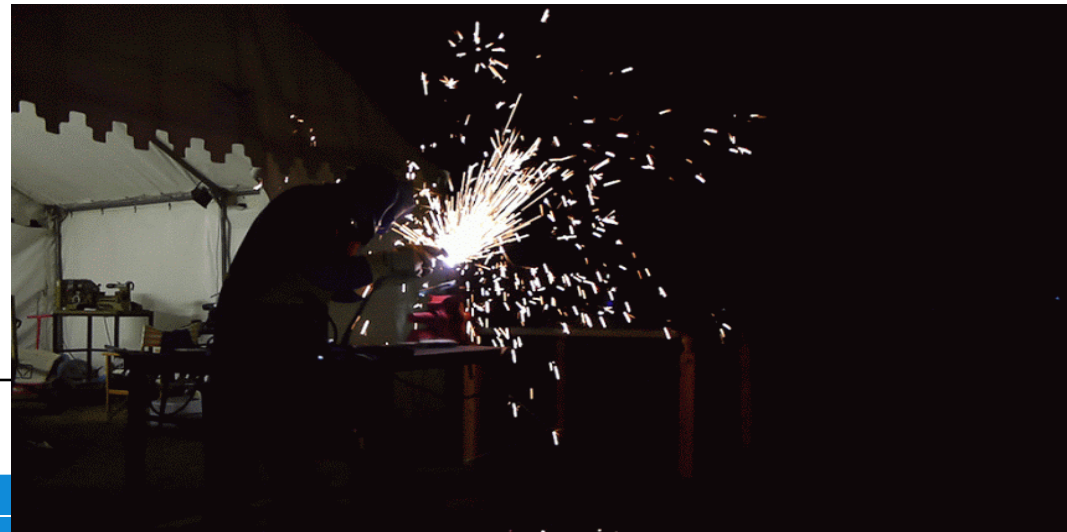
Dr. ir. Igor Nikolic

Associate professor
Section Energy and Industry, Department of Engineering Systems and Services
Faculty of Technology, Policy and Management
TU Delft

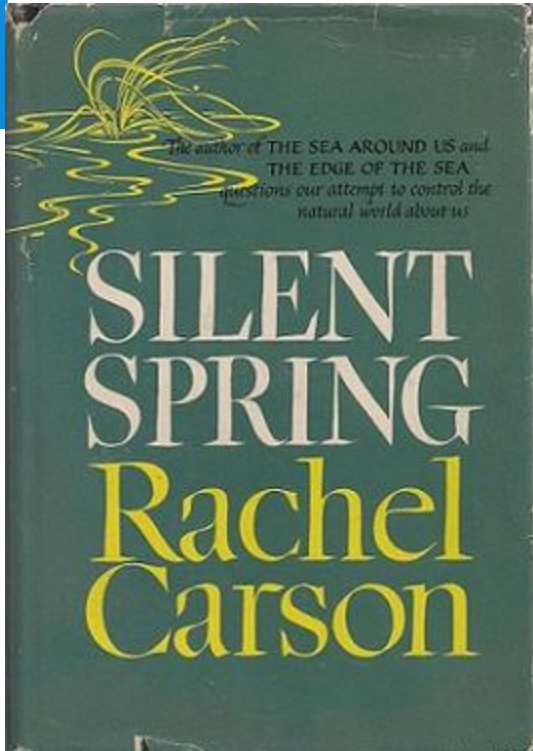


Bit of context

- engineer trying to use science to unf***k the world
- hacker@revspace.nl playing with fire and steel, electrons and bytes, microbes and light
- teacher, storyteller and organizer
- wannabe artist
- dad



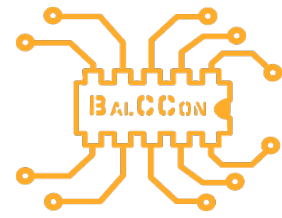
Silent Spring and the Blue marble



Rachel Carson 1962



NASA 1972

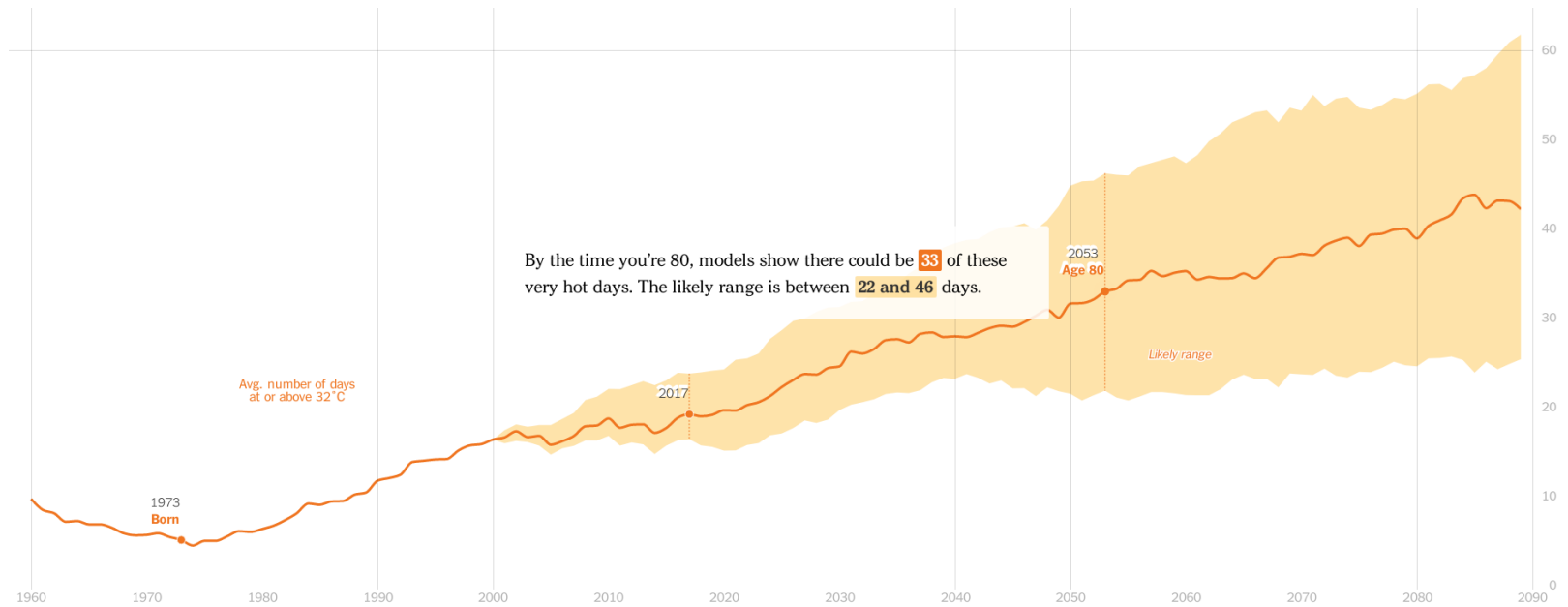
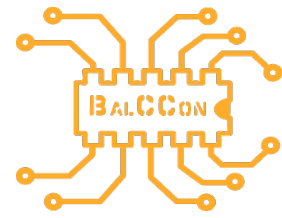


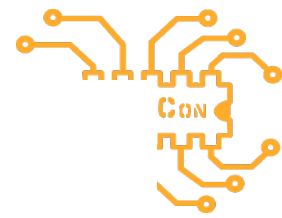
Bio-geo-chemical-socio-technical

- Ball of rust and silicon, floating in space
 - coated in thin, wet layer of green slime
 - permeated with socio-technical networks
-
- Planetary TIMES flux
 - Time
 - Information
 - Mass
 - Energy flows
 - across Space



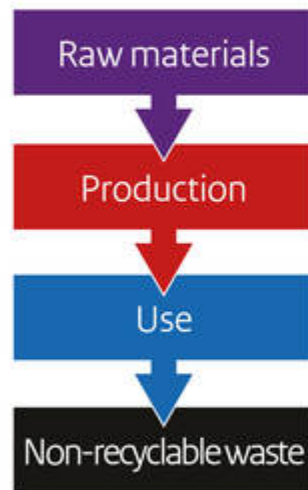
Climate change



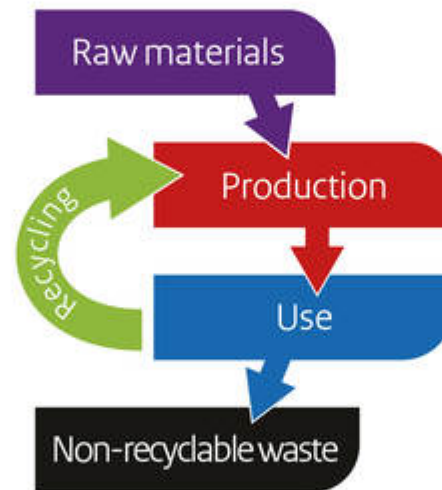


From a linear to a circular economy

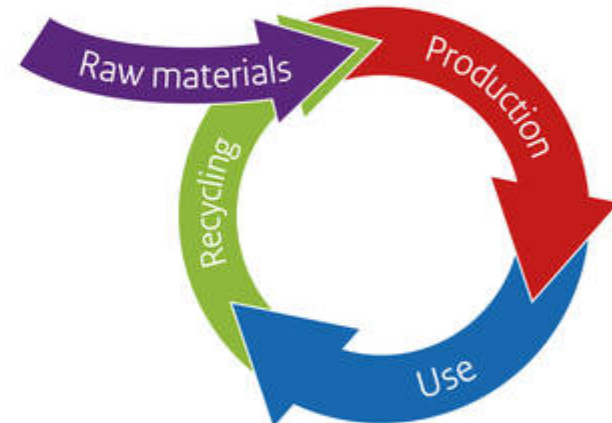
Linear economy



Reuse economy



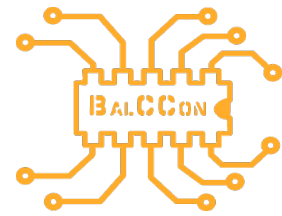
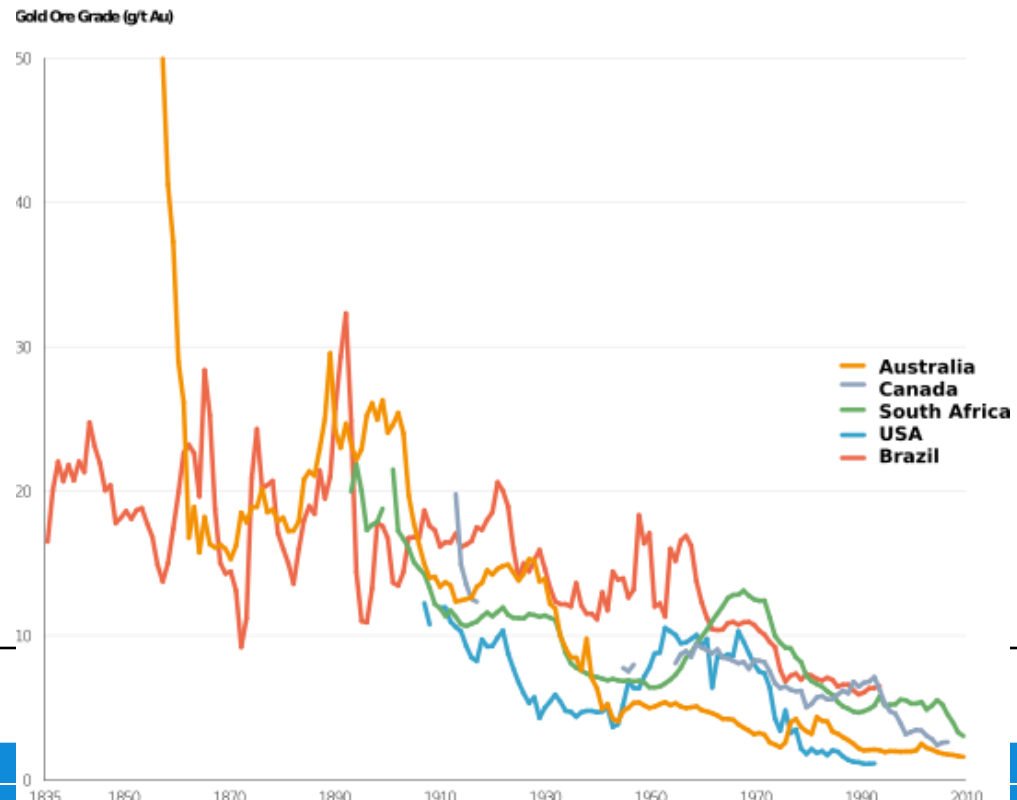
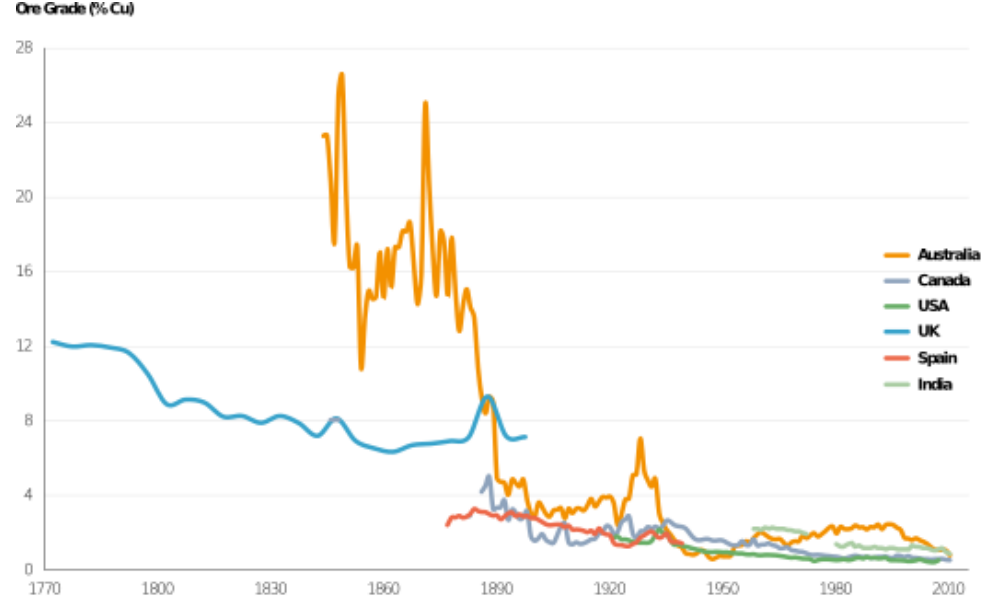
Circular economy



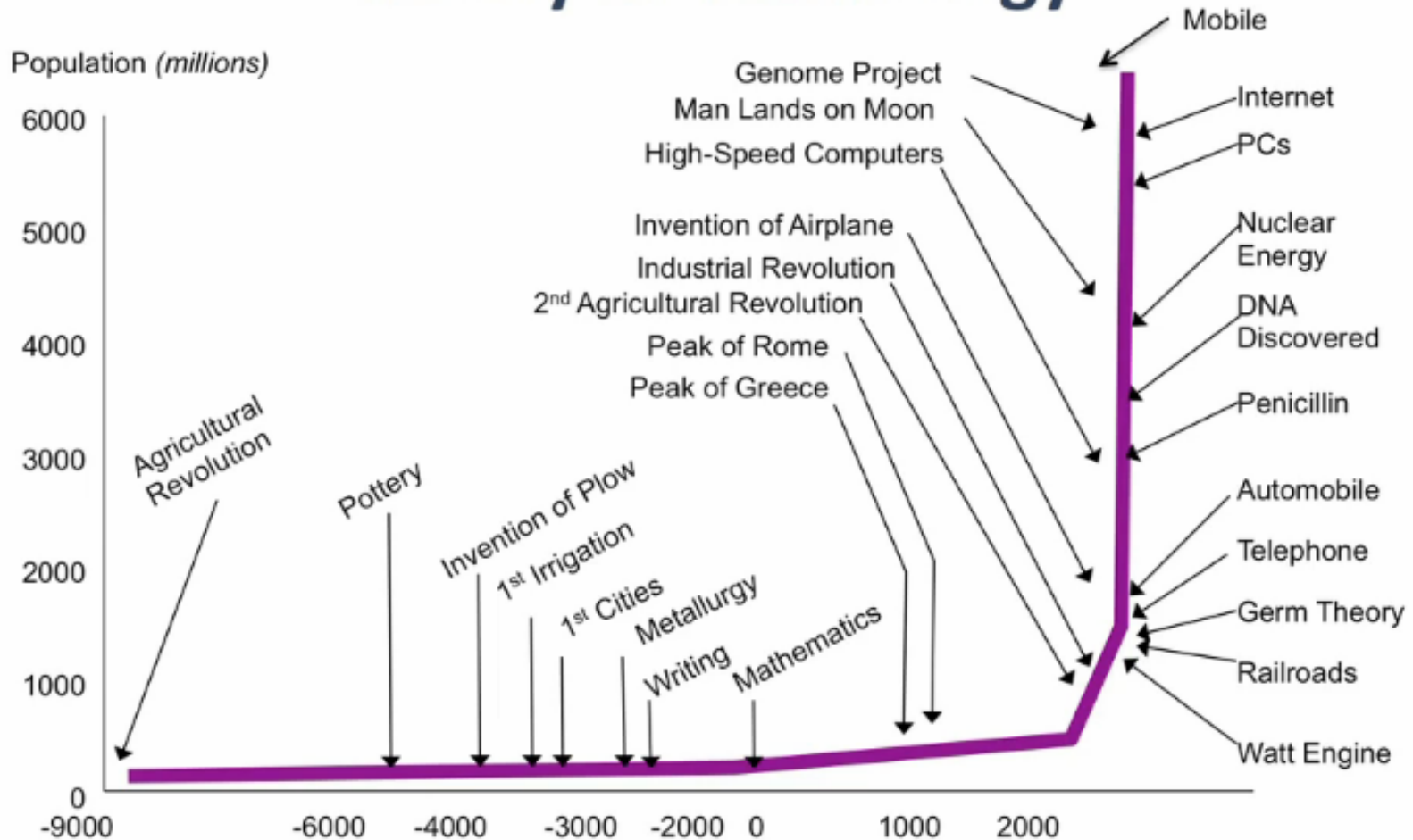
<https://www.government.nl/topics/circular-economy/from-a-linear-to-a-circular-economy>

<http://www.resourcepanel.org/reports/environmental-risks-and-challenges-anthropogenic-metals-flows-and-cycles>

<http://www.resourcepanel.org/file/364/download?token=hYEpbjx2>

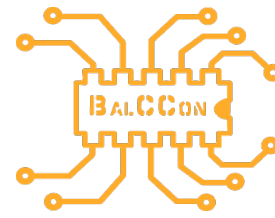


Growth of World Population and the History of Technology



Source: Milken Institute, Robert Fogel/University of Chicago

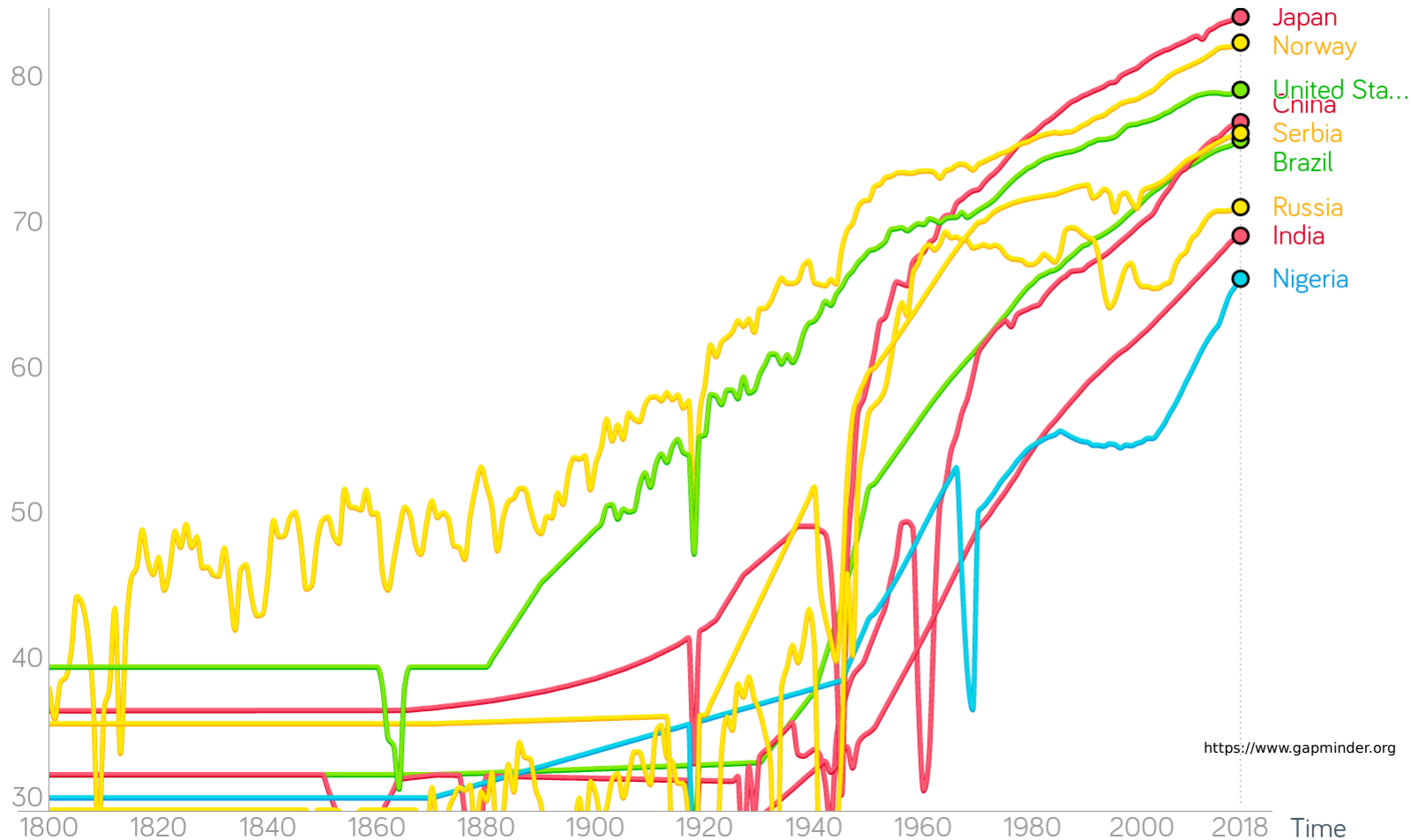
<https://www.milkeninstitute.org/assets/ccorner/healthreform.pdf>



Expected lifespan min. 125 years

<https://www.nature.com/articles/nature22792>

Life expectancy (years) ?



<https://www.gapminder.org>

Color World Regions



Show Search...

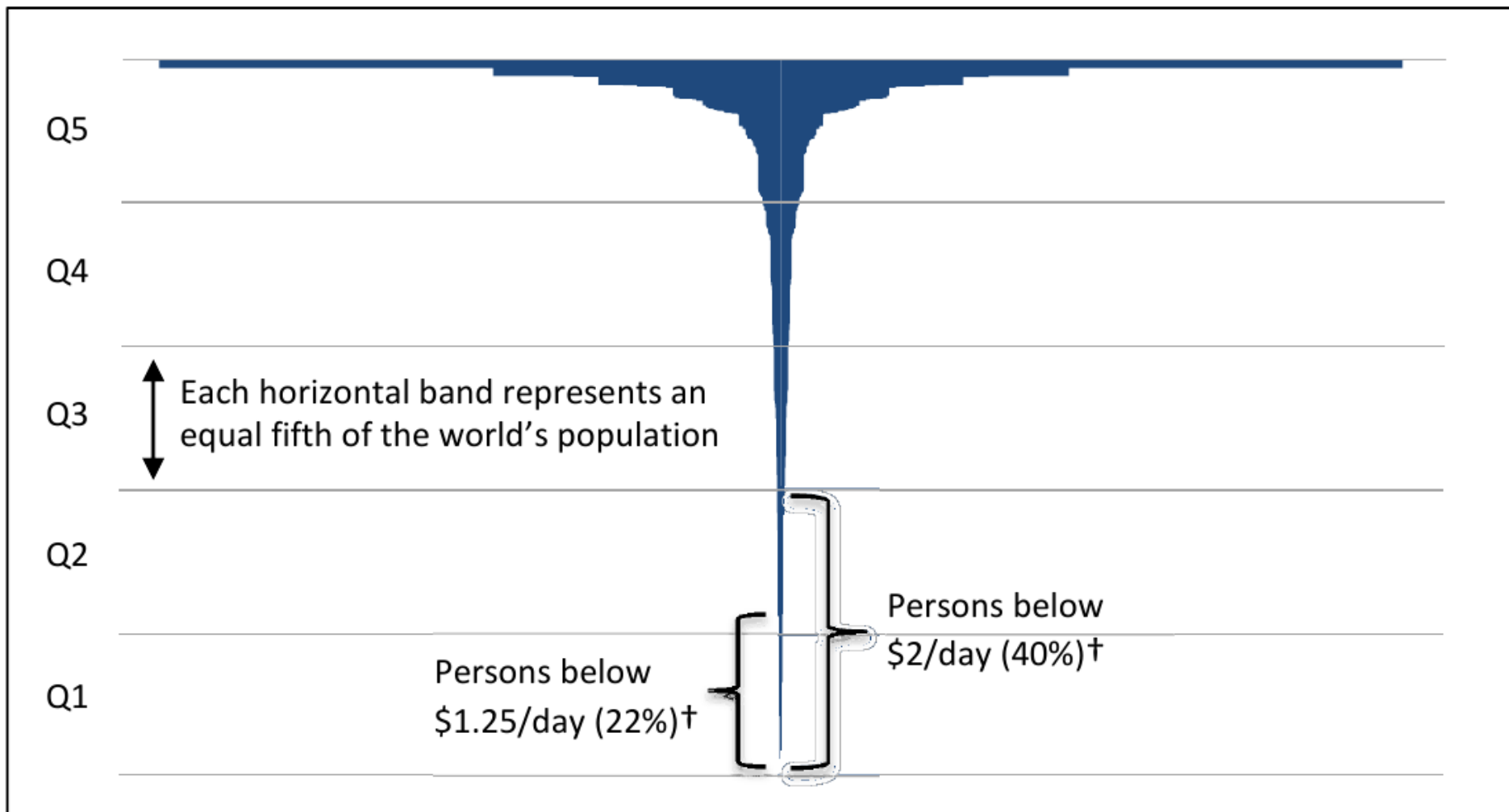
Geographic location

- United States
- Serbia
- Russia
- Norway
- Nigeria
- Japan
- India
- China
- Brazil
- Afghanistan
- Albania
- Algeria
- Andorra
- Angola
- Antigua and Barbuda
- Argentina
- Armenia
- Australia
- Austria
- Azerbaijan
- Bahamas
- Bahrain
- Bangladesh
- Barbados
- Belarus
- Belgium
- Belize
- Benin

RESET APPLY



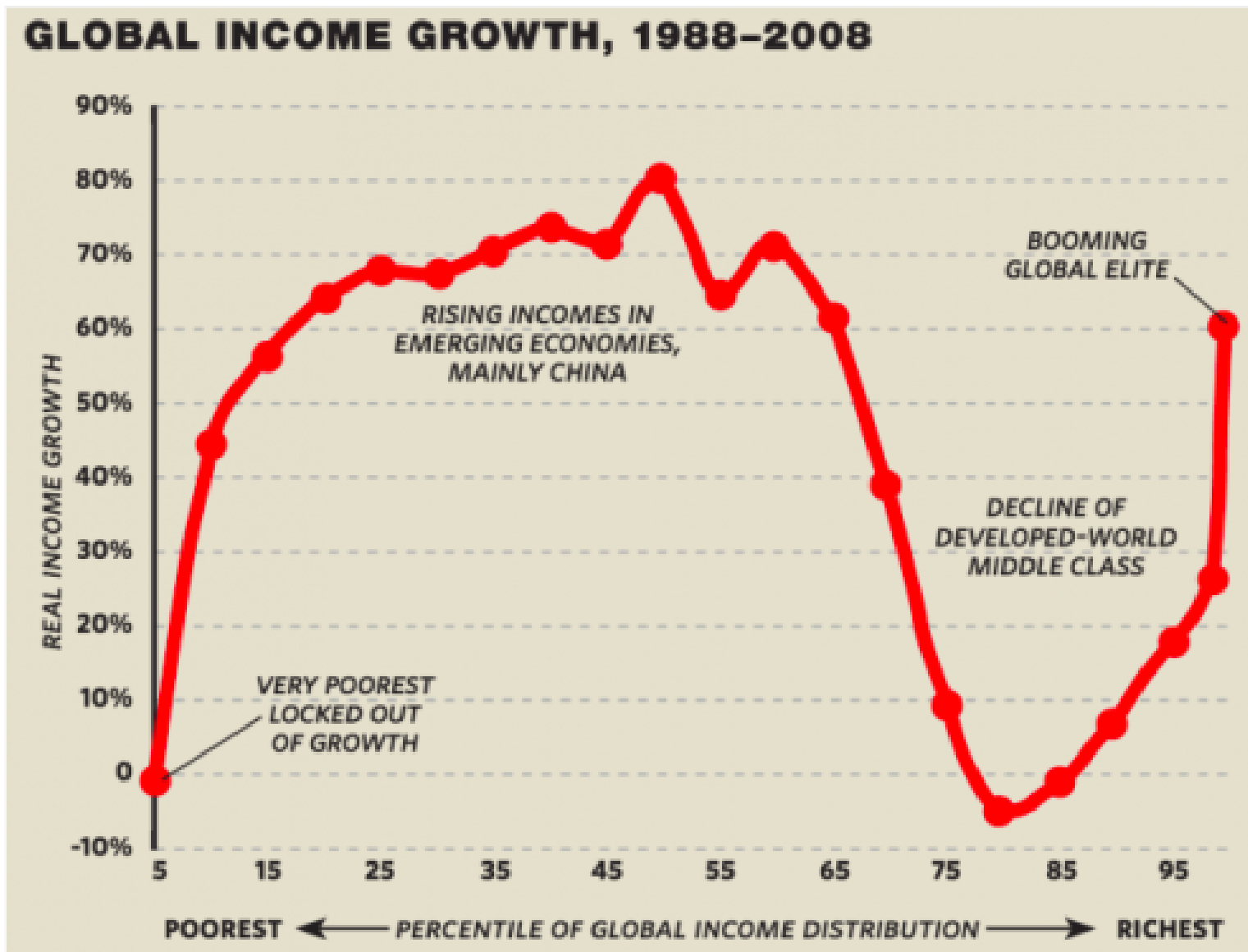
**Figure 7. Global Income Distributed by Percentiles of the Population in 2007
(or latest available) in PPP constant 2005 international dollars***



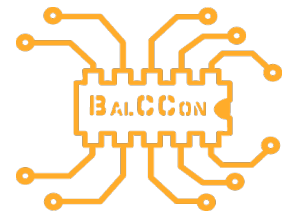
Source: Adapted from UNDP (2005) using World Bank (2011), UNU-WIDER (2008) and Eurostat (2011)

* According to the global accounting model

† Based on Chen and Ravallion (2008)



Global Inequality: A New Approach for the Age of Globalization, Branko Milanovic



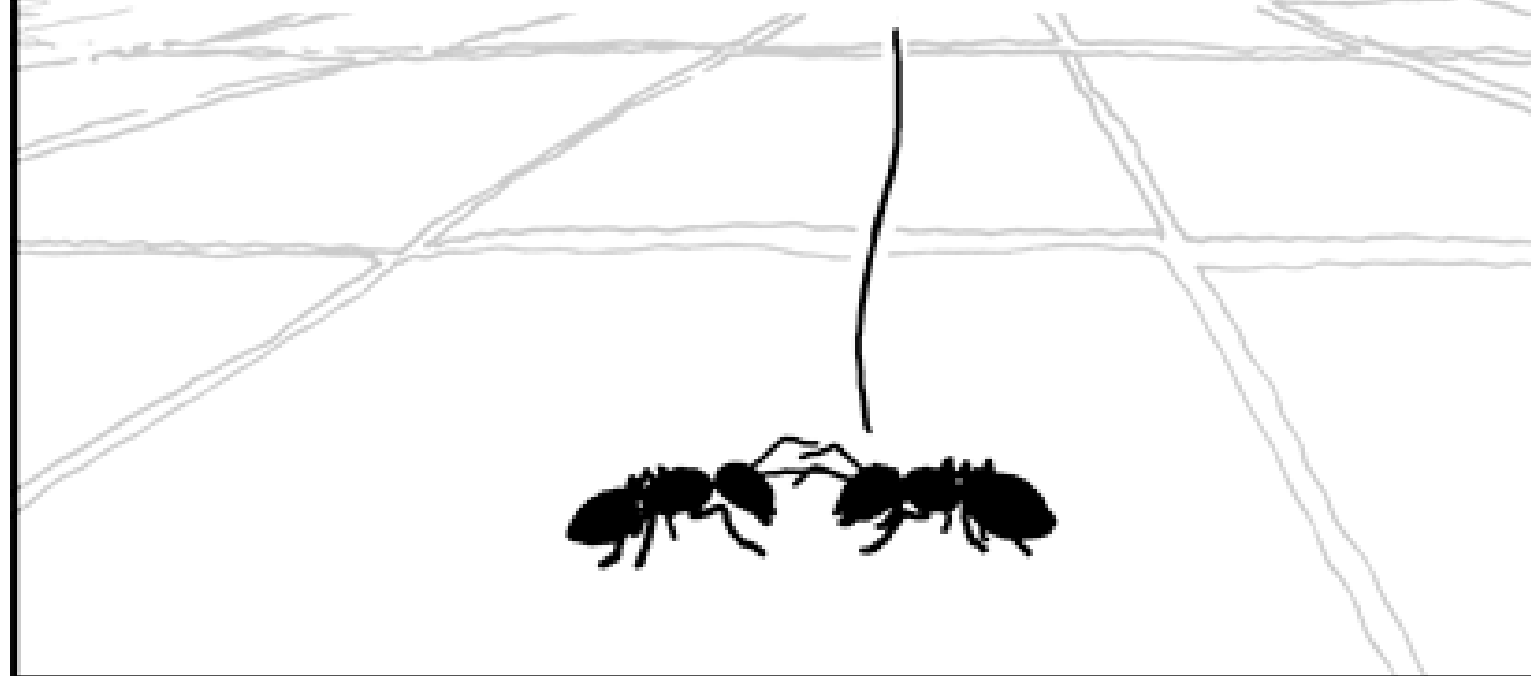
Monkey space

- Savannah primates:
 - 5 km / 1 hour walking
 - Next season
 - 150-200 people (Dunbar's Number)
 - Direct cause-effect logic
- Sustainability
 - 40K Km
 - 100-1000 years
 - 7.6B people
 - Complex, adaptive, non-intuitive logic



WE'VE SEARCHED DOZENS OF THESE FLOOR TILES FOR SEVERAL COMMON TYPES OF PHEROMONE TRAILS.

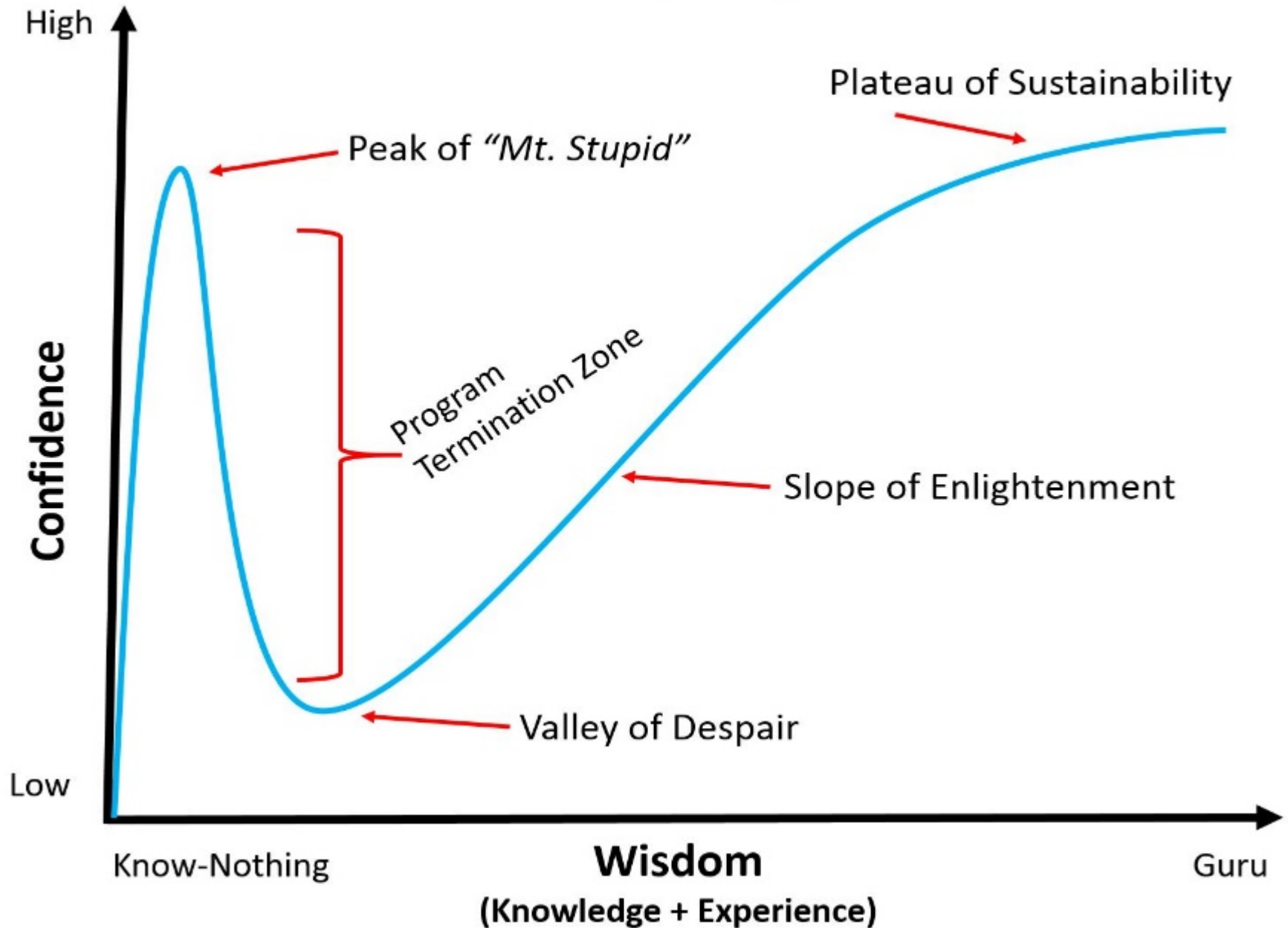
IF THERE WERE INTELLIGENT LIFE UP THERE, WE WOULD HAVE SEEN ITS MESSAGES BY NOW.

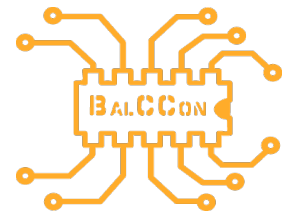


THE WORLD'S FIRST ANT COLONY TO ACHIEVE SENTIENCE CALLS OFF THE SEARCH FOR US.



Dunning-Kruger Effect

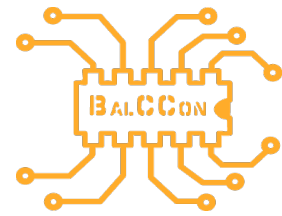




Hacker patterns

- As observed in ~10 year of engagement
- Obviously biased
- Real to the best of my knowledge

- Good
- Bad
- Ambiguous



Positive patterns

- Sharing / Openness
 - Code, designs, knowledge
 - Standards, Ideas
- Inclusiveness
 - Trying but requires natural ability/skill/education/ time
 - does require privilege of various forms, money, education, access etc
- Engaged
 - Many / most people are motivated, active, critical, care



Negative patterns

- Limited diversity
 - my city : 57% dutch born, 35% "non-western" immigrant, 18% "western" immigrant, 50.4% female
 - My hackerspace: ~1% POC, ~5% female, ~15% immigrant
- Elitism
 - Sheeple, LUSERS, ID10T error, etc,
 - below-average social skills ? In-group vs out-group selection?
- Techno fix
 - There is an app for that
 - "leaky abstractions"?
 - Digital : binary, structured, ordered, elegant
 - Real: messy, complex, value and emotion loaded

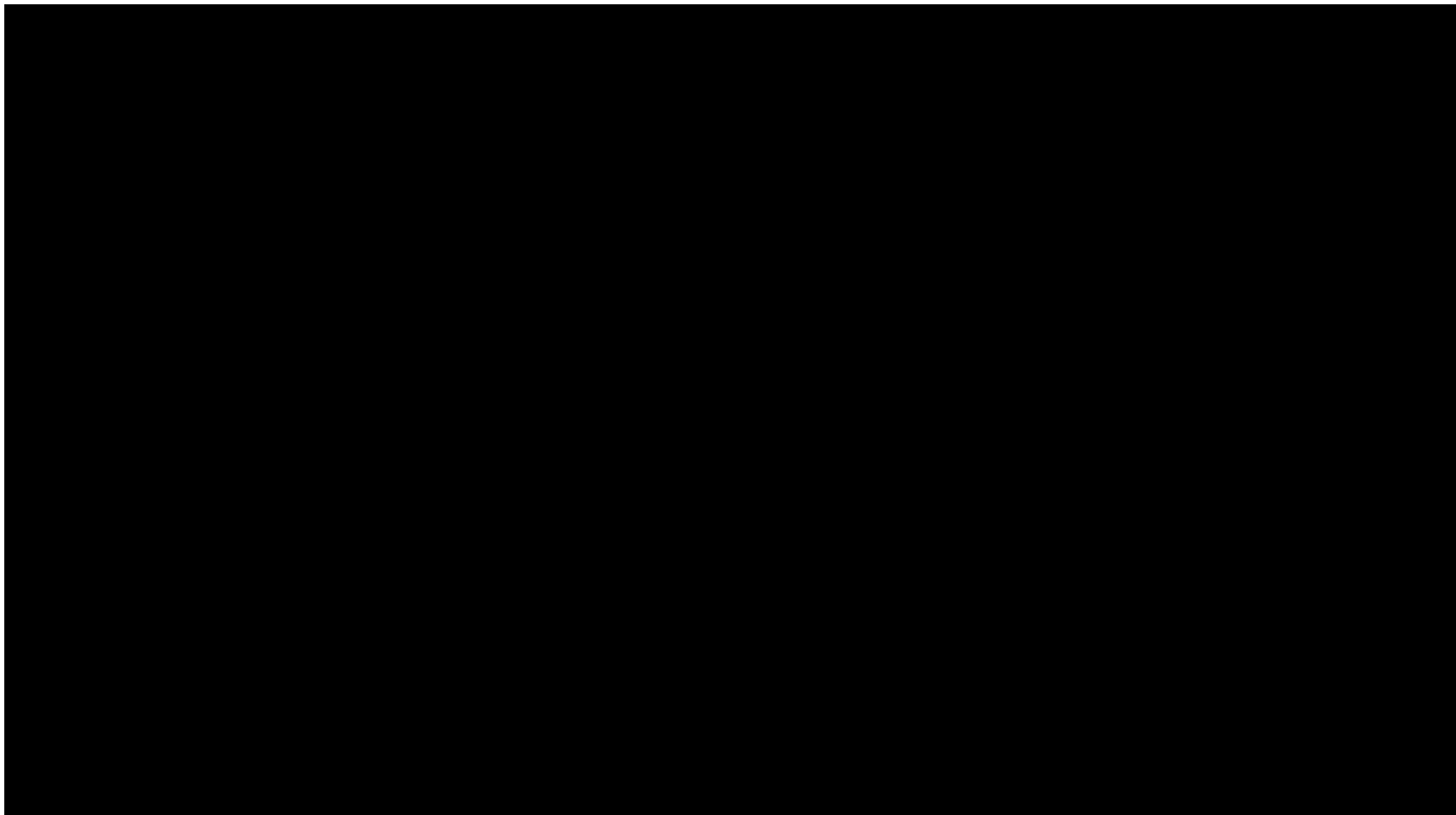


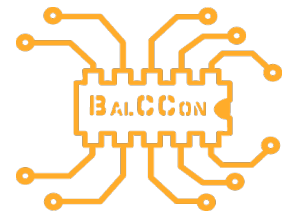
Ambiguous patterns

- Very idealistic
 - Non-compromising & unreasonable
 - "The reasonable man adapts himself to the conditions that surround him... The unreasonable man adapts surrounding conditions to himself.. All progress depends on the unreasonable man." - Bernard Shaw
- Superstar culture
 - Human need/want leaders
 - Sense of responsibility, inspire, lead by example
 - But elitism, abuse of power, personality cult
- It is a rich peoples game
 - you can afford to hack around
 - You can afford to support others



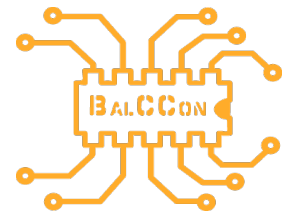
Leadership





Ambiguous patterns

- We make the tech !
 - On purpose : Deaths per KG optimization of weapons
 - Accidentally : Soap dispenser that does not react to dark skin.
- Humans are creative in abusing tech



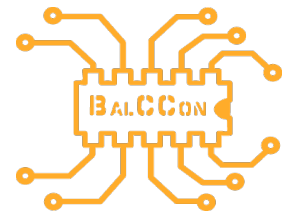
Tech is neutral?





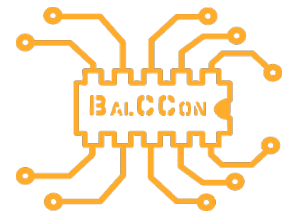
So, whats a hacker to do ?

- Vote
- Engage
- Work
- Think
- Make it easy
- Look at boring stuff
- Disseminate and backup



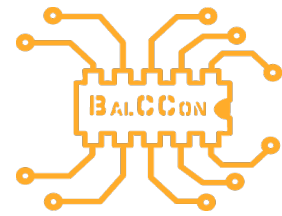
Vote

- With your ID
 - Support politics that engages with sustainable issues
- With your wallet
 - When available chose greener
 - Energy, Food, Clothing, Transport
 - When not
 - Ask for, name and shape - twitter s**t storms work
- With your feet
 - Get involved with positive activities



Engage with local communities

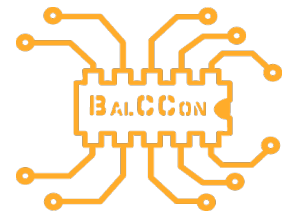
- Identify real, local problems
 - that you can solve
 - teach your neighbors skills and fix it together
- Have patience with n00bs
 - nobody is born with knowledge
 - willingness to learn >> current level of skill
- Start a hacker space or
 - repair cafe
 - organize a crypto party for local journalists
 - start a coder-dojō
 - provide free/cheap hosting to local initiatives
 - refurbish old computers with OSS, hand them out to schools



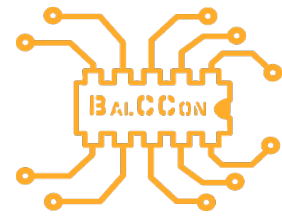
Be aware of your work

- More often than not, you do have a choice.
- "Ill try to change it from within"
 - Can work, is hard, frustrating and **very** slow
- "The evening mirror" test
 - Come home from work, look in the mirror
 - Say "I did good today"
 - Don't feel like an ass
 - ????
 - Profit

Think about tech for the poor, underrepresented, oppressed groups



- Simple to use, robust and empowering tech
 - Listen to their problems, don't assume!
- Some examples:
 - Open source farm machinery : opensourceecology.org
 - Water drum you can roll : rolloutthebarrel.org
 - Better batteries for electric rickshaws
 - Learn to weld while making jet stoves, hand them out to people will cooking on wood



Make it easy(er) to do good

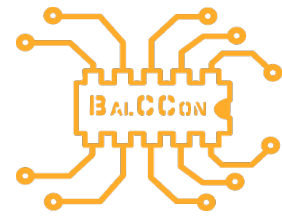
- Improve usability
 - Why is PGP still so darn hard to use ?
- Write HowTos and manuals
 - Why is documentation of so many OSS project so incredibly crap ?
- Translate software
- Maintain information sources



Look at the boring stuff

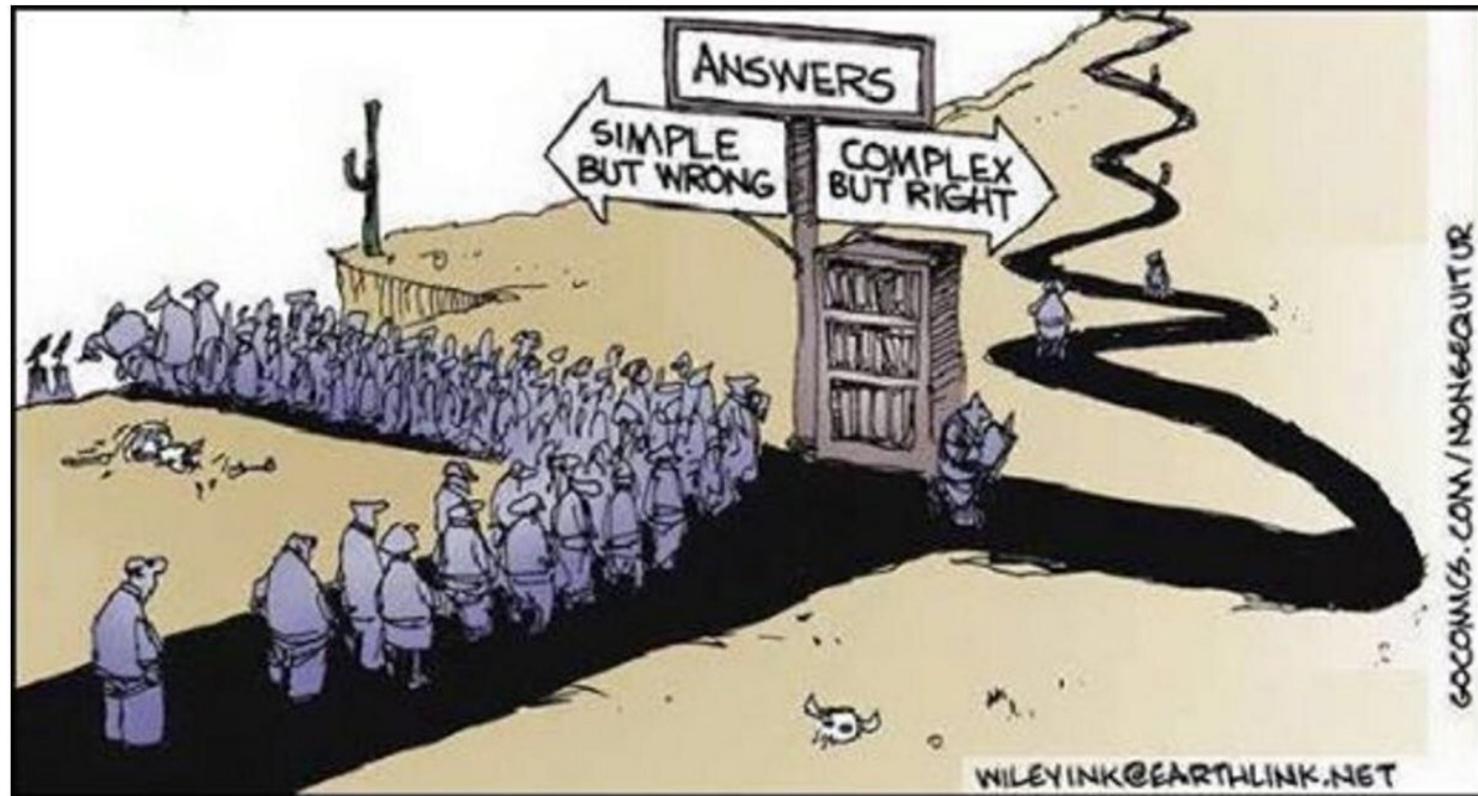
- Infrastructures, large basic industrial sectors
 - innovative things → massive impacts
 - CAPEX, consultants, legal departments :(
 - but plenty of great people who care, find them!
- Examples
 - Citizen science project on air pollution, environmental monitoring (luftdaten.info, flood.network)
 - OpenStreetmap : wiki.openstreetmap.org/wiki/Power
 - World powerplants : Enipedia.org

Disseminate and backup open knowledge



- Run wikipedia & wikiHow mirrors
 - Any and all open source knowledge, data etc you can find
 - OSS repos, datasets, etc
- Also really boring /basic stuff
 - Do you know how to make soap, if there is no internet?
 - Find, scan and online old craft and skill books

Thank you!



Dr. ir. Igor Nikolic - I.nikolic@tudelft.nl - @ComplexEvo