

Radiology 2050: Will You Even Recognize It?

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Disclosures

- I was instructed to be “provocative”
- This turns out to be a lot harder than I thought...
- Its unlikely I will be around in 2050 so I bare no responsibility for statements made today.
- If I am around, I hope the AI algorithm is nice to me

Radiology 1990 (30 years ago)

- Film based
 - Film libraries
 - X-ray alternators
 - Hot lights
- MRI primitive and slow
- PET only a research tool
- Plain films were important
- No RIS/PACS system, manual scheduling, reporting, no voice recognition
- However, fundamentally Radiology is unchanged in 30 years :
 - patient schedule, arrival, completion of study, dictation, report distribution



Provocative Statement #1

- The pace of change in the next 30 years will exceed that of the last 30 years.
 - Cost/speed of computing is approaching zero
 - Connectivity is unprecedented
 - Dramatic developments in immunology, genomics, medicine
 - The current system is economically unsustainable
 - Major paradigm shifts are upon us
 - The US health care system will begin to look like the rest of the world
 - Medical standards will be global, not local
 - Scale will invite big players to make big changes

Provocative Statement #1a

- AI will improve the productivity of health care
- AI will not change the care itself
- AI will be a great equalizer:
 - AI will hold medical care to universal standards
 - But...AI will be modified to local circumstances
 - There will continue to be massive inequalities

Radiology 2050:

Tom Smith, Age 47 wakes up with fever, burning on urination:

Consults on-line AI

Recommended to have home urine test

Results suggest need for blood work (local CVS)

Takes self driving car to local POC

Blood work performed (see later slide)

Automated US to rule out hydronephrosis

Imaging is pre-read by imaging AI

Treatment (medication) or referral (procedure) (at CVS)



Note: no primary care or radiologists in this paradigm

Do you need to see a doctor first?

- Based on symptoms, history, AI could do a good job of suggesting most likely diagnoses and ordering appropriate tests
- By consolidating testing in networked diagnostic centers the “personal AI thread” can be fed additional data
- Only after a reasonable diagnosis is established does a patient see a doctor
 - Saving time, reducing acuity
 - More accurate
 - Less “lost to followup”
- By the Way: This already exists: One Medical

A high percentage of patient complaints are psychosomatic...how will AI deal with that?

- On line therapy is becoming more common
- AI therapists will respond humanely
- Already starting:
 - Talk Space
 - ReGain
 - Breakthrough



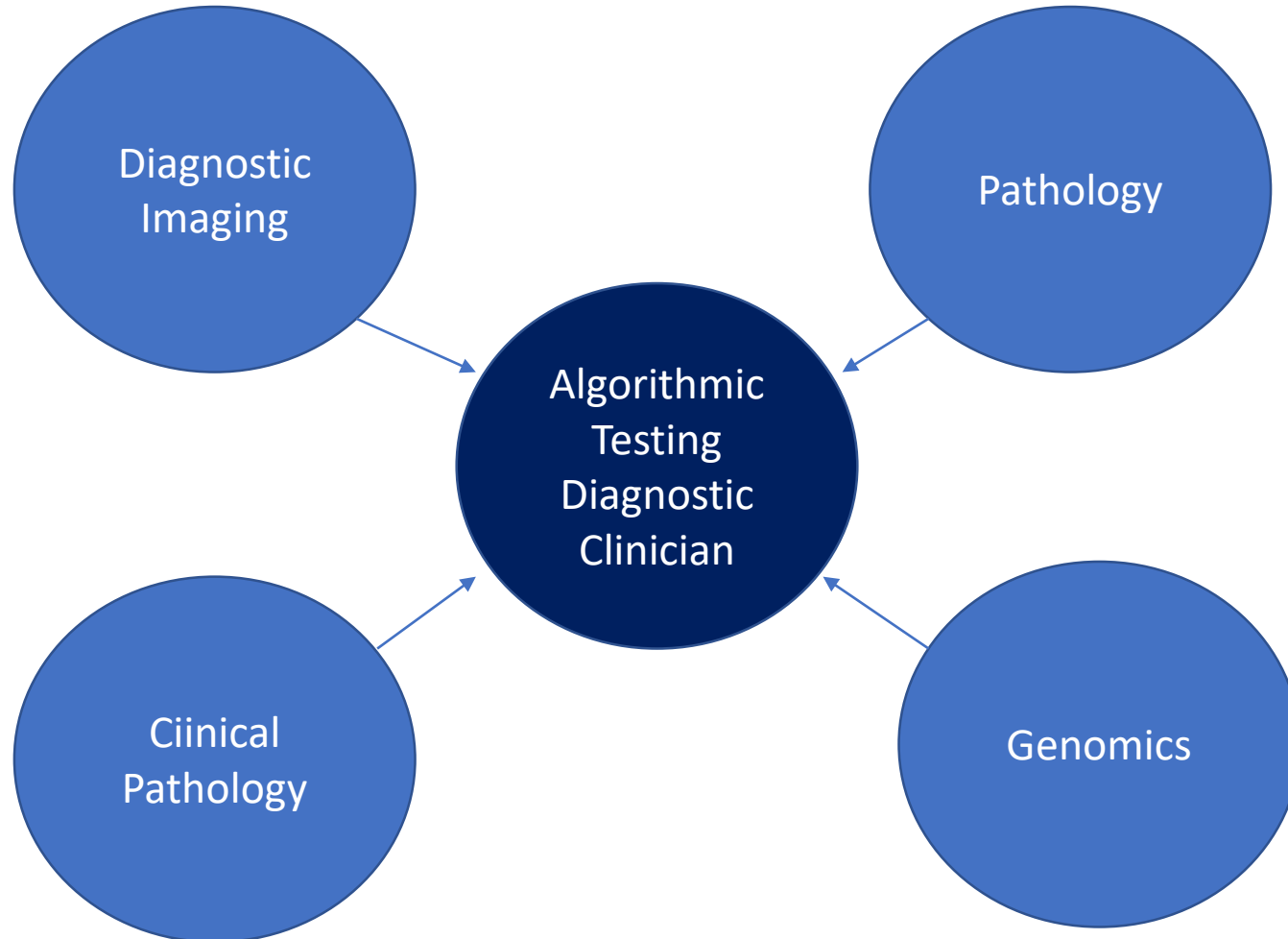
Provocative Statement #2:

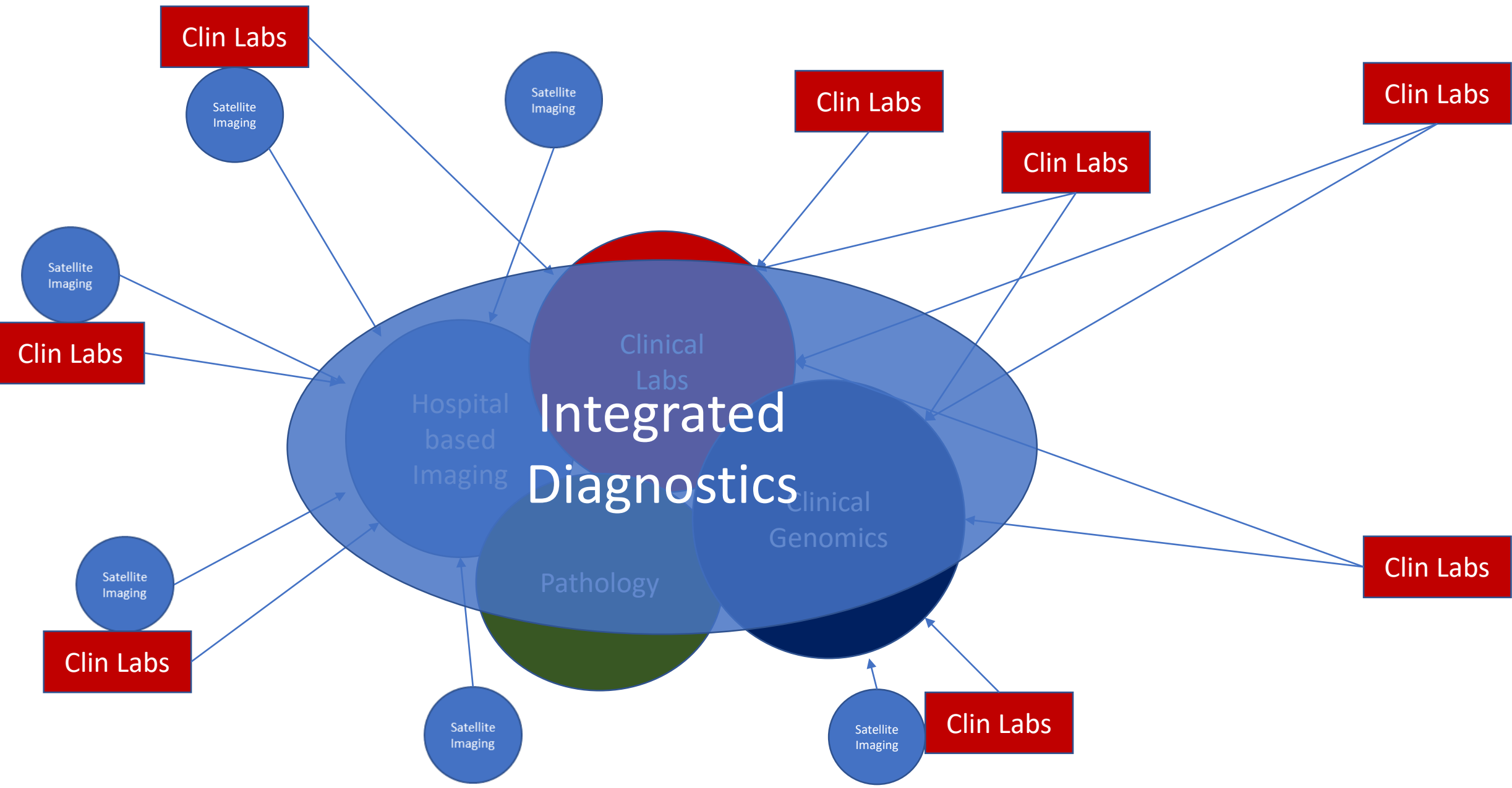
- AI will not reduce the need for imaging
- AI will reduce the need for the speciality of Radiology
- The field will evolve with Pathology, Clinical Path, Genomics to the Department of Diagnostic Testing and specialists will be called “Clinical Diagnosticians”

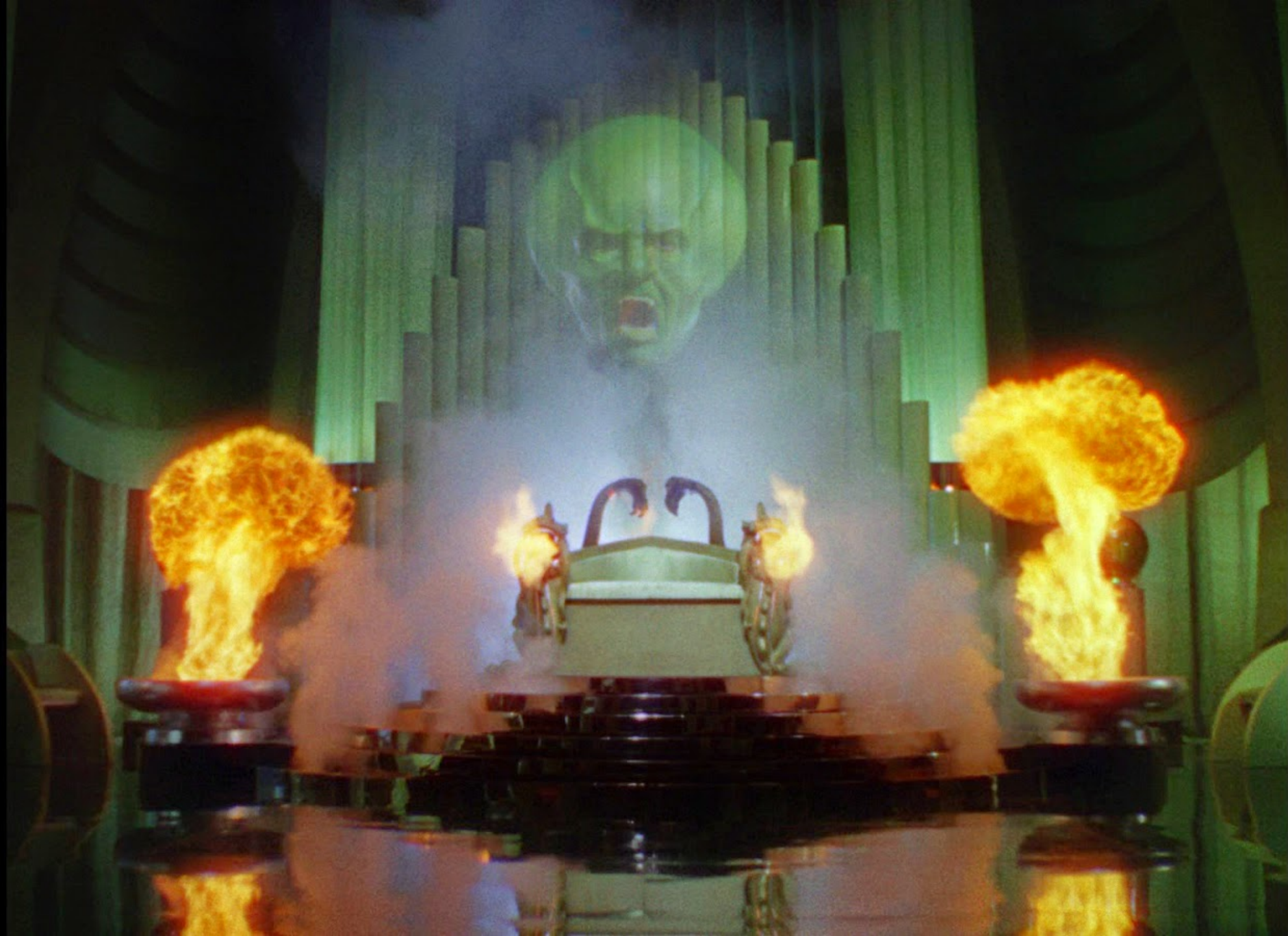
How I get there

- Over next 3 decades demand for Radiologists will decline as AI takes over more routine roles.
 - It will initially be fought by organized Radiology
 - However, economics will dictate downsizing
 - The American College of Radiology will become smaller as its base erodes
 - In order to prevent this, they will look for partners.
- Meanwhile, the same thing will happen in Pathology
- Burgeoning field of genomic diagnostics will grow multifold in 3 decades.
- Genomics will take Radiology and Pathology under its wings to create a powerful standalone diagnostic specialty

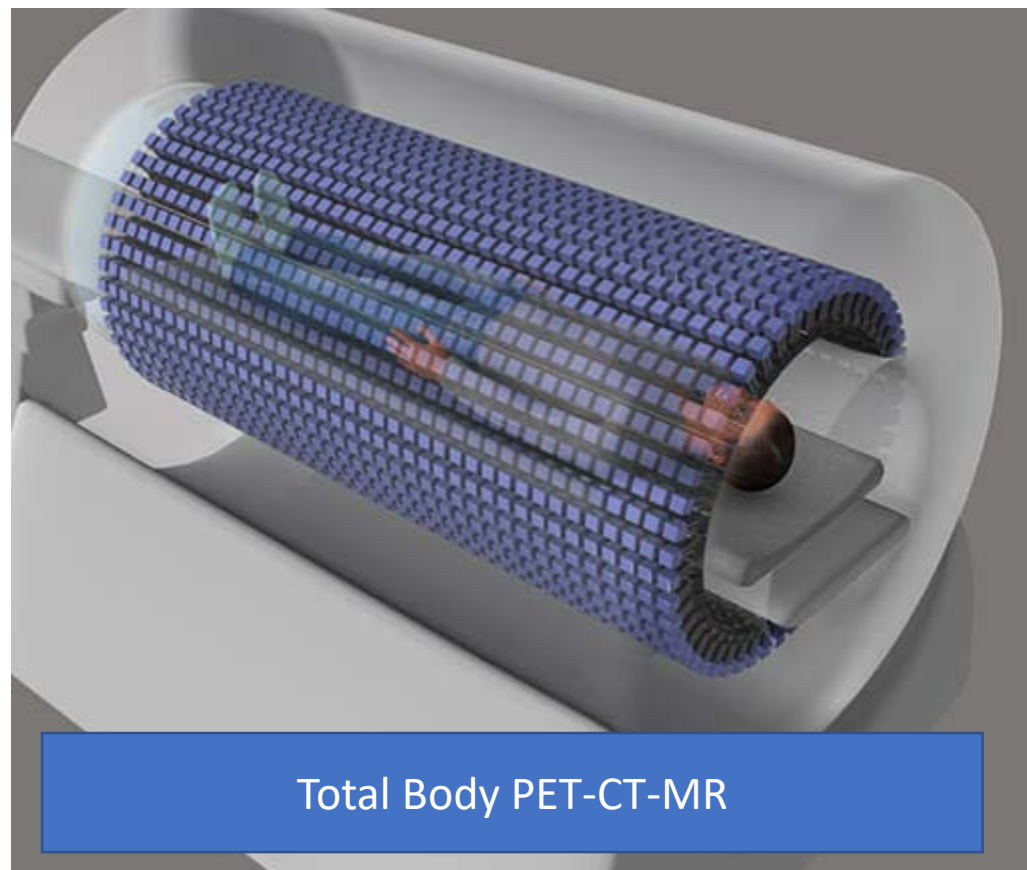
Department of Diagnostic Testing





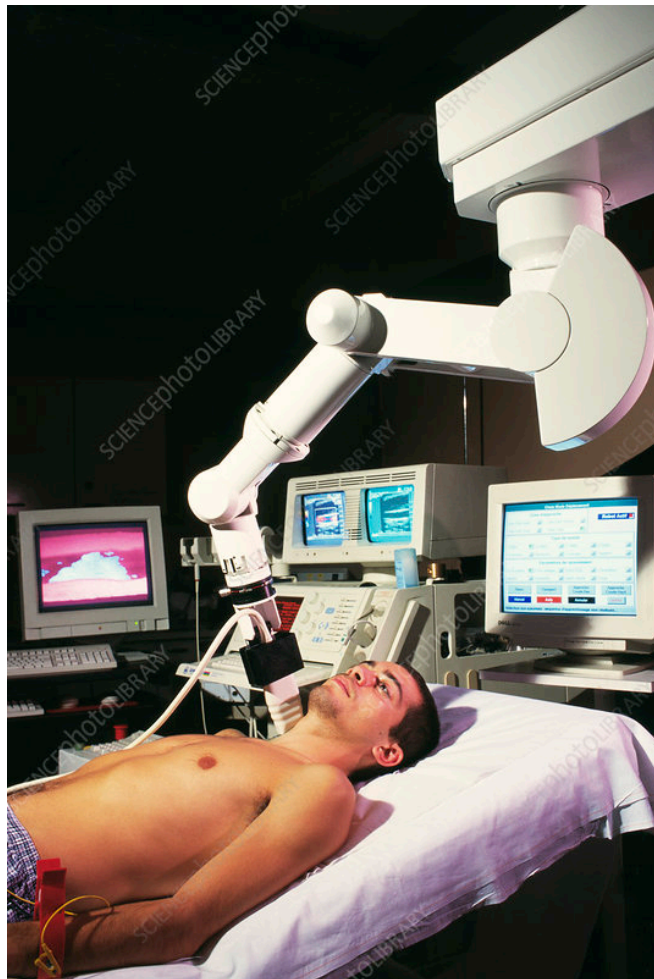


But the scanners may be very different!



Scan Time: 15 min

Robotic US guided by AI



What will a “Diagnostic Department” look like?

- Increased use of hybrid devices to speed diagnosis.
- They will dramatically come down in cost.
- CT: lower dose, dual energy automatic, no precontrast scans
- MRI: faster, shorter studies, dedicated MRIs for head/extremities
- PET: Whole body 10 sec scans, no CT, attenuation, based on modeling
- “Departments” decentralized with hybrid units deployed near patients and run with technologist.
- Focus on data integration and diagnostic/therapeutic procedures
 - Robot assisted interventions: Will “hold your hand” during procedures

Welcome to the Diagnostic Center!

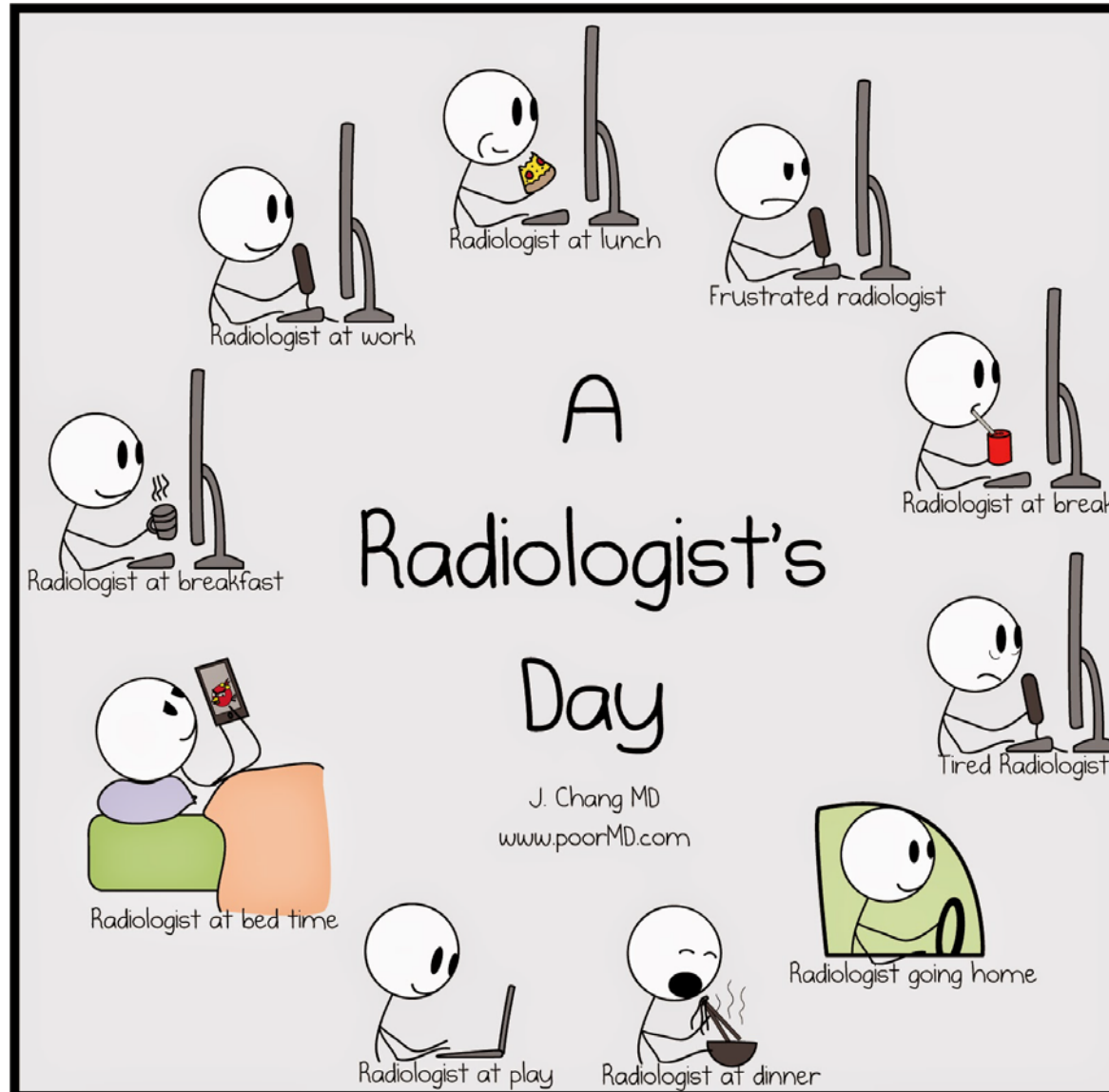


Will there still be a need for people?

- Absolutely
- However, you need a person standing by to help patients on and off the scanner and available for injections, emergencies?
- Will that ever be automated?

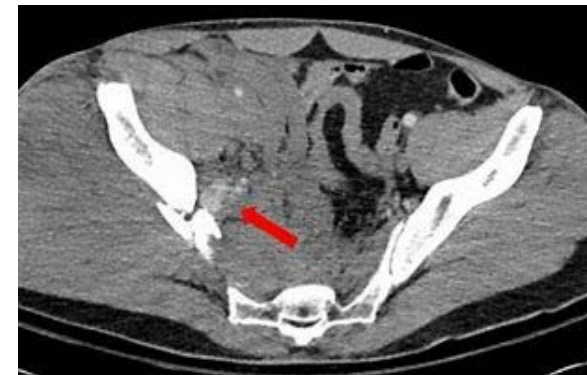


Does AI threaten Radiologists?



What will Diagnostic Clinicians do?

- Self driving car MVA (Google v. Uber)
- Human EMTs
- Patient brought to trauma center using with
 - Fast track automation routes to hospital
- At hospital patient immediate undergoes battery of serum, urine tests whole body low dose CT
- AI identifies all fractures, Radiologist reviews for accompanying abnormalities in conjunction with lab data
- Pt taken to OR and robotic surgery is performed using AI
- There is a Surgeon in the room!



How will we deal with all this data?



AI as Radiologist Assistant

- AI will be customized to each Radiologist...in essence cloning radiologists.
 - This is “George’s” AI reading....
- Studies will be pre-read by AI, annotated and a report pre-populated.
- Radiologists checks and releases.
Other data (imaging, pathology, clin path, genomics) is incorporated in report
- For measureable lesions, comparisons are automatic with previous measurements, lesions are graphed and trendlines established.
- Radiologist spends most time with cases not amenable to AI
 - Example: Patient undergoing surgery who develops fistulous track. Where does it go? What should be done about it?
 - Example: New mass in liver, needs biopsy or further testing?
 - Radiology will be far more interventional (biopsy, drain, tracks etc.)

Provocative Statement #3

- Elizabeth Holmes will be considered a pioneer
- Theranos v.2.0 will be in the Fortune 100



theranos

Clinical Pathology

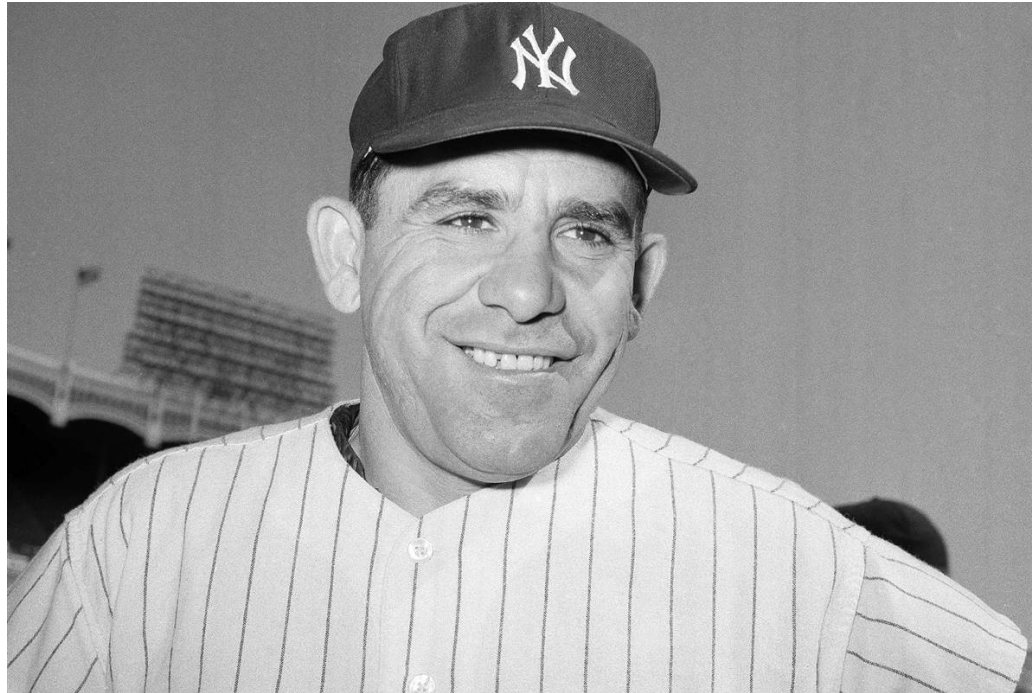
- We will need cheap, fast blood/urine/body fluid testing on small samples at point of care.

Provocative Statement #4 (see #1)

- Breakthroughs in medical care will not come from AI in 30 years
- Breakthroughs will come from:
 - Biology (Especially genomics and immunology)
 - Engineering
 - Chemistry
- AI will make these breakthroughs better:
 - Eliminate health care disparities
 - Increase speed of care, decrease length of illness
 - Decrease cost
 - Prevention!

Final Thoughts

- Yogi Berra (1925-2015) said:
 - Its tough to make predictions, especially about the future



Some predictions

- Radiology depts will be smaller, disbursed with more hybrid equipment.
- Radiologists/Pathologists/Genomicists will become one diagnostic speciality focusing on data science
- IR will be the most important part of Radiology/Pathology
 - Image guided viral vector therapy
- Specialists with imaging training will be integrated into disciplines
- AI will assist all these people so that the right test is performed.
- Reports will be issued but the full data will always append the report
- Patients will carry all their medical data, including imaging, possibly in their watch but definitely in the Cloud

Summary

- Our jobs will not exist in their current form in 30 years
- Care will be faster, cheaper yet more personalized
- People will spend much less time getting medical care
- AI will integrate into every aspect of medical care and it will change the way medicine is practiced
- However, AI will not solve all our problems.
- If we want better therapies we better invest in Science
- Unless, of course, someone comes up with 2nd generation AI....
- Caveat: Beware Digital Totalitarianism, perhaps the most immediate threat

Thanks to....

- Baris Turkbey
 - Stephanie Harmon
 - Tom Sanford
 - Sherif Mehralivand
 - Jonathan Sackett
- ...for helping me out



