



The Mars Age Technology Roadmap

The Good, the Bad, and the AI

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MacroInvent.com

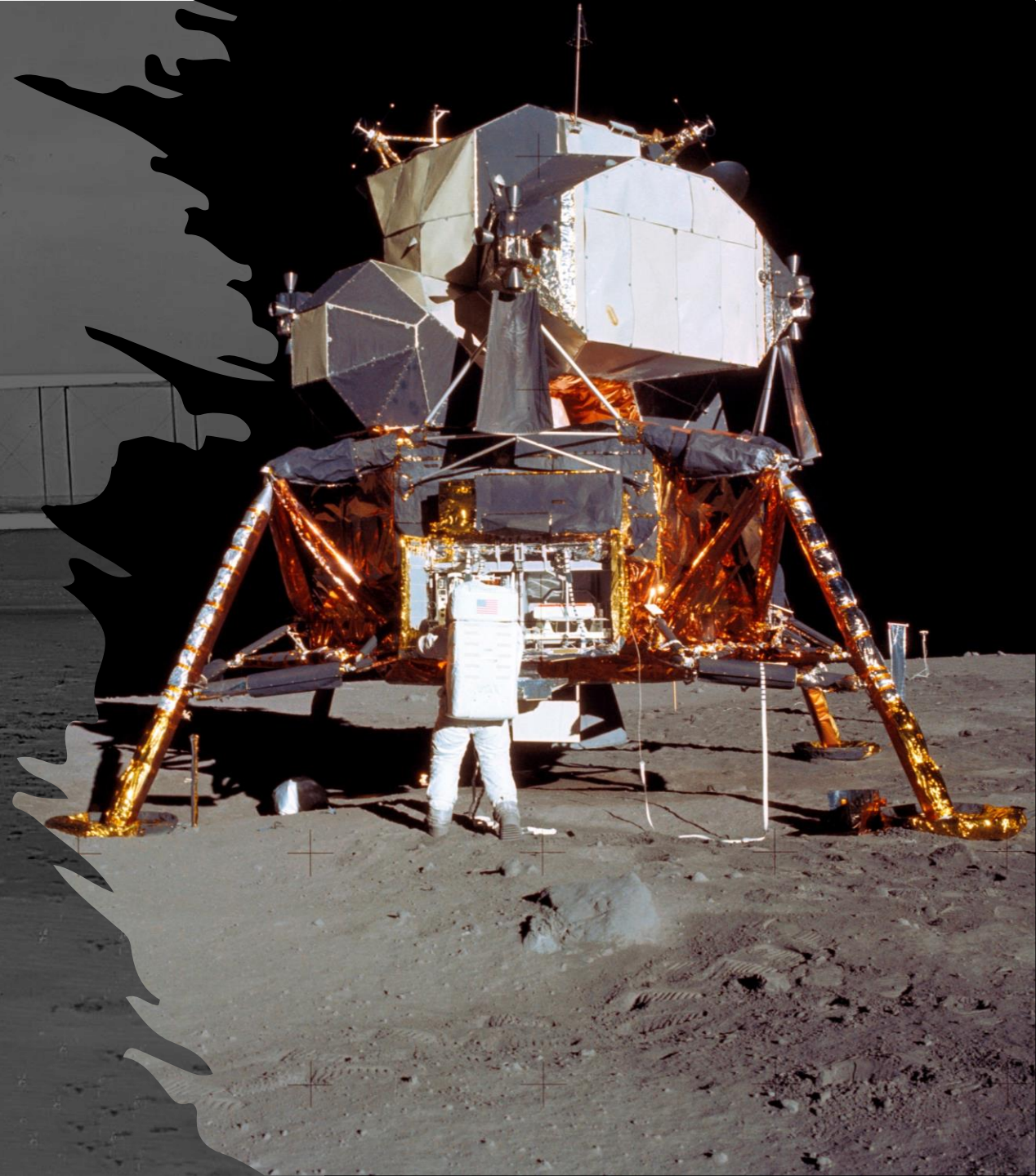
“Draw an astronaut walking up to a city on Mars.”

Tech Revolution 101

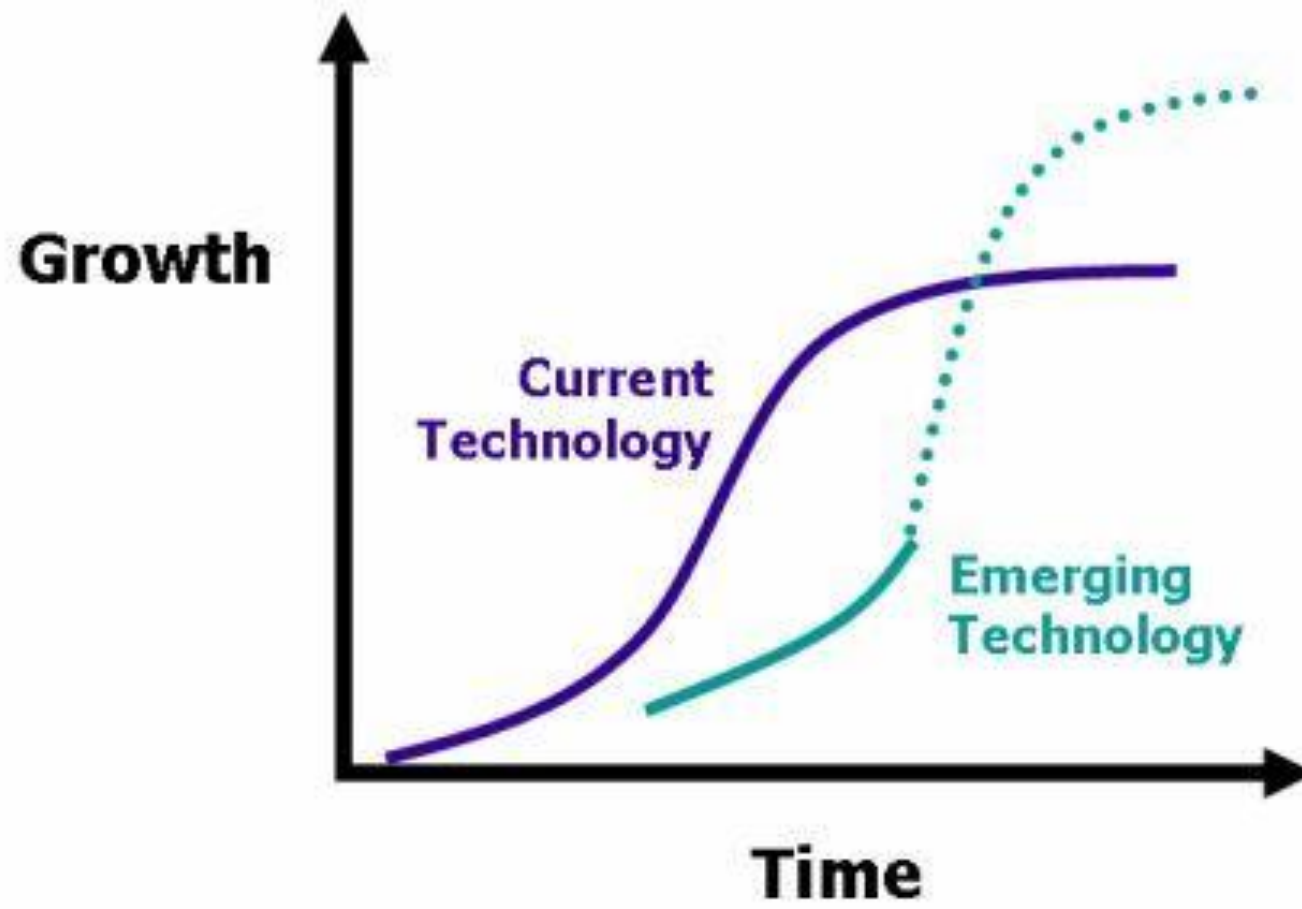
Review

Attention

Convergence



How Tech Revolutions Happen – the S Curve



Energy Density/Efficiency, Invention, Information

Energy System	Utilization Inventions	Information
Human Power	Hunting, Gathering, Migration, Villages, Basic Farming, Textiles	Language
Fire	Metallurgy, Cooking, Light, Heat	Engineering
Animal Power	Farming, Roads, Cities, Travel, Mass Warfare, Writing, Trade	Math
Wind Power	Ocean going vessels, Navigation	Celestial Navigation
Steam (Wood)	Fast transport on rail/oceans. Paddle-wheels/wood boats.	Telegraph
Steam (Coal)	Ironclad ships with screw propellers. Steel and other alloys.	Fast News
Petroleum (Kerosene)	Indoor lighting, advanced industrial chemistry of petroleum.	[Radio]
Electricity	Indoor lighting, Distributed mechanical/heat power.	Telephone
Petroleum (Gasoline)	Internal combustion, Cars, Aircraft, early rockets.	[Television]
Chemical Rockets	Moon landings, Solar system exploration, etc.	Satellites
Nuclear Power	Nuclear power plant, Submarines/Aircraft carriers, NERVA.	[Computers]

Empowering Technology Revolutions



Energy

- Higher Density
- Affordable, Consistent, Safe



Invention and Convergence

- Capacity Envelope Expansion (Superpowers)
- Factorial complexities ($2!=2$, $3!=6$, $4!=24$, $5!=120$, etc.)



Information

- Science Drives Engineering. Vice Versa.
- Communication Drives Factorial Expansion



Affordability (Efficiency)

- Applies to All of the Above



Excitement/Attention

- Boring Science and Technology Doesn't Explode Interest
- Superpowers, Comfort, Novelty

The Attention Gap

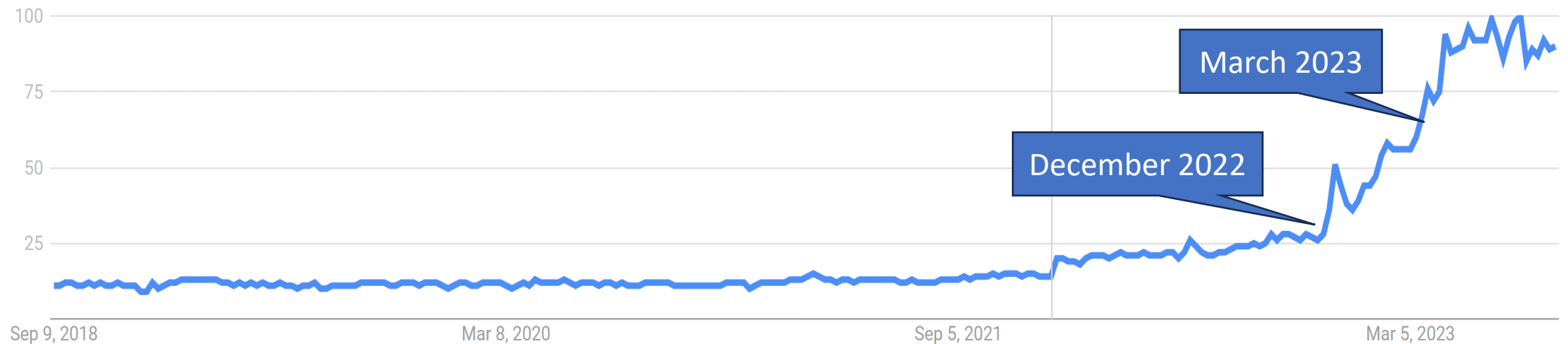
Knowledge without Surprise becomes Invisible



Searches for AI

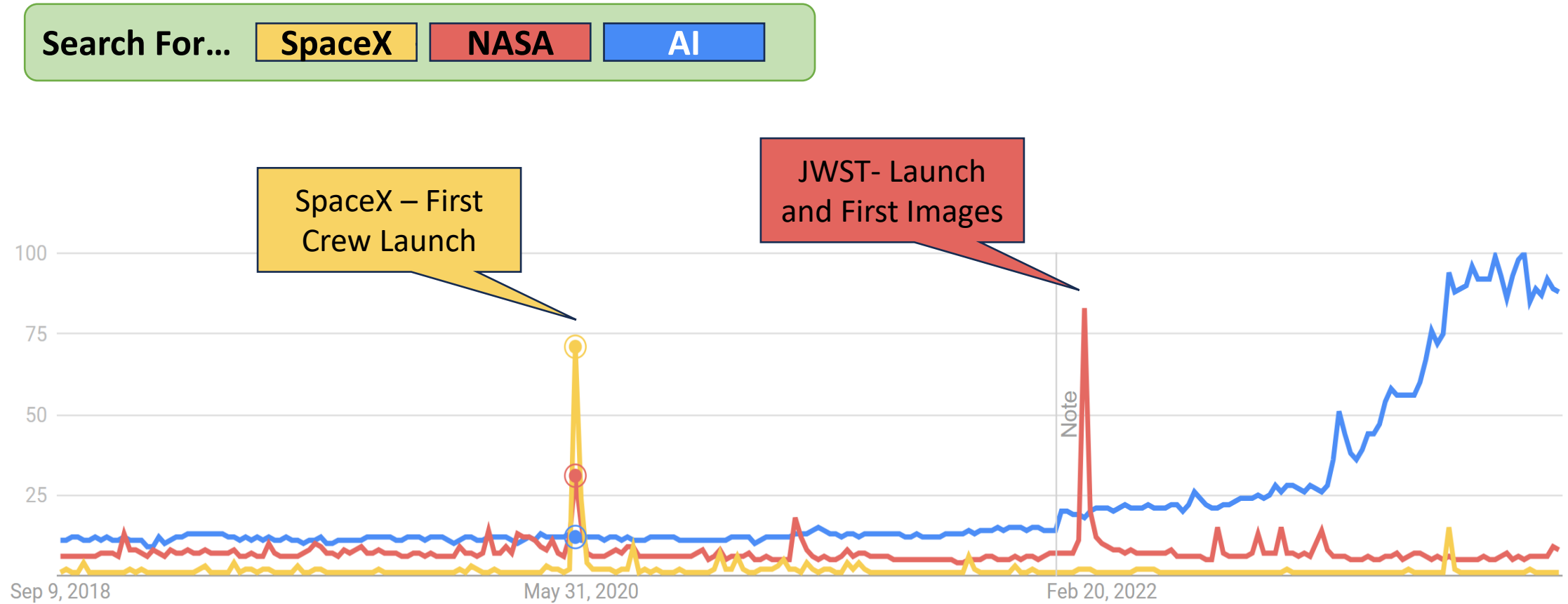
**Between 2015 and 2021,
AI-related patents increased 30-fold**

- Popular Science, March 16, 2021.

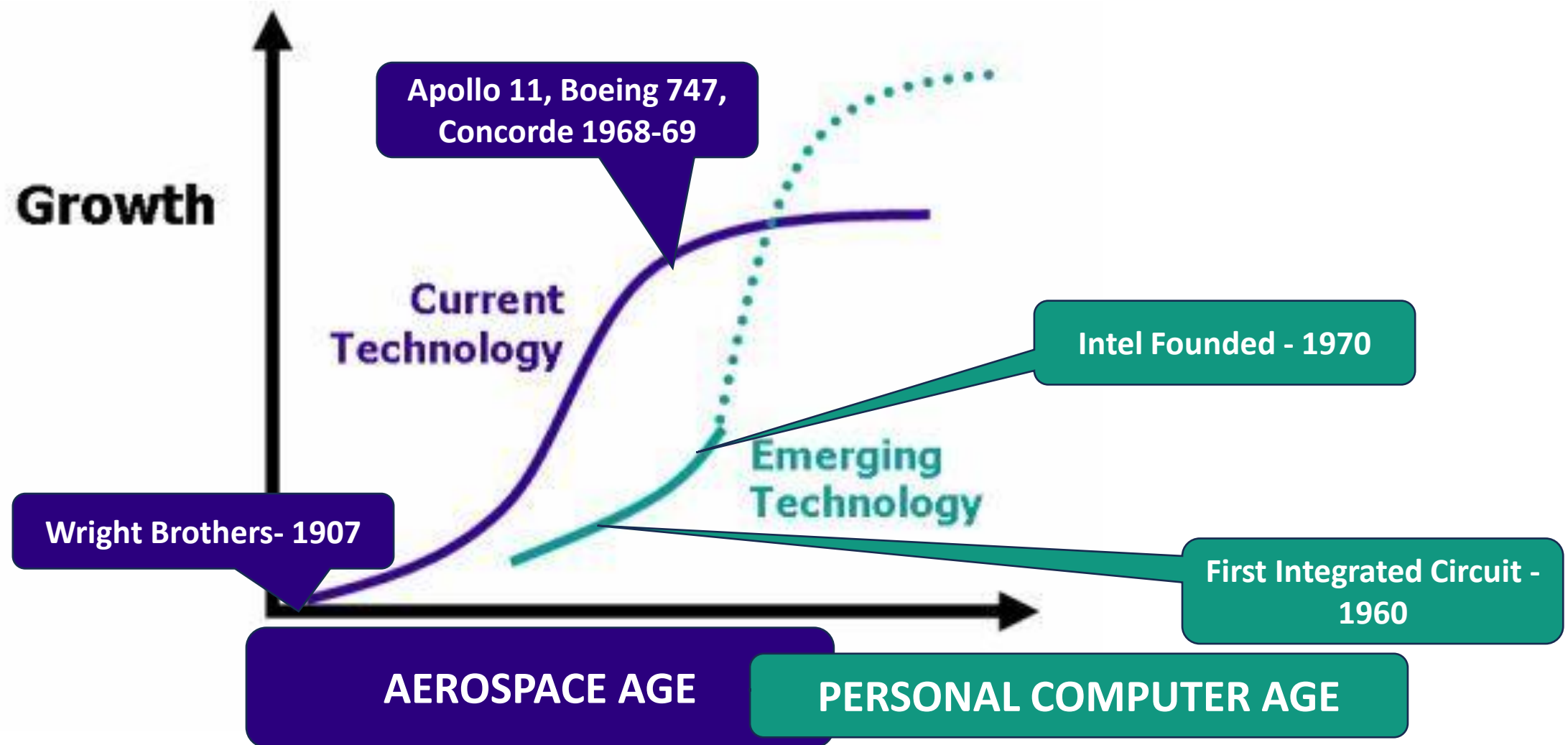


Google Trends, worldwide, search, on “Artificial Intelligence” – as of Sept 4, 2023

Comparative Interest – AI vs. Space

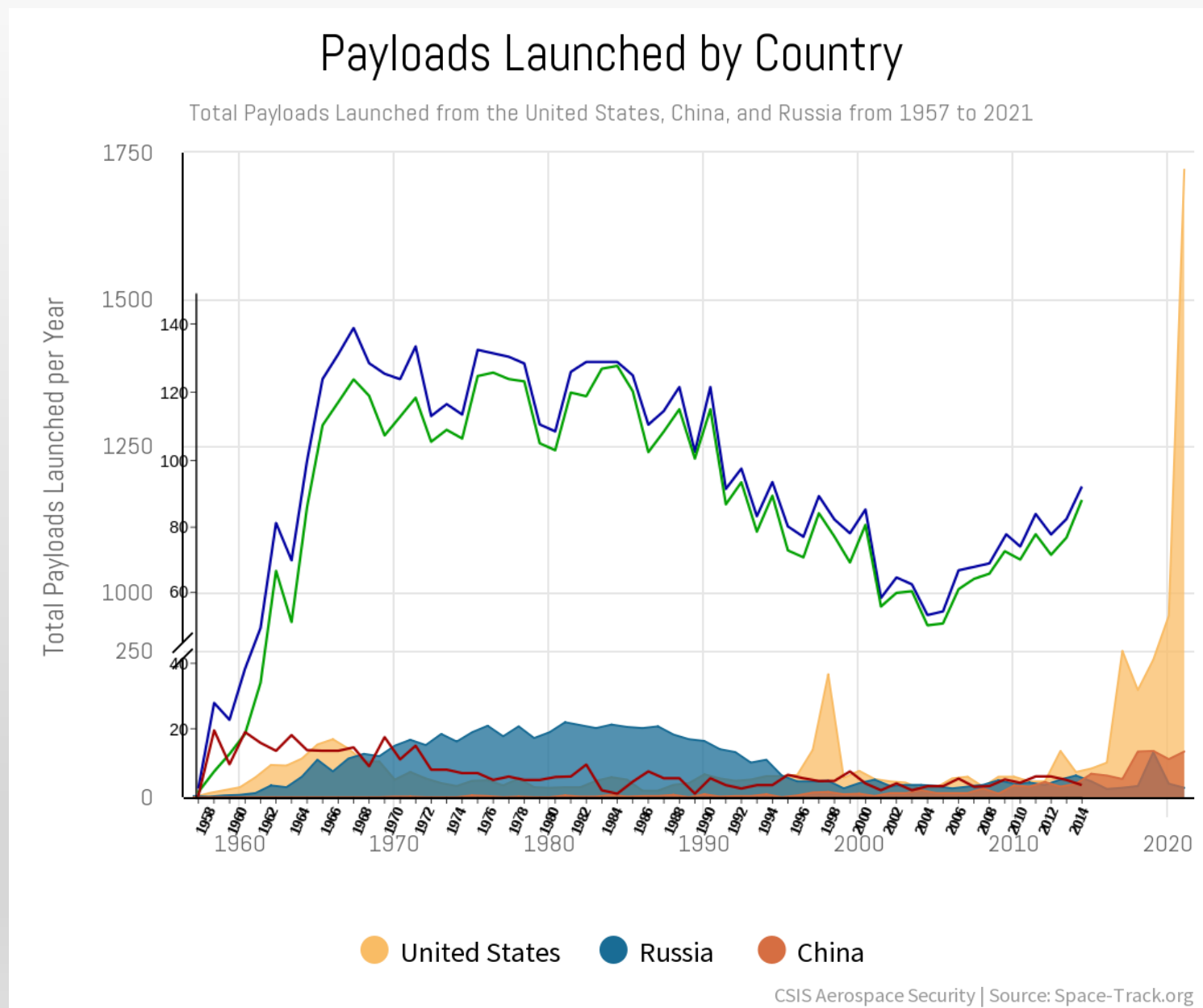


1970's Transition from Space to Information Age



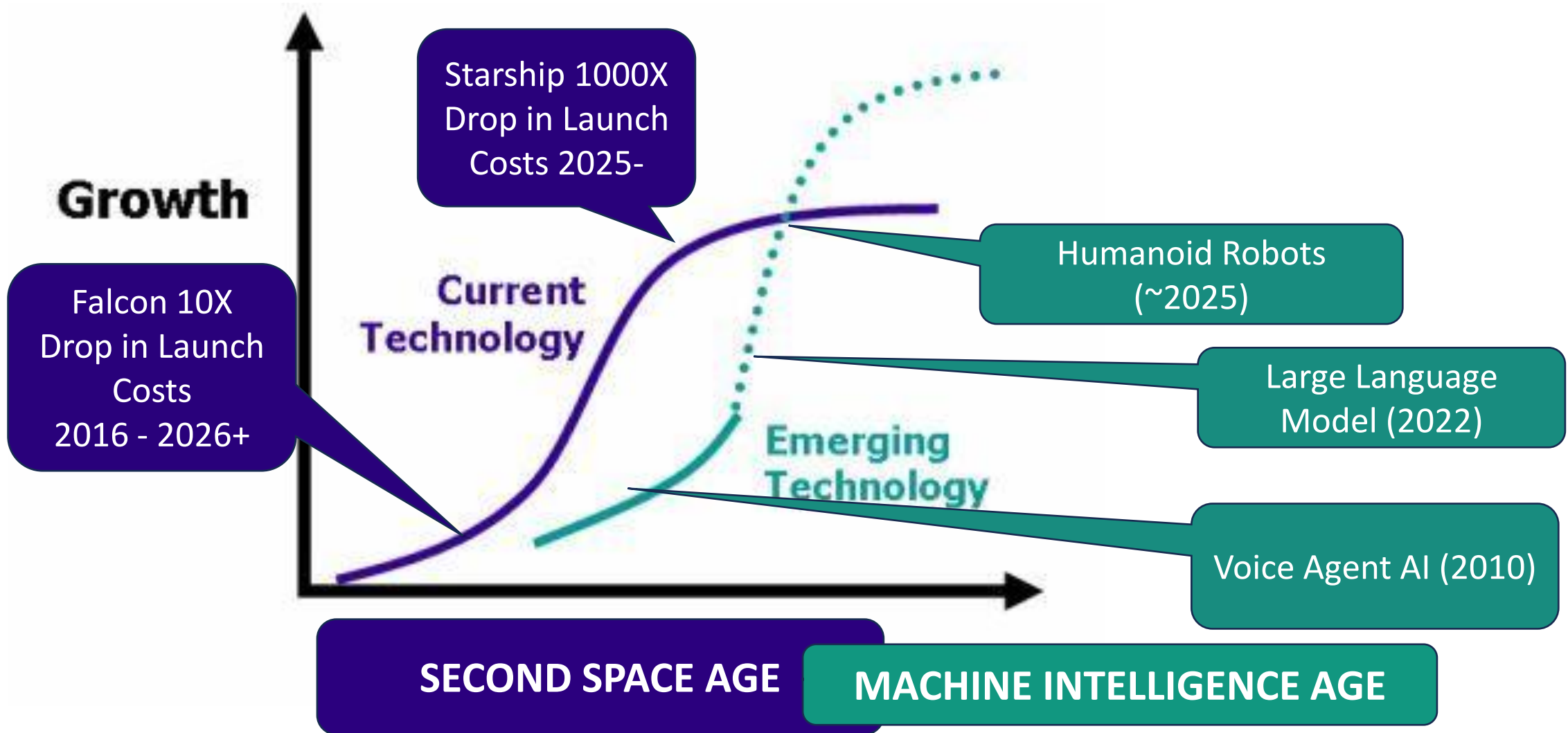
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Launcher Evolution, Payload Revolution



[File:Orbital launches by year.svg - Wikimedia Commons](#)

Is History Repeating?



A detailed illustration of a Mars base. A SpaceX Starship is landed on the reddish-brown surface. Large blue solar arrays are deployed from the ship. Several Optimus robots, which are humanoid with blue and white bodies, are working on the solar arrays. In the foreground, one Optimus robot stands facing away from the viewer, while another stands to the right, facing the viewer. The background shows a hazy orange sky with a large sun or planet on the right and stars in the distance.

Convergence: Starship/Optimus

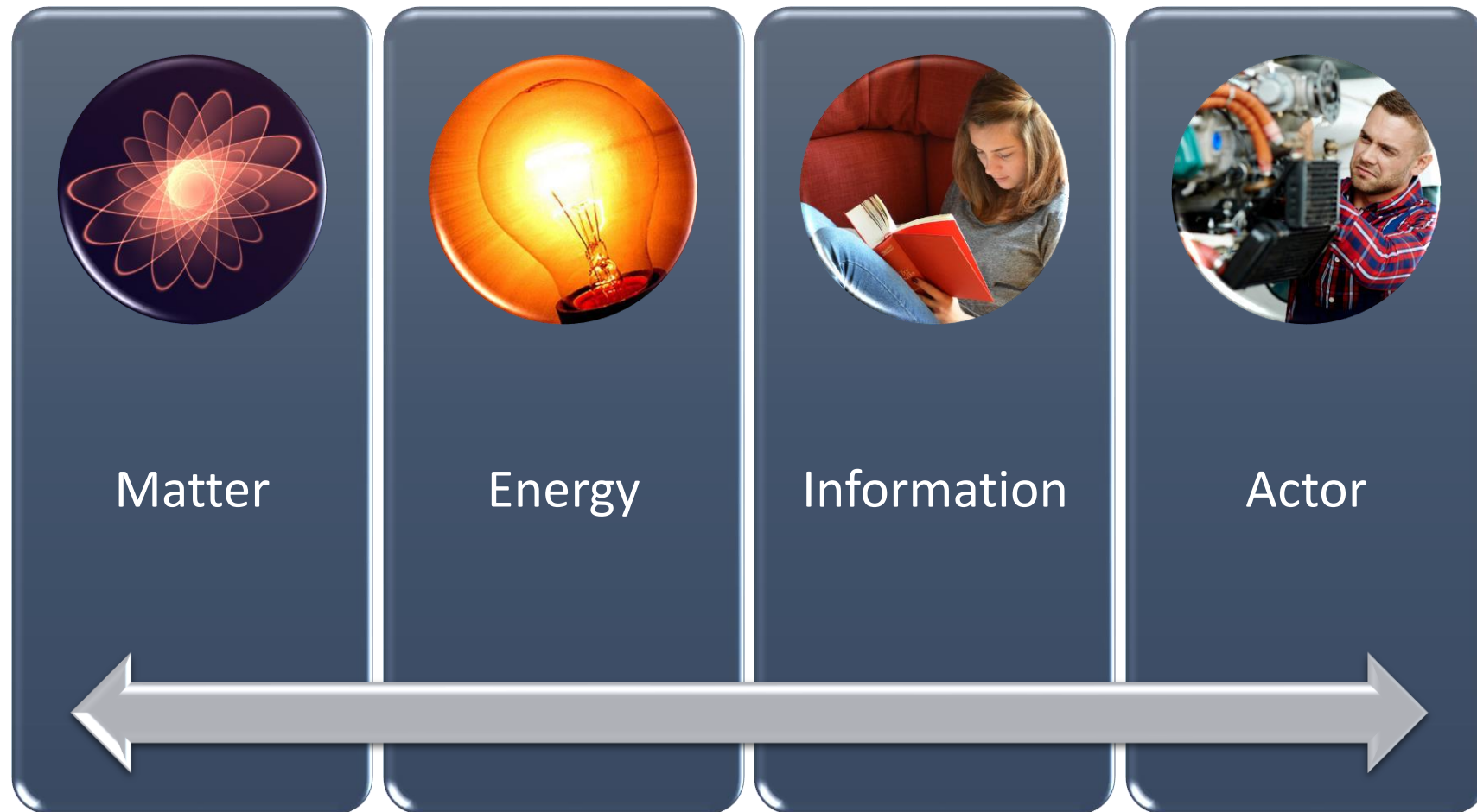
“Draw SpaceX Starship on Mars with Optimus robots setting up solar arrays on the surface.”



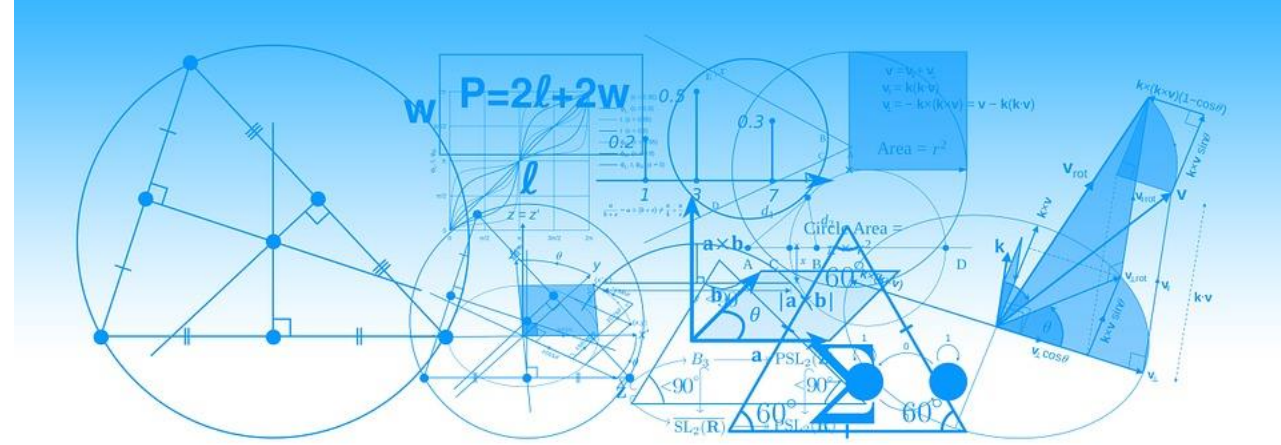
Space Independence – Where AI is Useful

Launch/LEO	Deep Space	Moon/Mars	Settlement	Independence
Affordable Launch	Solar Flares	Moon Landing	Air/Water	Transport Autonomy
Large Vehicle Launch	GCR: Cell Damage	Mars EDL	Power and Propellant	Chem-E Autonomy
Orbital Refueling/ Mass Fraction beyond Earth Orbit	Medication/ Food Expiration	Spacesuit Lifespan	Base Construction	Construction Autonomy
Space Junk	Life Support Closed Loop	Dust Issues	Food Growth	Food & Medical Autonomy
Microgravity (health issues)	Medical Entropy	Basic Power/ Propellant Production	Surface Mining and Extraction	Mining Autonomy
	Psychology	Return Flight to Earth (speed, mass, etc.)	Hybrid Manufacturing	Manufacturing Autonomy
	Mechanical Entropy	Planetary Protection	Reproduction	Genomic Sufficiency

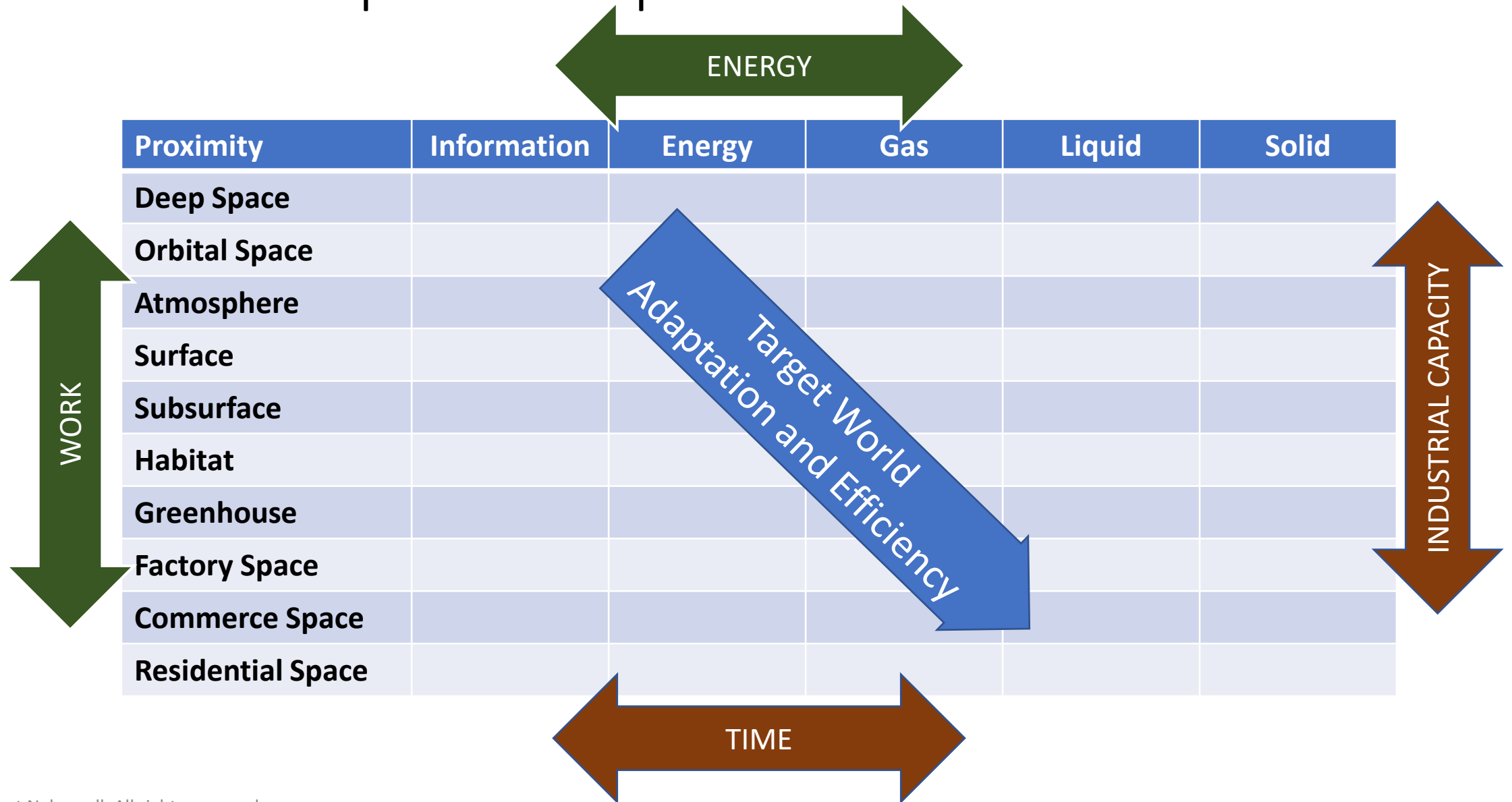
Elements of Life and Civilization



The diagram is a complex geometric construction on a light blue background. On the left, a large circle contains several points and lines, with some lines being tangent or normal to the circle. In the center, there is a coordinate system with a curve and a shaded area. To the right, a vector diagram shows the decomposition of a vector v into components v_{rot} and v_{strip} . Various mathematical formulas and labels are scattered throughout, including $P=2l+2w$, $Area = r^2$, and references to $SL_2(\mathbb{R})$ and $PSL_2(\mathbb{R})$.



Vector Map- From Space to Surface Settlements



AI Server Farms on Mars

- A current Nvidia H100 DGX Pod or a Tesla Dojo rack module of 11 racks can fit in a 20-foot shipping container.
- BioNeMo as a biology model making service (drug discovery), along with Piccaso (artwork) and NEMO (Language)
- OmniVerse: Digital twin modeling, robotics for factories, warehouses, etc.



- 1 ExoFLOP AI or 7.7 PetaFLOPs of conventional performance per Pod.
- Estimated 330 kW per pod.
- An AI computing center with dual pods and a modular nuclear reactor would fit on one Starship.



A blue, metallic robotic hand is shown in a hovering position, its fingers slightly curled. Below the hand, a surface of glowing digital data, resembling binary code or a complex network, is visible. The background is dark, with some blurred light sources. In the top left corner, there is a small orange rectangular bar.

Human and AI

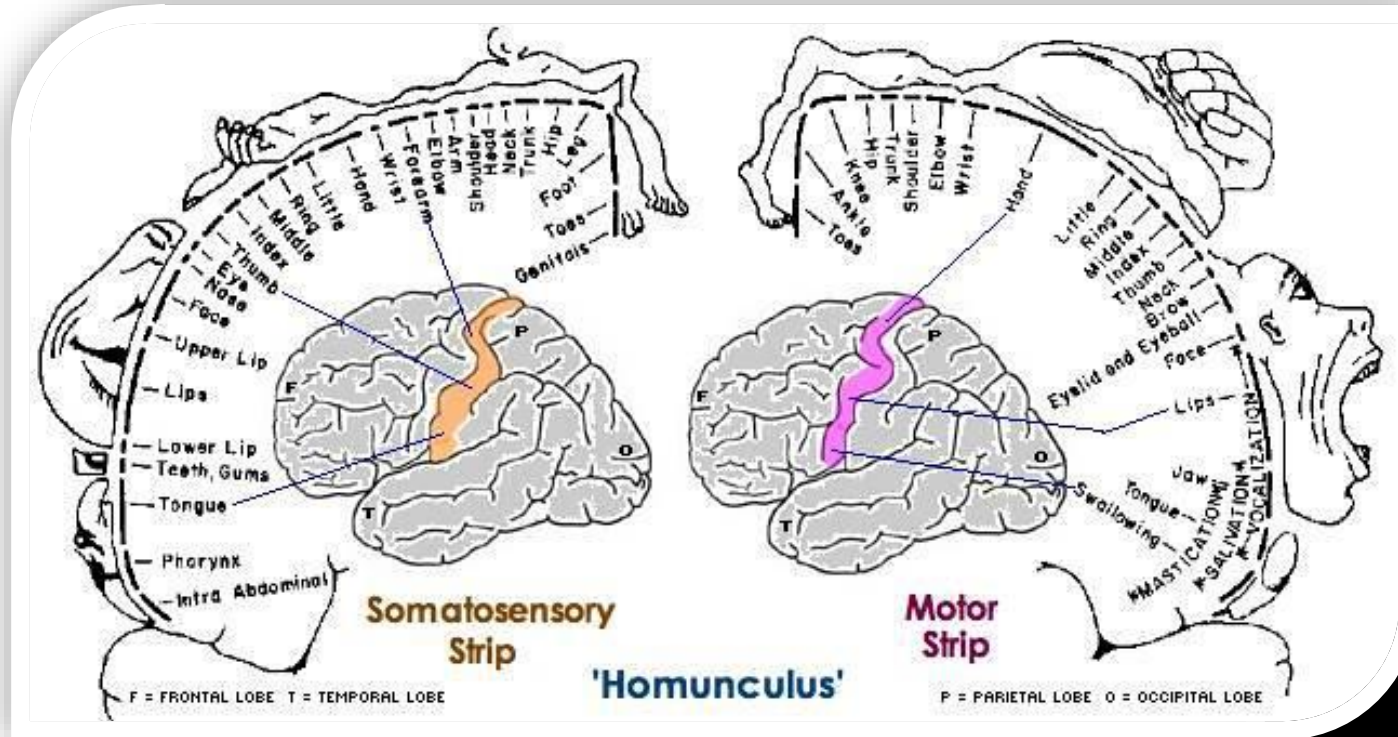
The Balance of Technology
Dependence and Empowerment

Nebergall's Laws of Technology

- Any technology that does not push performance or efficiency will die quickly. *These will be a form of “superpower” compared to past levels.*
- Human nature will not change, even though technology changes how we interact with the world around us.
- Humans will use these new powers in three ways.
 - Most will do greater productive good
 - Some will do greater destructive evil
 - ALL will reach historically unprecedented levels of personal laziness.

“Draw a bald white man with NO BEARD, clean shaven, reading a list of rules... Again” X 12.. Oh well..

Outsourcing our Humanity: Homunculus for Creation and Communications

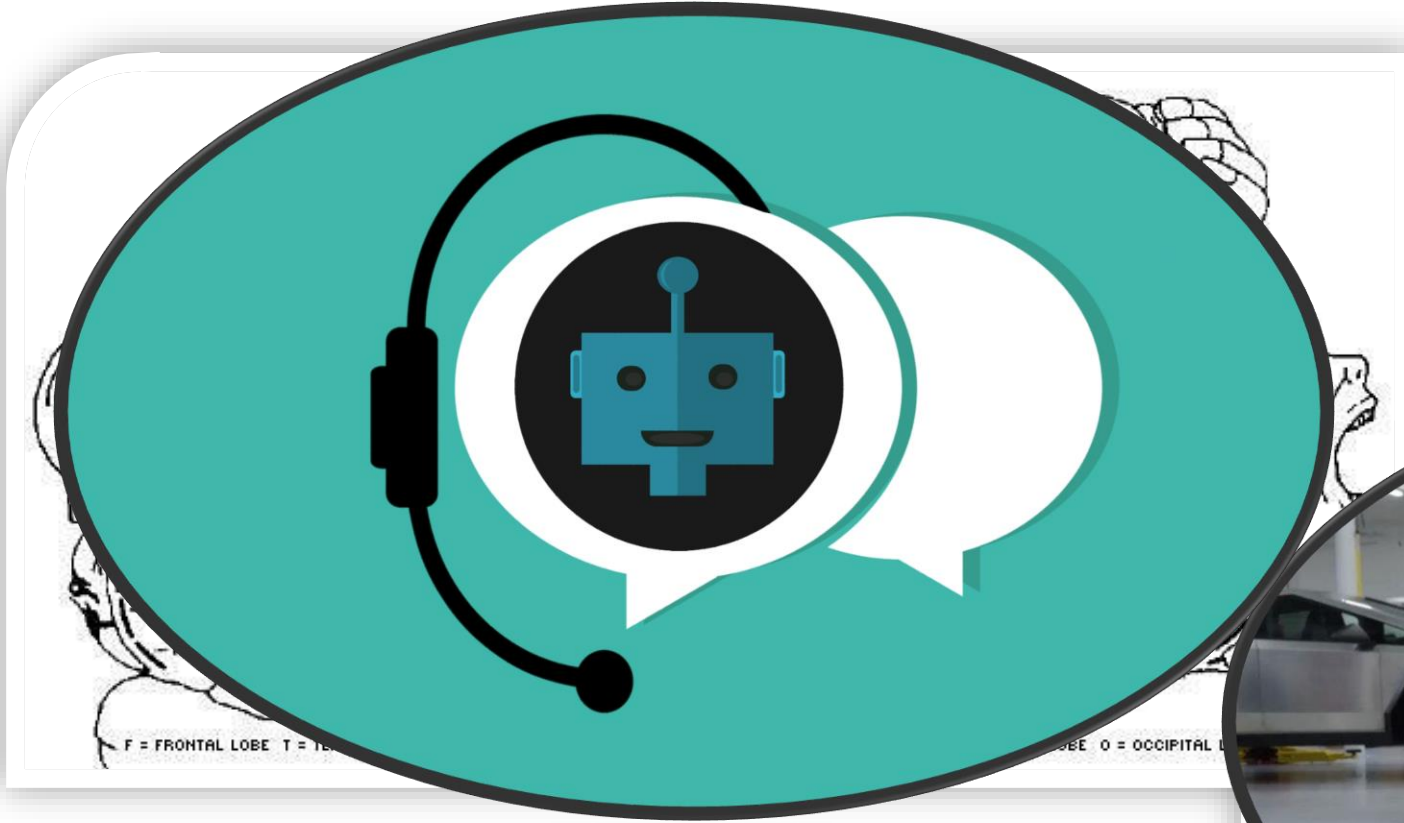


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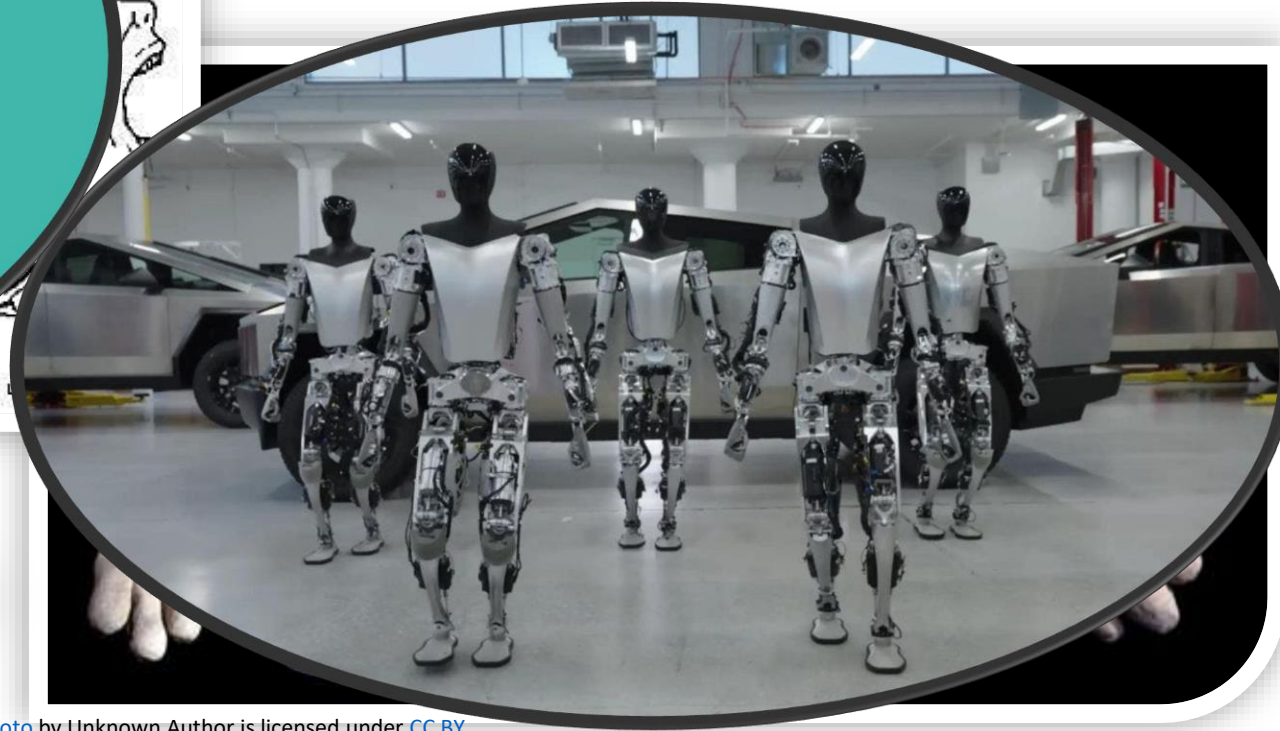


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Outsourcing our Humanity: Homunculus for Creation and Communications



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General AI- SWOT

Strengths

Allows knowledge workers to leverage writing skills more as a creative manager than a self-editor.

Can speed research on massive libraries of material.

AI design can optimize vehicle design for weight, endurance, etc.

Opportunities

Improved medical research could address grand challenges around deep space flight

Can design optimum vehicles for weight, endurance, etc.

Automation can accelerate design, production, and testing of equipment for space settlement.

Weaknesses

Allows “cheating” by generating supposed research but actually just regurgitating speech patterns.

Anything put into servers is “stolen” from creators and re-hashed as something “found”.

Offline AI is expensive (\$8K for good Nvidia card). Online will violate IP protection.

Threats

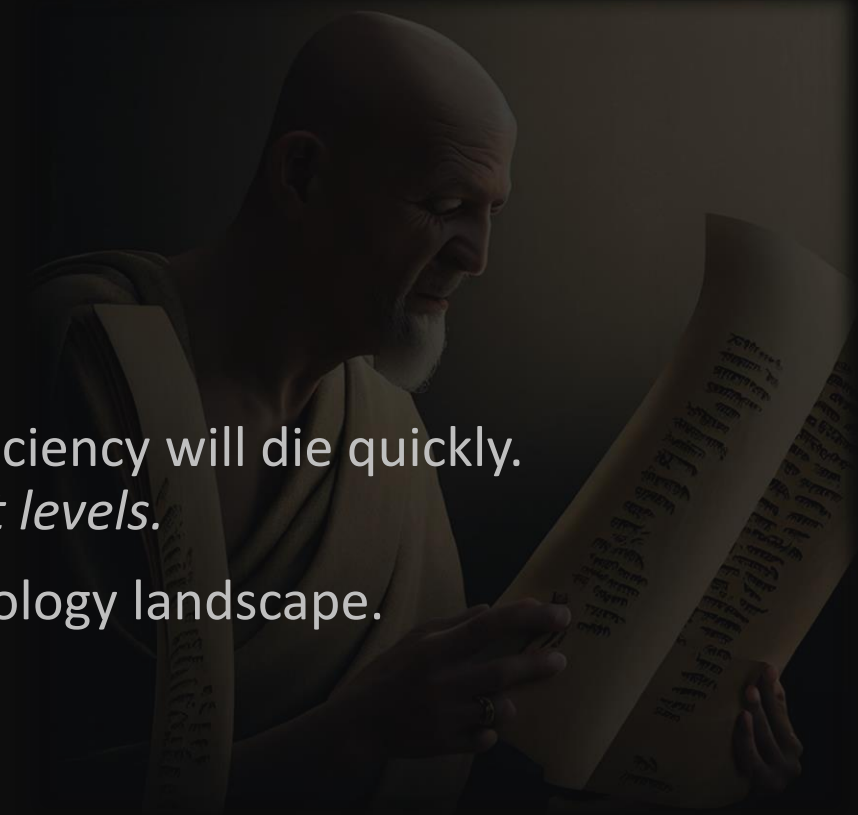
Social manipulation is tuned to individuals and intentionally insidious.

Misanthropic amplification – any fool can design a pathogen, hack a network, or stalk the innocent.

Lazy users will assume AI correct and tune out critical thinking of designs, budgets, etc.

Nebergall's Laws of Technology

- Any technology that does not push performance or efficiency will die quickly. *These will be a form of “superpower” compared to past levels.*
- Human nature will not change because of a new technology landscape.
- Humans will use these powers in three ways.
 - Most will do greater productive good
 - Some will do greater destructive evil
 - ALL will reach historically unprecedented levels of personal laziness.
- **Nearly everyone will use it for all three in roughly these ratios.**
- **The art of the personal-possible may atrophy even as the scope of accomplishment is leveraged to unprecedented heights while technology is present.**



Modular Technology Revolution Workshops



Team of 5-20 People
(plus robots)



All equipment in 1
shipping container



Pressurized Workshop
of 1000 Cubic Meters



Ready access to power,
data, and value-add
commodities



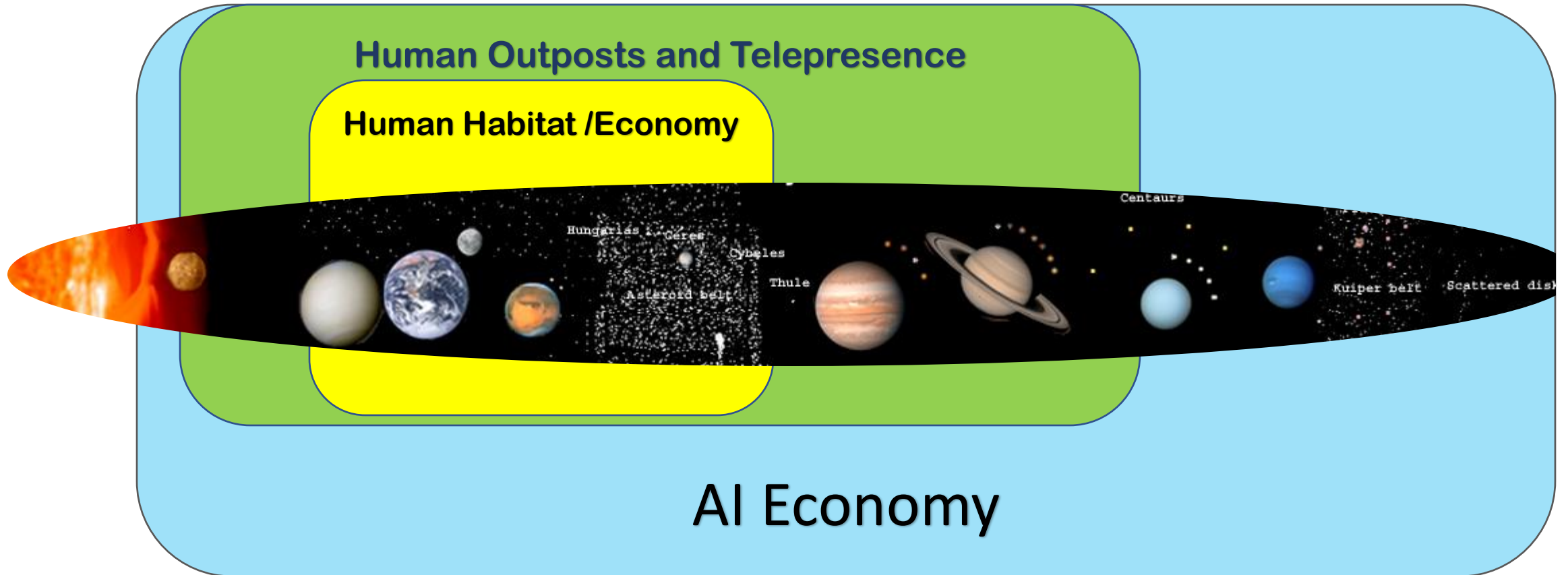
Full Deck Technology
(Versatile/Simple)



The Fate We Make

Solar System 2100

Solar System 2100



Thank you!
Questions?

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