

Tech Curiosity Session 4 of 6

Glen Maxson & Alan Freedman

Delaware Valley University

Fall II 2021

Welcome

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[Tech Curiosity Presentation Archive](#)

Alan Freedman

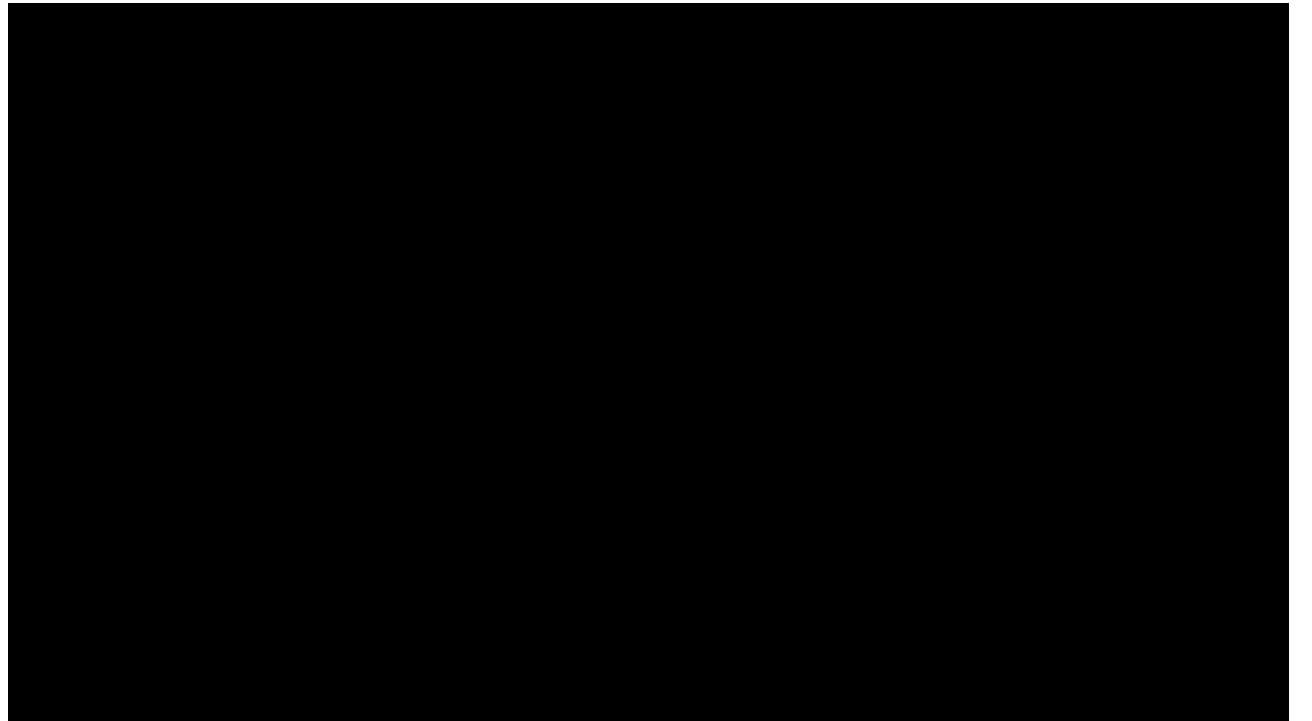
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Dog Talk – A follow-up to CETI (whale talk)

- From [Finch](#) (on Apple TV+)



Let's spend some time in space

LEO

- Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth
 - The rapid development of mega-constellations risks multiple tragedies of the commons, including tragedies to ground-based astronomy, Earth orbit, and Earth's upper atmosphere.
 - Moreover, the connections between the Earth and space environments are inadequately taken into account by the adoption of a consumer electronic model applied to space assets.
 - Untracked debris will lead to potentially dangerous on-orbit collisions on a regular basis due to the large number of satellites within mega-constellation orbital shells.
 - The total cross-section of satellites in these constellations also greatly increases the risk of impacts due to meteoroids.
 - De facto orbit occupation by single actors, inadequate regulatory frameworks, and the possibility of 'free-riding' exacerbate these risks.
 - International cooperation is urgently needed, along with a regulatory system that takes into account the effects of tens of thousands of satellites.

Ruling Space: Governance, Security, and Commerce

- In today's rapidly advancing world, there are now 72 countries with space programs and dozens of major players in the private sector. A new space race is looming, teeming with emerging players eager to take part in a new phase of outer space competition and cooperation. As we transition from the age of discovery to that of security and commerce, what actions must the United States and its allies and partners take to safeguard the future of this **global commons**?
- What legal frameworks, investments, and new partnerships must be made or changed to enhance a rules-based international order in outer space?
- Speakers:
 - **Dr. Jessica West**, Senior Researcher at the Canadian peace research institute Project Ploughshares
 - **Dr. Scott Pace**, Director of the Space Policy Institute and Professor of the Practice of International Affairs at the George Washington University's Elliott School of International Affairs
 - **Therese Jones**, Senior Director of Policy at the Satellite Industry Association

More about LEO

- From a Nov. 8 seminar entitled “[Ruling Space: Governance, Security, and Commerce](#)”
- My question:
 - Regarding companies posturing to be THE global communication provider by launching very large numbers of small satellites into LEO, who's to say "enough is enough".



Tech in the News

- **Several companies filed requests with the FCC last week to approve approximately 38,000 satellites to V-band spectrum frequency and provide broadband internet coverage from space.** According to Quilty Analytics founder Chris Quilty, "this is an attempt by every company with any future plans to stake a claim on beachfront that's currently unclaimed."
- **The companies and number of proposed satellites include:**
 - Astra: 13,620.
 - Amazon: 7,774.
 - OneWeb: 6,372.
 - Boeing: 5,789.
 - Hughes: 1,440
 - Telesat: 1,373, among others.

This is in addition to Starlink, the world's largest satellite constellation, with more than 1,730 satellites launched to date and plans for as many as 42,000 satellites in their constellation

Tech in the News

- **Starlink, SpaceX's satellite internet service, plans to ship 200,000 dishes to users in India by December 2022.** The user terminals will supply remote rural areas with high-speed internet from orbiting satellites.
 - Starlink registered a 100% owned India subsidiary, Starlink Satellite Communications Private Limited, on Monday.
 - As of August, SpaceX had 100,000 users in 14 countries. It also has 500,000 sign-ups on a waitlist.

And some numbers, not specific to LEO



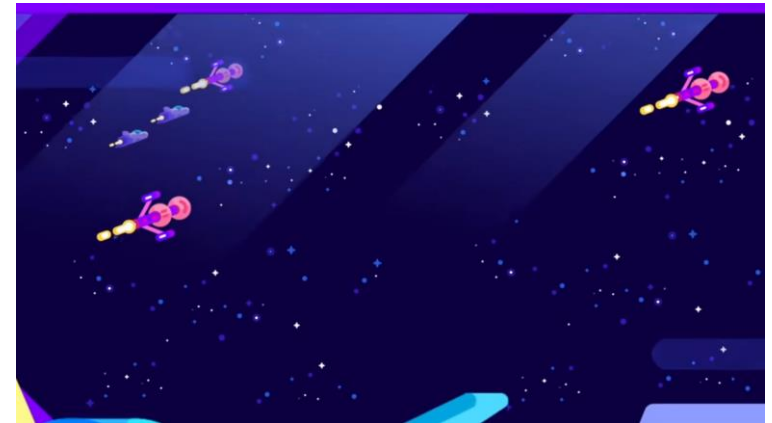
Private Space Stations (also in LEO) - [video](#)

- [US Companies Seek to Develop Private Space Stations](#)
- [Private space stations will soon be in orbit](#)
 - *Starlab*
 - *Orbital Reef*
 - *ISS*
 - *Axiom Station*
 - *NASA's Commercial Low-Earth-Orbit Destinations (CLD)*
 - *Tiangong*



Skyhooks (video)

- Skyhooks Might Just Make Rockets a Thing of the Past
 - Yuri Artsutanov made the first realistic proposal for this kind of structure in 1960, called a "space elevator."
 - "Space elevators" are 'geostationary structures', but skyhooks have no need to maintain their relative position to the Earth's surface.
 - A skyhook consists of a rotating satellite of some kind with a very long tether on one side and a small tether with a counterweight on the other side. During a launch, a spacecraft attaches to the long tether side and is flung out into space by the rotation.
 - Something like a 'trebuchet' in space...



Some thoughts about blockchain and NFTs

The fun in non-fungible

- nfts are a digital property deed that lives on a blockchain and can be bought on financial platforms using digital currencies
- nfts on the Ethereum blockchain are today worth \$14bn, up from \$340m in 2020. Jefferies, an investment bank, thinks the total will reach \$80bn by 2025
- So, what exactly do the owners of nfts get?
 - An nft sale can embody any combination of property rights designed by the seller, AND
 - A public, irrevocable record of the transaction exists on a blockchain, BUT
 - nfts have three big practical flaws
 - The process is a nightmare and it's expensive
 - The energy issue – an nft transaction can generate emissions equal to a seat on a long-haul flight*
 - Contract enforcement - property rights conferred by a nft may conflict with other contracts, and courts may not recognize the digital agreement

The Ethereum platform uses 48.14 kilowatt-hours of energy per transaction - as much power as the conventional household uses over a day and a half ([source](#))

AI – what can go wrong?

Zestimate – What can go wrong with AI? [\(video\)](#)

The demise of Zillow's iBuyer division

2018: Zillow begins iBuyer division that buys homes almost instantly by relying on technology -Zestimate - to determine a market-based cash offer. Online transaction, often sight unseen, for a quick sale. Zillow's goal is to make a profit flipping them.

Jan 2019: Zillow awards \$1m prize to Team ChaNJestimate for machine learning software (AI) to that improves on Zestimate

Zillow Awards \$1 Million to Team that Built a Better Zestimate

- The winning team's algorithm incorporated several sophisticated machine learning techniques, including using deep neural networks to directly estimate home values and remove outlier data points that fed into their algorithm. They also leveraged publicly-available, external data including rental rates, commute times, and home prices, among other types of contextual information, such as road noise – all variables that factor into a home's estimated value.

Zestimate – What can go wrong with AI? [\(video\)](#)

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June 2021: Zillow updates its AI algorithm - properties eligible for iBuyer from 900k to 1.2 million. Predicts \$20 billion in annual revenue from iBuyer

Zestimate – What can go wrong with AI? [\(video\)](#)

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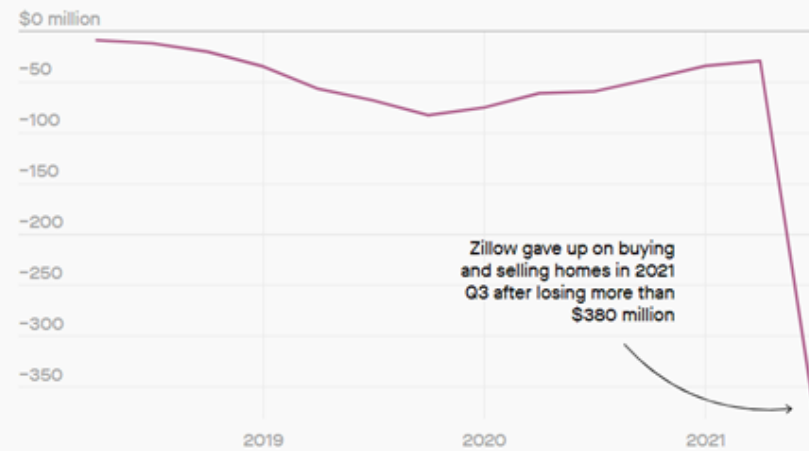
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June 2021: Zillow updates its AI algorithm - properties eligible for iBuyer from 900k to 1.2 million. Predicts **\$20 billion** in annual revenue from iBuyer

Nov 2021: Zillow shuttered iBuyer division. Lost **\$420 m** in 3 months to Sept. *"Algorithm to buy and sell houses have not produced predictable profits"*. 7,000 houses still for sale.

<https://www.zillow.com/sellers-guide/what-is-an-ibuyer/>
<http://zillow.mediaroom.com/2019-01-30-Zillow-Awards-1-Million-to-Team-that-Built-a-Better-Zestimate>
<https://www.wired.com/story/zillow-taps-ai-improve-home-value-estimates/>
<https://www.nytimes.com/2021/11/02/business/zillow-q3-earnings-home-flipping-ibuying.html>
<https://qz.com/2084310/how-zillow-got-rocked-by-the-housing-market/>

Zillow has lost millions of dollars per year from its iBuyer business



[video](#)



5G and the FAA – they have issues

Tech in the News

- **AT&T, Verizon to Delay 5G Rollout Over FAA's Airplane Safety Concerns**
 - Wireless carriers postpone planned Dec. 5 launch of new spectrum to address concerns about potential interference with cockpit safety systems
 - The FAA had been planning to issue official mandates as soon as this week that would limit pilots' use of certain automated cockpit systems, such as those that help planes land in poor weather. Those limits would aim to avoid potential interference from wireless towers on the ground transmitting new 5G signals.
 - Such limits for pilots could disrupt passenger and cargo flights in the 46 metropolitan areas where the towers are located, aviation industry officials have said.

Enough about the Metaverse already!

Tech in the News

- **Microsoft plans to debut [Mesh for Teams](#) for mixed-reality work experiences in 1H 2022.** The virtual collaborative platform will roll out in preview mode first, supporting animated avatars in 3D virtual environments as Microsoft expands its [vision for the metaverse](#).
 - Mesh for Teams will be accessible through laptops, smartphones, VR headsets, and Microsoft's [HoloLens](#).
 - Reports compared it to Facebook's (now Meta's) [Horizon Workrooms](#) for virtual work meetings.

And Facial Recognition

Tech in the News

- **Facebook, now Meta, says it will shut down its facial recognition system and delete more than one billion biometric "faceplates" of people amid concerns about how the technology is used.** It plans to remove the company services that utilize facial recognition in the coming weeks.
 - It made facial recognition an opt-in service in 2019. About a third of its daily users, around 643 million people, have had it turned on, providing alerts when new photos and videos of them were uploaded.
 - The effort is "part of a company-wide move to limit the use of facial recognition in our products," it said.

Tech in the News

- **Meta, formerly Facebook, clarified that the shutdown of its facial recognition system doesn't apply to the metaverse.** The company could continue to use its DeepFace AI technology for face matching in metaverse products.
 - The technology could "enable positive use cases in the future that maintain privacy, control, and transparency," a Meta spokesperson told Recode.
 - Vox notes that Meta is already looking into ways to incorporate facial recognition and biometrics into the larger metaverse.
 - This includes the DeepFace algorithm behind its photo-tagging face recognition feature.

Tech in the News

- **Australia's national privacy regulator ordered Clearview AI to destroy its facial templates of individuals in the country after finding that the company violated their privacy.** The NY-based facial recognition company amassed a database of 10 billion images of people from social media sites and the web, selling its technology primarily to law enforcement to help identify suspects.
 - The Office of the Australian Information Commissioner barred the company from scraping more online photos after determining that its data gathering practices are "unreasonably intrusive and unfair."
 - Its services carry "significant risk of harm" to people, including children and victims, whose images are searchable in its database, the agency said.

Who thought scooters would be interesting?

Tech in the News

- **E-scooter rental startup Neuron Mobility will trial its updated scooters in the U.K., Australia, and Canada during the next six months.** The company's N3 scooters now have high-accuracy location technology and rapid geofence detection to make rides safer.
 - The upgraded scooters can warn users if they're engaging in unsafe behavior or leaving the service area, and even cut off power.
 - New sensors and technologies allow scooters to speak to riders in multiple languages and generate safety evaluations after rides.
 - The high-accuracy location technology connects the e-scooters to base stations and tracks every vehicle's location within 4 inches.

And there's more

Tech in the News

- **Google is reportedly going after the Pentagon's [cloud-computing contract](#) following the cancellation of JEDI earlier this year.** The new project will replace the \$10B Joint Enterprise Defense Infrastructure initiative that went to Microsoft until the Pentagon [canceled it](#) amid legal challenges from Amazon.
 - The new contract, the Joint Warfighting Cloud Capability, seeks to upgrade the Defense Department's cloud tech and support its AI efforts in warfare.
 - The DoD said the program is an effort to “achieve dominance in both traditional and non-traditional warfighting domains.”
 - **It comes three years after Google abandoned its Pentagon initiative, [Project Maven](#), amid ethical concerns.** At that time, 4,000 Google employees petitioned Google to withdraw from the project, which used machine learning to help detect objects in drone footage and improve target strikes.

Tech in the News

- **Europe's proposed regulation for sideloading apps onto iPhones poses major security risks to Apple's computer network, Apple software senior VP Craig Federighi [argued](#) on Wednesday.** The European Commission's proposed [Digital Markets Act](#), which would open the door for Apple users to install apps outside of the iOS App Store.
 - According to Federighi, the practice would "open up a Pandora's Box of unreviewed malware and software."
 - He said a lack of sideloading keeps malware on iOS at a relatively low rate, compared to the estimated 5 million monthly attacks on Android.
 - **Critics note that Apple relies heavily on the App Store for profits through in-app purchases and download fees.**

I think it's all about the money!

Tech in the News

- **Waymo will map New York City streets using human-driven vehicles as it seeks to advance its autonomous vehicle tech, [the company said](#).** The Alphabet subsidiary will map every intersection, sign, and signal within a designated area, which would then be matched with real-time sensor data to determine location during Driver operations.
 - The fleet will initially begin with Chrysler Pacifica minivans that have high-powered sensors and computing units before expanding to Jaguar I-Pace SUVs.
 - Each vehicle will have a driver and a passenger to direct activity and monitor the software and performance.
 - The company said it will help Waymo Driver "improve its ability to perceive and predict the actions of other road users in dense urban areas."

Tech in the News

- **Miso Robotics introduced [Flippy 2](#), a next-gen cooking robot designed to do more food preparation tasks in small spaces.** The news comes as fast-food giants like McDonald's, Taco Bell, and Domino's are [turning to automation](#) and robotics systems to supplement or replace human workers.
 - Miso's robotic arm system relies on AI machine vision to identify ingredients and place them into the correct fry basket and holding areas.
 - Its fry station capabilities are now fully automated and don't require human intervention.
 - **The improvements over its predecessor, [Flippy 1](#), are based on employee feedback and data from Miso's [pilot program](#) with White Castle.**

Tech in the News

- The Biden administration [blacklisted](#) Israeli spyware firm NSO Group, saying it supplied tech to foreign governments that "maliciously" targeted phones of dissidents, journalists, and others.
- NYC Mayor-Elect Eric Adams [said](#) he wants to make New York more crypto-friendly.
- Black Lives Matter co-founder Opal Tometi [urged](#) Big Tech to better identify racial bias in advanced technologies such as facial recognition.
- The iPhone 13's Face ID [no longer works](#) when its display is repaired by third-party shops, which could be forced to shut down, according to iFixit.

Tech in the News

- **Google parent Alphabet launched Isomorphic Laboratories to accelerate the discovery of new drugs using artificial intelligence.** It could build AI models that predict how drugs interact with the human body and sell them to support new drug development.
 - Isomorphic will build off the research, discoveries, and protein structure work of Alphabet's AI subsidiary, DeepMind.
 - DeepMind founder and CEO Demis Hassabis announced the lab's creation in a blog post, saying its work could ultimately "find cures for some of humanity's most devastating diseases."
 - The company aims to develop "a computational platform to understand biological systems from first principles" and find new avenues to treat diseases.

Tech in the News

- **The \$1T bipartisan infrastructure bill, passed by Congress over the weekend, sets aside [\\$7.5B](#) for a national network of electric-vehicle charging stations over the next five years.**
 - Biden [claimed](#) the funding could help build 500,000 new charging stations and support making half of all vehicles electric by 2030.
 - Another \$2.5B is dedicated for hydrogen-fueling infrastructure and other charging alternatives, and \$7.5B toward electric and low-emission buses and ferries.

Question: Does anybody know if I'll get a tax break for buying an electric vehicle, and how much?

Tech in the News

- **An investor group led by private equity firm Advent International will take McAfee Corp. private in a deal that values the cybersecurity company at around \$14B, including debt. McAfee has agreed to the buyout, which is expected to close in the first half of next year.**
 - In the all-cash deal, the investor group will buy McAfee's outstanding shares for \$26 apiece.
 - Entrepreneur John McAfee founded the company in 1987. It had its first IPO in 1992 before it was sold to Intel in 2011 for \$7.7B.
 - Intel and private-equity firm TPG Capital, shareholders in the company, have agreed to vote in favor of the sale.

Tech in the News

- Steve Grobman is senior vice president and chief technology officer at McAfee.
- Prior to joining McAfee, he dedicated more than two decades to senior technical leadership positions related to cybersecurity at Intel Corporation where he was an Intel Fellow.
- And before that, he was my superstar programmer working on creating an enterprise directory service for Intel



Tech in the News

- E-bike sales rose 145% from 2019 to 2020, according to NPD Group, and Deloitte projects that 130 million will be sold globally from 2020 to 2023. My new website... *and an upcoming post on seniortechadvisor.com*
- The growth of automated writing technologies, based on language generators like GPT-3*, has raised concerns about student cheating in academics.
- NASA is expected to launch SpaceX Crew-3 to the ISS today – earlier than 9:03 p.m. Eastern time?

*GPT-3 (Generative Pre-trained Transformer 3) is an autoregressive language model that uses deep learning to produce human-like text.

Tech in the News

- **Nov. 8, Four NASA Crew-2 astronauts [landed safely](#) back to Earth Monday night after nearly 200 days aboard the ISS.** Their return paves the way for the SpaceX Crew-3 launch of their four replacements, now scheduled for [Wednesday night](#), no earlier than 9:03 p.m. Eastern time.
 - The Crew 2 astronauts are NASA's Shane Kimbrough and Megan McArthur, Thomas Pesquet of the European Space Agency (ESA), and Akihiko Hoshide of Japan's space agency, JAXA.
 - They departed from the space station at 2:05 p.m. Eastern time Monday and landed in a SpaceX capsule off the coast of Pensacola, Florida at 10:33 p.m.
 - Their replacements — NASA astronauts Raja Chari, Tom Marshburn, and Kayla Barron, and ESA astronaut Matthias Maurer — are planning scientific experiments during their six-month stay aboard the ISS.
 - This includes the testing of medical devices and a muscle sensor to gauge how muscles atrophy in space.

Did You Know

- **South Dakota has now become one of the world's best tax havens.** According to the Guardian's [Oliver Bullough](#), a South Dakota trust is "the most potent force-field money can buy." ([link](#))

Tech in the News

- **Sony and Taiwan Semiconductor Manufacturing Co. (TSMC) announced plans to build and open a \$7B chip plant in Japan by 2024.** Sony will have a minority stake of less than 20%, investing about [\\$500M](#) in a new TSMC subsidiary, called Japan Advanced Semiconductor Manufacturing.
 - The factory will produce 22-nanometer and 28-nanometer chips, with a monthly production capacity of around 45,000 12-inch wafers, the companies said.
 - It will fill a gap in demand for less-advanced chips that are commonly used in smartphones and cars.
 - With "strong support" from Japan's government, the plant is expected to directly create around 1,500 high-tech professional jobs.
 - Construction in the southwestern city of Kumamoto is slated to start in 2022, with mass production occurring by late 2024.
 - It's the first foundry in Japan for TSMC, which still produces most of its chips in Taiwan. Its \$12B 5-nanometer chip manufacturing plant in Phoenix, Arizona will start production [in 2024](#).

Tech in the News

- **Robinhood says a Nov. 3 [data breach](#) exposed varying amount of data, from names to email addresses, of 7 million customers.** A hacker "socially engineered" a customer service rep by phone to gain entry into customer support systems before demanding an extortion payment, according to a company [blog post](#).
 - The hacker obtained the email addresses of five million customers and the names of two million customers.
 - Robinhood notified law enforcement and hired [Mandiant](#), a security firm, to investigate the incident.

Tech in the News

A functioning Apple-1 model built by Steve Wozniak and Steve Jobs is expected to fetch up to \$600,000 at an auction today.

The 45-year-old computer is one of 200 that the Apple founders built and tested with friend Daniel Kottke and Patty Jobs, Steve Jobs' sister, at the Jobs' family garage in Los Altos, California.

- John Moran Auctioneers is leading the auction, with bids starting at \$200,000.
- About 20 of the original 60 models still in existence are functioning. In 2014, one of the operational units sold at auction for a record \$905,000.

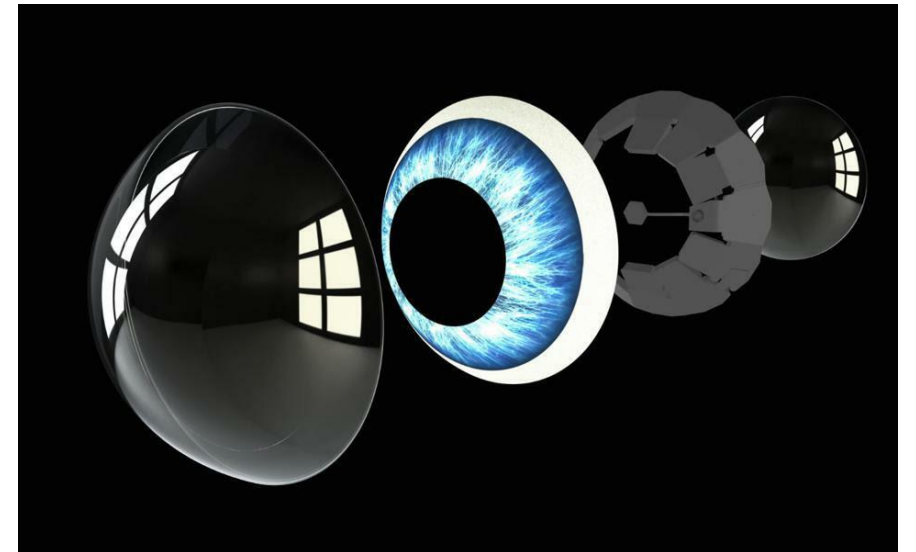


Tech in the News

- **Apple's supply chain issues for the iPhone 13 are [gradually easing](#), although supply is not expected to meet demand until February, according to a [Digitimes report](#).** Suppliers are increasing production to address a shortage of key chips.

Tech in the News

- **Mojo Vision developed a prototype for augmented reality contact lenses to provide access to the metaverse.** The California-based startup is developing the contact lens to help people with vision loss and more.
- The lenses are being designed in response to the way large VR headsets can restrict movement.
- Some practical applications include:
 - **Aiding those with poor vision.** The tech can potentially enhance images by providing real-time contrast and lighting adjustments, which may help with things like border detection and night vision.
 - **There's also zoom,** which could be useful for discerning things like facial expressions.



Tech in the News

- Tim Cook said Apple is [looking into cryptocurrency](#), which he owns and called "reasonable" for a diversified portfolio.
- Ethereum, the world's second-largest cryptocurrency after bitcoin, [reached](#) a record high of \$4,700 on Monday. Bitcoin rose 7% to \$66,250.
- The Israeli military has been using a [facial recognition program](#) to track and monitor Palestinian residents.
- SoftBank will test out the [wireless charging of smartwatches](#) using 5G antennas, initially at a range of 10 meters from base stations. Yikes!
- PepsiCo CEO's [announced](#) that the company is expecting to receive [delivery of its Tesla Semi Trucks](#) this quarter.

Tech Resources

- <https://www.wsj.com/news/technology>
- <https://www.wsj.com/news/tech/future-of-everything>
- <https://www.nytimes.com/section/technology>
- And many others:
 - <https://arstechnica.com/>
 - <https://techcrunch.com/>
 - <https://thenextweb.com/>
 - <https://www.wired.com/>
 - <https://www.cnet.com/>

- **What's Harder to Find Than Microchips? The Equipment That Makes Them**
- The world is hungry for semiconductors, and not all of them need to be made with cutting-edge technology. The race is on to find older machines that can still crank out chips.

Here's Why Smart Home Technology Adoption is Rising Among Seniors

- Amazon (Alexa Smart Home), Apple (HomeKit), Google (Nest)
 - *Voice-activated smart home assistant speaker*
 - *Smart lights and lightbulbs*
 - *Smart locks*
 - *Smart doorbell*
 - **Senior living communities also are adopting smart technologies**
 - With the right smart home device set-up, seniors who are isolated, have mobility or dexterity challenges, or have memory issues can live in their home more safely, happily, and easily. This also has the potential added benefit of alleviating loved ones' and/or caregivers' concerns
 - *Plus wearables*
 - **Related:** [How Technology Is Reducing Long-Distance Caregiver Burden](#)

Where Are All the Truck Drivers?

- The American Trucking Associations, one of the largest trade bodies, estimates the industry is some 80,000 drivers short of the workers needed to keep goods moving freely this year—up from an estimated shortage of 61,500 drivers before the pandemic. New trucks, trailers and other equipment are [in short supply](#), further limiting the movement of cargo.
- And there's a lack of efficiency in a model that hasn't changed much in several decades.
- And there are truckers quitting because of low pay and poor treatment by both employers and customers.
- Bottomline: "There is absolutely not a shortage of people licensed and trained to do that job," Mr. Viscelli said. "The industry has burned so many of them that they left."

- What's Causing The Container Ship Traffic Jam Clogging Up Global Trade

Who is ClearView AI?

<https://www.nytimes.com/2021/10/28/technology/clearview-ai-test.html>

<https://www.nist.gov/programs-projects/face-recognition-vendor-test-frvt>

<https://pages.nist.gov/frvt/html/frvt11.html>

<https://cvrl.nd.edu/projects/data/> (For your Face recognition – and other biometric - training data sets)

Seedlings



Office of the Director of National Intelligence
Intelligence Advanced Research Projects Activity
I A R P A
Creating Advantage through Research and Technology

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SEEDLINGS

Seedlings are typically 9 – 12 month research efforts that are less than \$1M in cost. They are intended to address highly innovative ideas and concepts within IARPA's topics of interest that are high-risk but have the potential for a high payoff. Seedling research takes an idea from disbelief to doubt, with the potential for a follow-on effort (e.g., a full research program).

FILTERS

PAST



ENTER KEYWORD

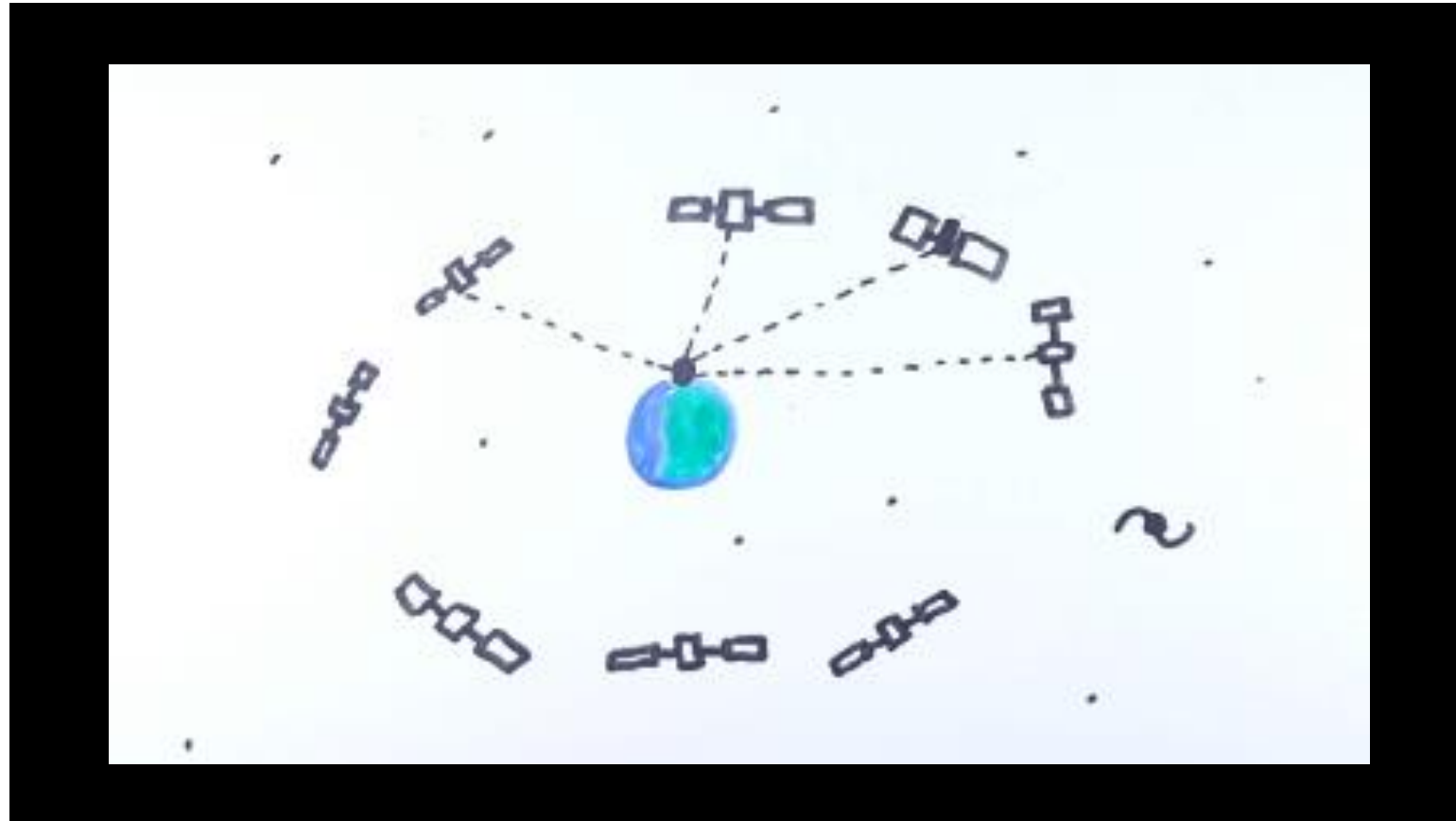
Like

- High-speed hyperspectral four-wave-mixing microscopy with frequency combs
 - A four-wave-mixing, frequency-comb-based, hyperspectral imaging technique that is spectrally precise, potentially rapid, and can in principle be applied to any material, is demonstrated in a near-diffraction-limited microscopy application.
- Real-time automated detection, tracking, classification, and geolocation of dismounts using EO and IR FMV
 - The VideoPlus[®]-Aware (VPA) system enables autonomous video-based target detection, tracking and classification. The system stabilizes video and operates completely autonomously.

Options

GPS

What is GPS and how does it work?
([source](#) – video 2:10min)

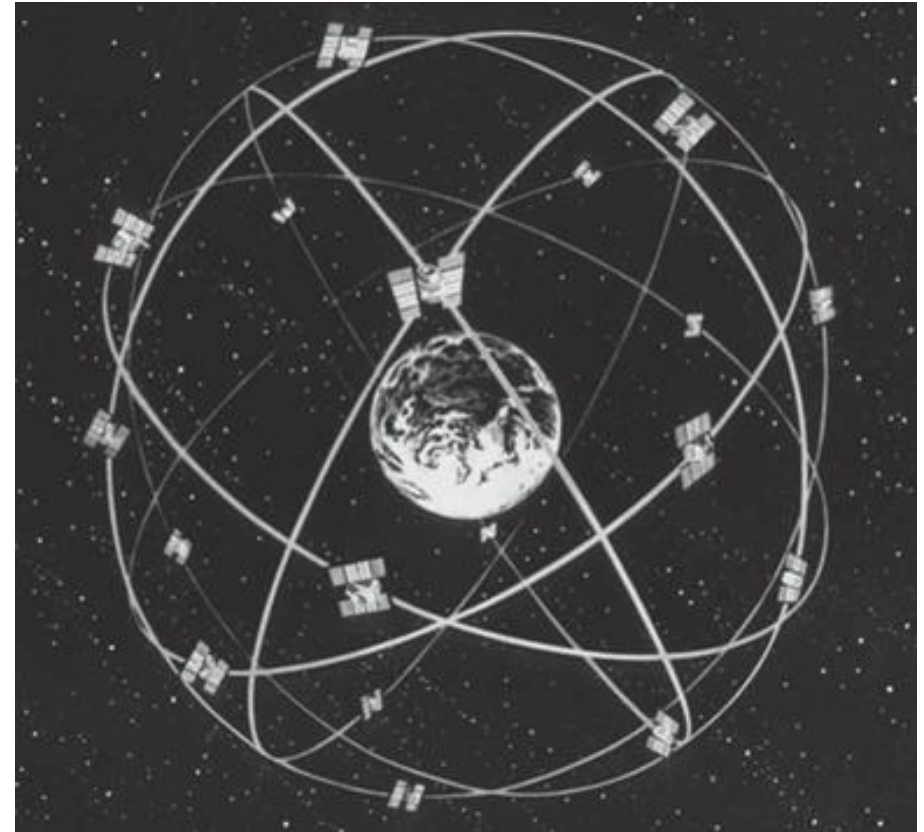


GPS

- [Two Decades of Development and Evaluation of GPS... \(1999\)](#)
- [GPS Future and Evolution](#)
 - The [GPS](#) is a space-based global navigation satellite system (GNSS) that provides reliable positioning, navigation, and timing services to civilian and military users on a continuous worldwide basis. GPS is a U.S.-owned utility, developed by the U.S. Air Force starting with the program in 1978.
 - The U.S. actively engages in bi-lateral cooperation: Europe, Japan, India, Russia and multi-lateral cooperation: International Committee on GNSS (ICG), Asia Pacific Economic Cooperation (APEC), [International Civil Aviation Organization \(ICAO\)](#), [International Maritime Organization \(IMO\)](#), [International Telecommunication Union \(ITU\)](#) International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), International Telecommunication Union (ITU).

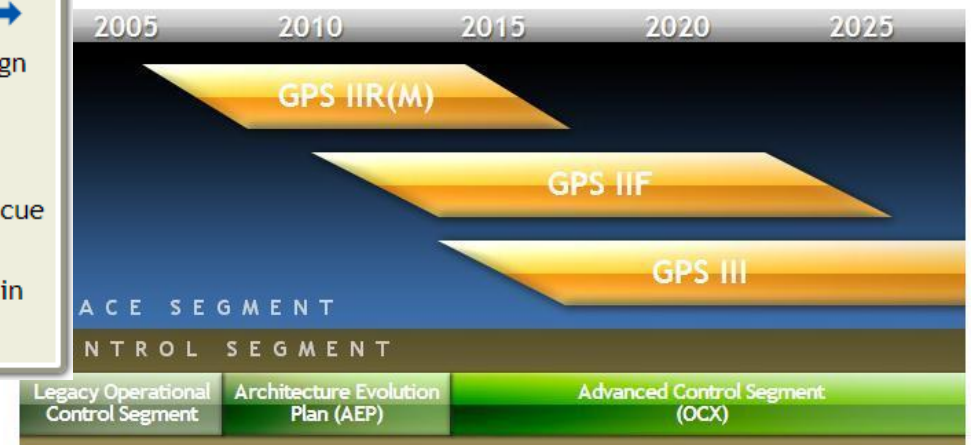
GPS

- The operational GPS satellite constellation consists of 24 NAVSTAR satellites arranged in six 55° planes around the Earth so that a minimum of four satellites would always be in view above the horizon.
- GPS satellites fly in medium Earth orbit (MEO) at an altitude of approximately 20,200 km (12,550 miles). Each satellite circles the Earth twice a day.



Space Segment Futures

LEGACY SATELLITES		MODERNIZED SATELLITES		
GPS IIA satellite	GPS IIR satellite	GPS IIR-M satellite	GPS IIF satellite	GPS III satellite
BLOCK IIA	BLOCK IIR	BLOCK IIR-M	BLOCK IIF	GPS III/IIF
0 operational	8 operational	7 operational	12 operational	4 operational
<ul style="list-style-type: none"> Coarse Acquisition (C/A) code on L1 frequency for civil users Precise P(Y) code on L1 & L2 frequencies for military users 7.5-year design lifespan Launched in 1990-1997 Last one decommissioned in 2019 	<ul style="list-style-type: none"> C/A code on L1 P(Y) code on L1 & L2 On-board clock monitoring 7.5-year design lifespan Launched in 1997-2004 	<ul style="list-style-type: none"> All legacy signals 2nd civil signal on L2 (L2C) LEARN MORE → New military M code signals for enhanced jam resistance Flexible power levels for military signals 7.5-year design lifespan Launched in 2005-2009 	<ul style="list-style-type: none"> All Block IIR-M signals 3rd civil signal on L5 frequency (L5) LEARN MORE → Advanced atomic clocks Improved accuracy, signal strength, and quality 12-year design lifespan Launched in 2010-2016 	<ul style="list-style-type: none"> All Block IIF signals 4th civil signal on L1 (L1C) LEARN MORE → Enhanced signal reliability, accuracy, and integrity No Selective Availability LEARN MORE → 15-year design lifespan IIF: laser reflectors; search & rescue payload First launch in 2018



Who is Brad Parkinson?

- [The Origins of GPS, and the Pioneers Who Launched the System](#) May 1, 2010
- [GPS pioneers honored with Queen's award at Buckingham Palace](#) Dec 3 2019
 - Bradford Parkinson said: "Today marks a landmark moment in all of our lives—there is no prize for engineering greater than this, it is an honor. This recognition reflects the responsibility incumbent upon those developing technology today to strive to do so for the good of humanity. Day-after-day, we are astounded at the new ways in which people across the world use GPS. It is a 'System for Humanity' in each and every sense."
- [My father in-law's](#) classmate and companymate at the Naval Academy
 - Brad lived across the hall from me at USNA from 1953 to graduation in 1957. While in SLO for David's graduation Marilyn and I visited with Brad at his palatial home outside SLO. One of his sons is sheriff of the territory.

What's on your mind for next week?

Our brains on technology

Our brains on technology

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7366948/#:~:text=Potential%20harmful%20effects%20of%20extensive,brain%20development%2C%20and%20disrupted%20sleep.>
- <https://wexnermedical.osu.edu/blog/how-internet-affects-your-brain>
- <https://www.scientificamerican.com/article/are-digital-devices-altering-our-brains/>

Our brains on technology

- Some say our gadgets and computers can help improve intelligence. Others say they make us stupid and violent. Which is it?
 - **Research shows that by constantly distracting us, the Internet affects cognitive performance but does not radically alter our brains.**
 - **The findings also suggest that although video games and brain training influence aggression and cognitive performance, respectively, the extent of that influence is much less than many would think.**
 - **The risks of digital devices might be minimized by educating people in ways to enhance concentration, self-control and critical-thinking skills.**

Our brains on technology

- Discussion:
 - Are we becoming 'stupid'?
 - Have we become (better) multitaskers?
 - What about our 'attention span'?
 - Do video games increase aggression?
 - Is gaming better for our brains?

Fact: young people must be taught to develop their concentration, self-control and critical-thinking skills!

Our brains on technology

- More on this topic can be found in this series of book reviews I taught in 2017:
 - [Born Digital](#) by Urs Gasser & John Palfrey
 - [Alone Together](#) by Sherry Turkle
 - [Reclaiming Conversation](#) by Sherry Turkle
 - [The Shallows](#) by Nicholas Carr
 - [The Glass Cage](#) by Nicholas Carr
 - [What Technology Wants](#) by Kevin Kelly
 - [The Inevitable](#) by Kevin Kelly
 - [Irresistible](#) by Adam Alter

Extra Credit

Some slides from my 2017 class

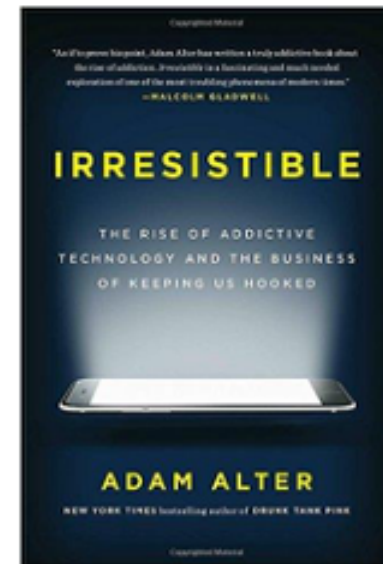
Tech Talks: Tech for Seniors

Addiction by Adam Alter

Center for Learning in Retirement - Fall 2017

Glen Maxson

seniortechadvisor.com



Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooked

Review of a book by Adam Alter

Introduction

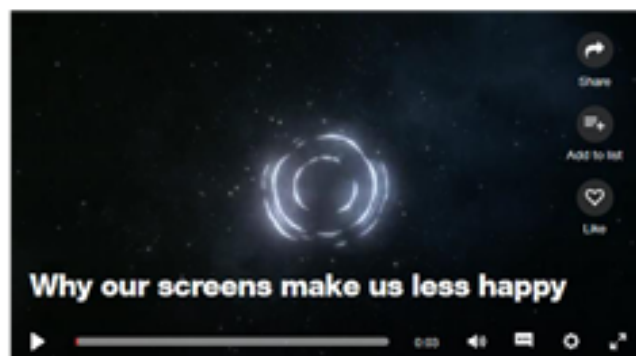
Adam Alter is an Associate Professor of Marketing at New York University's Stern School of Business, with an affiliated appointment in the New York University Psychology Department.



Adam is the *New York Times* bestselling author of two books: *Irresistible* (March, 2017), which considers why so many people today are addicted to so many behaviors, from incessant smart phone and internet use to video game playing and online shopping.



[2017 TED Talk](#)



What are our screens and devices doing to us? Psychologist Adam Alter studies how much time screens steal from us and how they're getting away with it. He shares why all those hours you spend staring at your smartphone, tablet or computer might be making you miserable -- and what you can do about it.

NPR Interview (Mar. 13, 2017)

'Irresistible' By Design: It's No Accident You Can't Stop Looking At The Screen (30:20)

Adam's definition of "addiction"?

It is something you enjoy doing in the short term, that undermines your well-being in the long term — but that you do compulsively anyway.

[Play Intro](#)

The Addicted Brain (Sept. 17 National Geography)

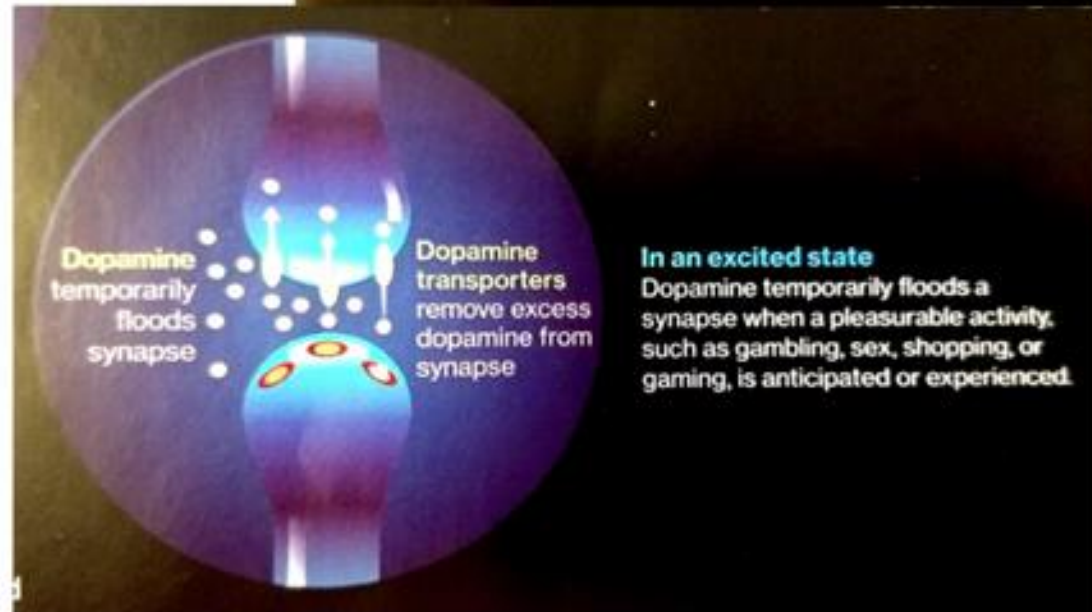
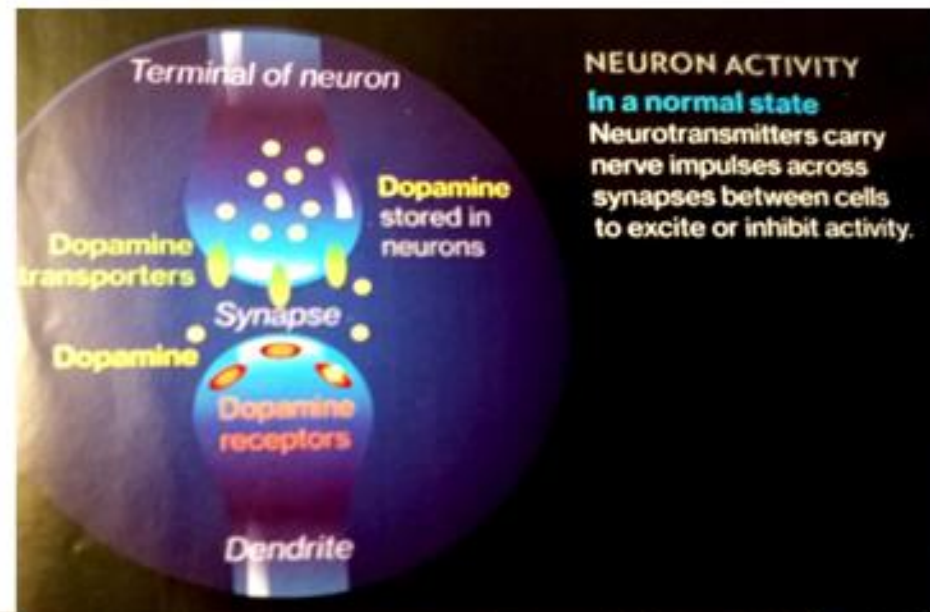
p. 41 – In the Grip of Gaming

In Seoul, e-stadiums and game parlors charge about a dollar an hour, and some venues are open around the clock. Soon after South Korea made super-high-speed Internet cheap and widely available, it became clear that some people were ruining their lives through obsessive game playing. The government now pays for treatment. The American Psychiatric Association hasn't recognized compulsive gaming as an addiction, but it lists Internet game disorder as 'requiring more study'.

Hijacking the Brain (continued)

A NATURAL HIGH

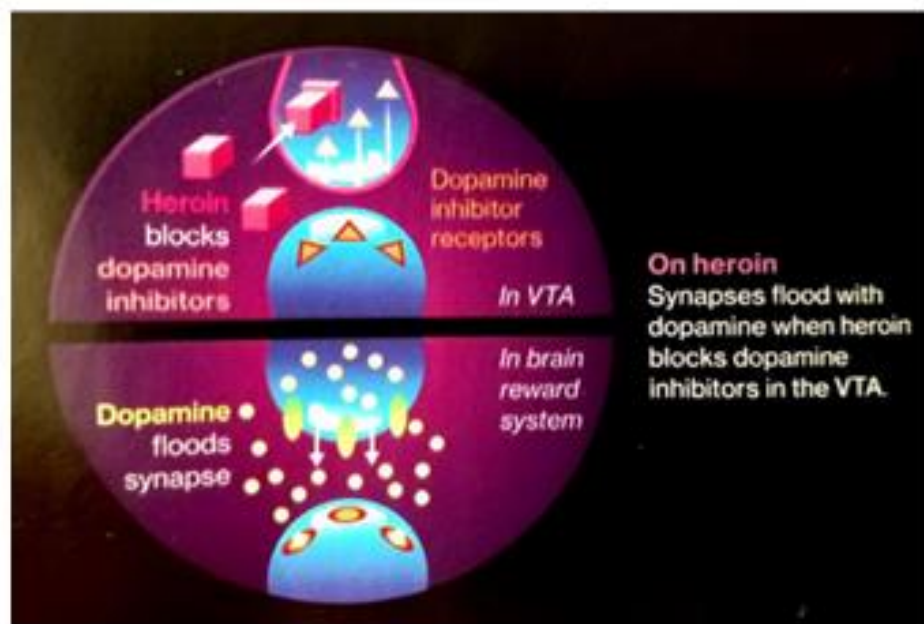
Our brains evolved a dopamine-based reward system to encourage behaviors that help us survive, such as eating, procreating, and interacting socially.



Hijacking the Brain (continued)

A CHEMICAL RUSH

Different drugs interact with the reward system in unique ways to keep synapses artificially flooded with dopamine. That dopamine rush can rewire your brain to want more drugs, leading to addiction.



Common 'behavioral addictions':

- Exercise
- Video games
- Gambling
- Work
- E-mail (p 109)
- Social media
- Binge watching
- Hoarding
- ...

What do these have in common?

- Behavioral addiction is rooted in environment + circumstance
- Might fulfill a psychological need, obsession, compulsion
- May be detrimental to work, health, hygiene, social interaction...
- Often becomes something we 'want' versus something we 'like'

What makes tech so 'irresistible'?

By design,

- Goal setting, perfectionism – time and numbers (e.g. FitBit)
- Classic reinforcement – provide small doses of positive feedback (work)
- Uncertainty - Facebook, Instagram... (social media)
- 'Loss as motivation' – the gambler's paradox (slots)
- Mobile access – iPad and iPhone enabled (mobile devices)
- Ludic loops – complete one challenging element, then the next... (video games)
- 'Flow' - proximal (skill) development – skill vs. challenge (video games)
- Zeigarnik effect – incomplete experiences (e.g. cliff-hangers) (TV shows)
- MUDs & MMOs - immersion, achievement, social (connection) (video games)
- Absence of Stopping rules (all)

Bottomline: Every technique in the book is used to get and keep us hooked!

GDPR vs privacy US laws

- <https://www.ispartnersllc.com/blog/us-nationwide-data-privacy-law-gdpr/>
- <https://edaa.eu/a-legislative-comparison-us-vs-eu-on-data-privacy/>
- <https://www.forbes.com/sites/forbestechcouncil/2020/07/29/the-privacy-mindset-of-the-eu-vs-the-us/?sh=57bff0597d01>

The Privacy Mindset Of The EU Vs. The US

- The norm in the U.S. that online behavior gets tracked and used for a slew of subsequent manipulation. U.S. legislation isn't even close to providing adequate protection of consumer privacy interests.
- Americans choose to believe that their online behavior being tracked happens in their best interests or is a price to pay for getting free or discounted products.
- GDPR was adopted on April 14, 2016, and before it became enforceable on May 25, 2018, the U.S. Congress enacted the Clarifying Lawful Overseas Use of Data (CLOUD) Act on March 23, 2018. Rather than being compatible with the GDPR, the U.S. CLOUD Act overrules it.

The Privacy Mindset Of The EU Vs. The US

- Federal law requires U.S.-based software companies and IT service providers to ensure that authorities can have access to all stored data, including data stored on foreign servers. Furthermore, it guards U.S. service providers from having to tell customers whether authorities have requested their data.
- One lobbying group that represents internet companies is striving for a [federal privacy law](#) that would preempt more state regulations like the [California Consumer Privacy Act](#) (CCPA), which actually makes real progress. Its ideal federal privacy law would undermine the CCPA to essentially let companies return to business as normal and also make it impossible for other states to set the bar even higher.

What is GDPR, the EU's new data protection law?

- In May 2018, the EU implemented the **General Data Protection Regulation (GDPR)** which became the new legal backbone on data protection and privacy in the EU.
 - It **imposes obligations onto organizations anywhere, so long as they target or collect data related to people in the EU.**
 - **The GDPR applies to you even if you're not in the EU**
 - **Fines for violating the GDPR are very high**

What is GDPR, the EU's new data protection law?

- If you process data, you have to do so according to seven protection and accountability principles outlined in [Article 5.1-2](#):
 1. **Lawfulness, fairness and transparency** — Processing must be lawful, fair, and transparent to the data subject.
 2. **Purpose limitation** — You must process data for the legitimate purposes specified explicitly to the data subject when you collected it.
 3. **Data minimization** — You should collect and process only as much data as absolutely necessary for the purposes specified.
 4. **Accuracy** — You must keep personal data accurate and up to date.
 5. **Storage limitation** — You may only store personally identifying data for as long as necessary for the specified purpose.
 6. **Integrity and confidentiality** — Processing must be done in such a way as to ensure appropriate security, integrity, and confidentiality (e.g. by using encryption).
 7. **Accountability** — The data controller is responsible for being able to demonstrate GDPR compliance with all of these principles.

What is GDPR, the EU's new data protection law?

- GDPR recognizes a litany of new privacy rights for data subjects, which aim to give individuals more control over the data they loan to organizations. **Data subjects' privacy rights:**
 - 1.The right to be informed
 - 2.The right of access
 - 3.The right to rectification
 - 4.The right to erasure
 - 5.The right to restrict processing
 - 6.The right to data portability
 - 7.The right to object
 - 8.Rights in relation to automated decision making and profiling.