

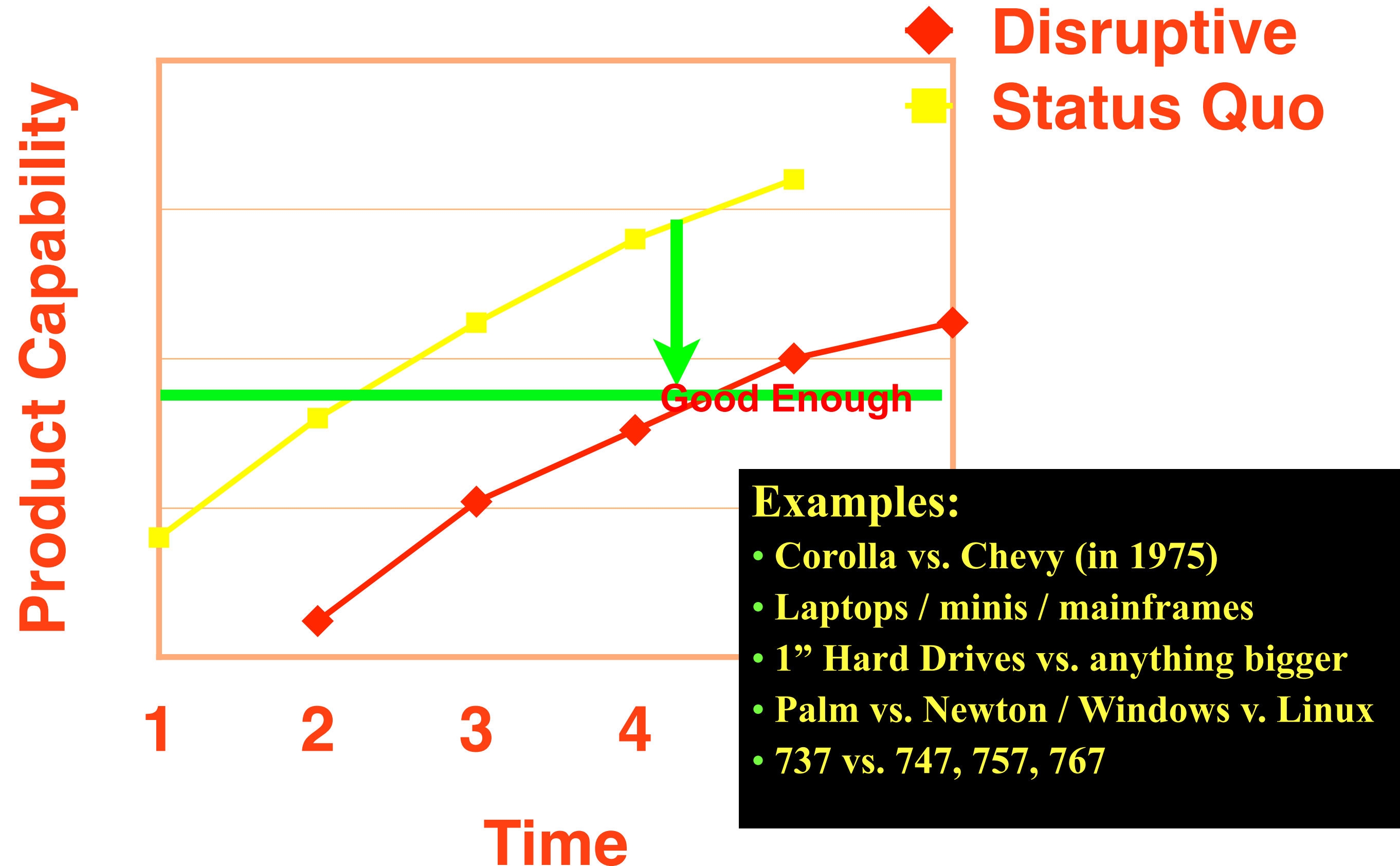
Op-Eds past / future



- Feb. 25: **disruption**: does less, is less capable, killed its predecessor anyway.
- March 11: Describe a **parallel** from everyday products having (apparently) nothing to do with your project. Tell me what the chasm crossing issues and strategies of two seemingly dissimilar products have in common



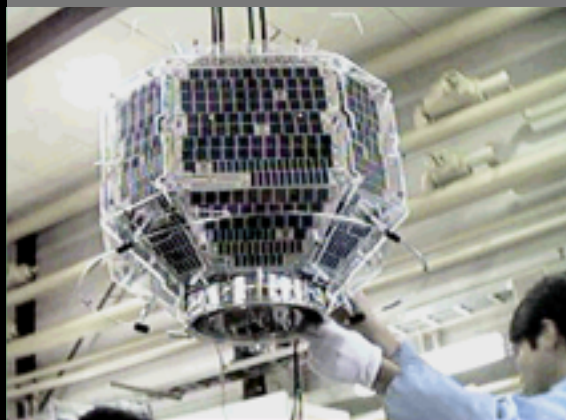
Disruption: being better by being worse



Disruptive Technologies:

Most things worse, one better

- | Item | Better | Worse |
|-------------------------------|-----------------------------|--|
| Walkman | Cheap / Small audience size | Sound quality; Sound sources; data displays; lifetime; operating time; ease of use; share sounds; copying; |
| Laptop / palmtop / cell phone | Transportable | Expensive; small display; small or no keyboard; slow; limited storage; battery life limit; poor fidelity; low reliability, low bandwidth |
| Electric car | Clean | Limited range; expensive; small; lower reliability |
| Telephone | Save time | Lower bandwidth; poor fidelity; misunderstandings interruptive; limited attention span - listener often distracted; no graphics; impersonal - no visual cues |
| Jet Travel (vs. ocean liner) | Faster | Jet lag; limited baggage; confining; noisy; lousy food; no pool or other amenities; not sociable |

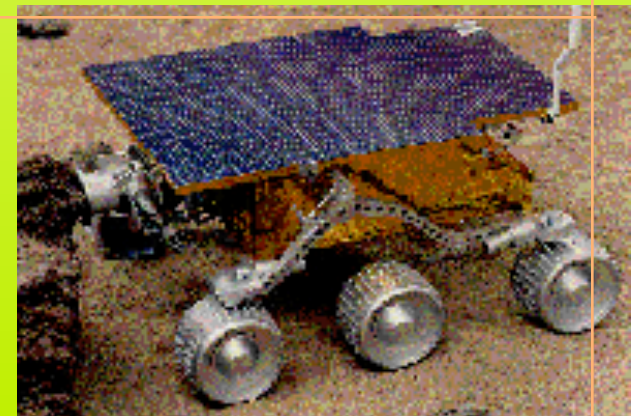


Microspace Spontaneous Low power, bitrate and pointing precision.
 Limited payload mass, volume, mission duration.
 High Marginal Costs: \$/bit; \$/kg; \$/watt
 No playbook =>
 greater management risk & expertise

Like Buggywhips: too close to customer

Disruptive Technologies: Change the Application

Item	Old App	New App
• Walkman	Home listening	Personal space on planes, subways... Listen while running, gardening...
• Laptop / palmtop / smart phone	Office tasks	Field data entry & retrieval, emergencies, office anywhere (web surf, email, news, no-secretary office) social apps, games, ebooks, pull entertainment
• Electric car	Road travel	Drive-in mall, golf course, airport + <i>hybrids</i>
• Telephone (vs. in person)	In-person visits	Phone shopping / ordering; personal security, fax / net.
• Jet Travel (vs. ocean liner)	Airmail & Defense	Transcontinental and intercontinental tourism /business
Microsatellite	GEO Hi B/W Comm Hi-Res Recon	LEO Low B/W Comm Hi-Temporal Res Recon
• Human Spaceflight		Robotic Exploration Teaching tool





These Mostly Crossed

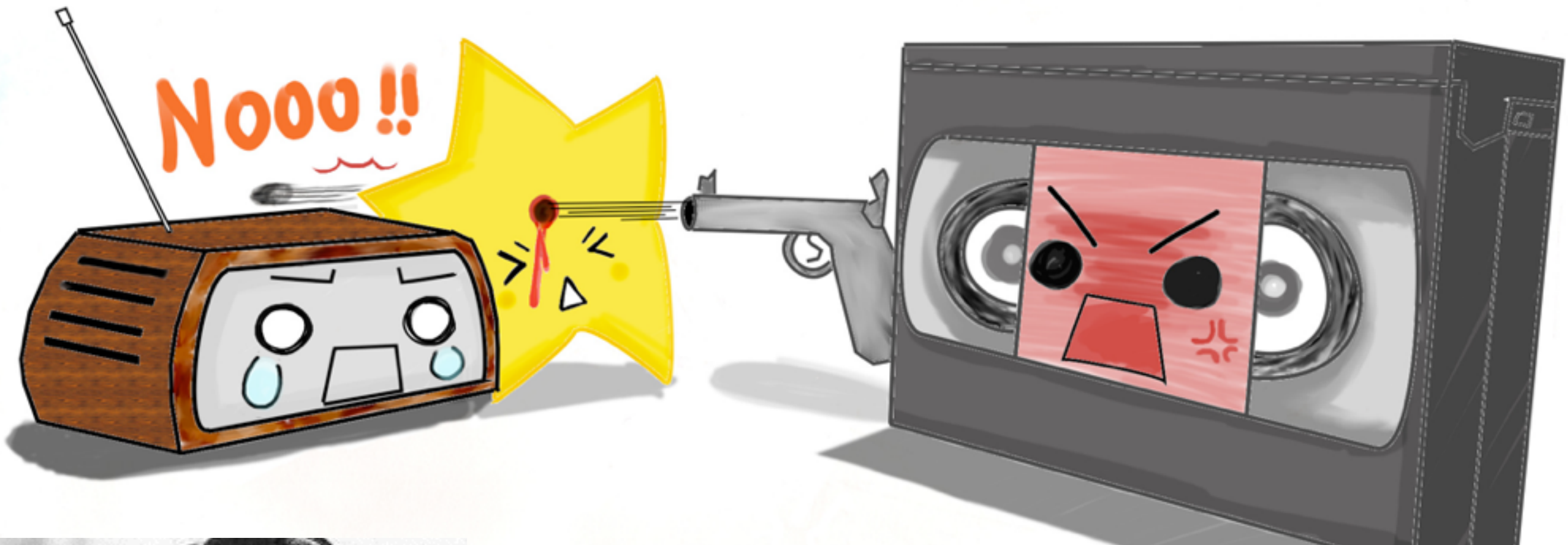


They killed the status quo

They were not disruptive



VIDEO KILLED THE RADIO'S STAR



Seen a good
silent film
lately?

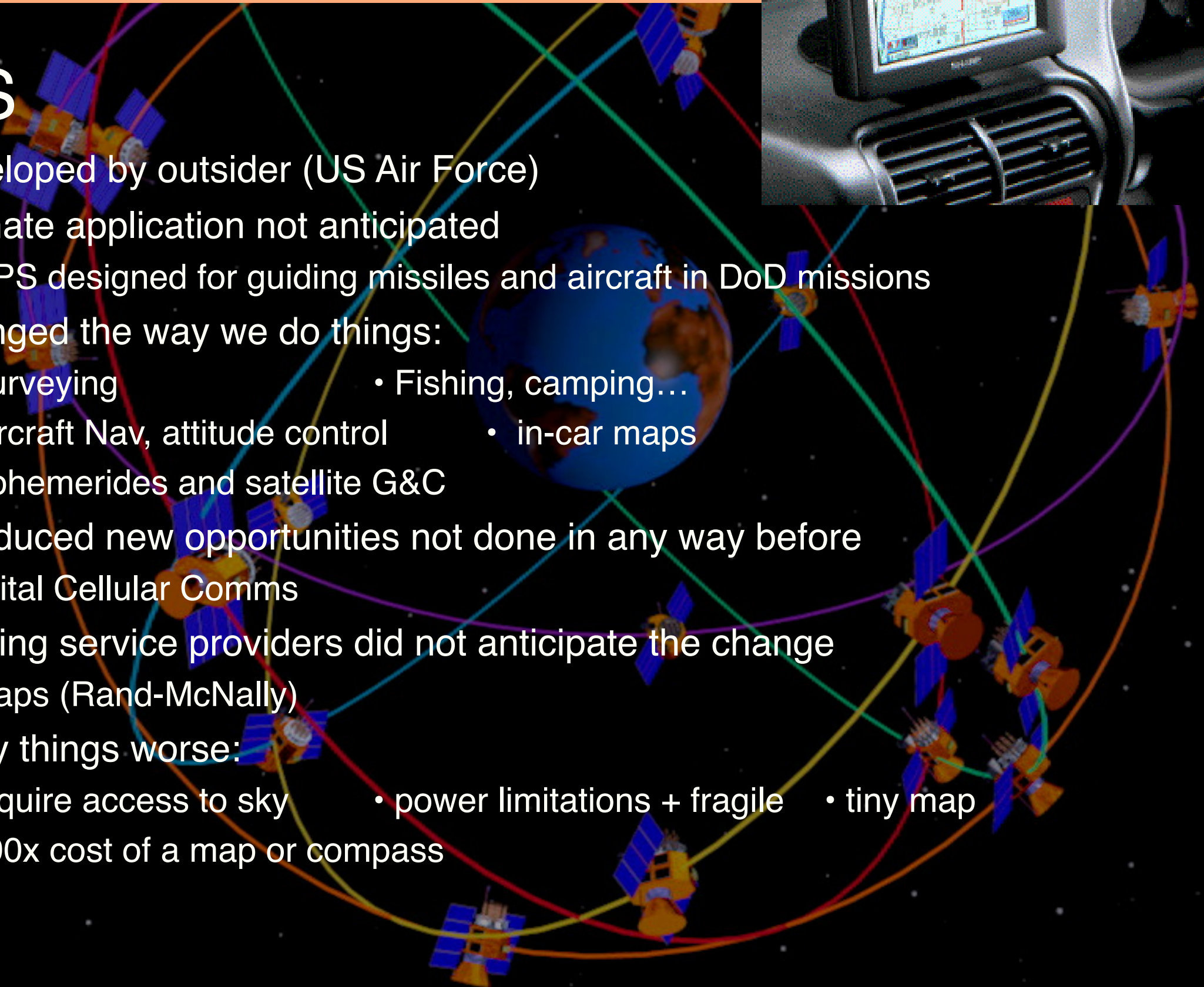


Disruptive Technologies: Three you might own: #1



• GPS

- Developed by outsider (US Air Force)
- Ultimate application not anticipated
 - GPS designed for guiding missiles and aircraft in DoD missions
- Changed the way we do things:
 - Surveying
 - Aircraft Nav, attitude control
 - Ephemerides and satellite G&C
 - Fishing, camping...
 - in-car maps
- Introduced new opportunities not done in any way before
 - Digital Cellular Comms
- Existing service providers did not anticipate the change
 - Maps (Rand-McNally)
- Many things worse:
 - require access to sky
 - power limitations + fragile
 - tiny map
 - 100x cost of a map or compass



Disruptive Technologies:

Three you might own: #2

- Digital Camera

- Developed by outsider (Asian electronics mfgs. e.g. Casio)
- Ultimate application not anticipated
 - Designed for satellites (getting film to MotoFoto is a problem), then point-and-shoot -
- Changed the way we do things:
 - Professional Photography (10 Mpixels)
 - 1-hour film developing & prints
 - Sharing photos via cell phone
 - Slides vs. flat panels
 - Photo albums v. iphoto
- Introduced new opportunities not done in any way before
 - Webcams
- Existing service providers did not anticipate the change
 - Kodak did: but did it help? Devaluation of unique, valuable tech base; Intel problem
 - Fuji, 1-hour photo shops: didn't
- Many things worse - one thing better (instant, no film, zero recurring cost)
 - requires camera + PC, printer, software, savvy beyond photo tech
 - lower res, poor color rendition, short battery life, not permanent



Disruptive Technologies: Three you might own: #3



- ipod

- Developed by outsider (Apple not a player in personal audio - or any audio)
- Ultimate application not anticipated
 - Legal downloading turned out to be pivotal innovation - not the ipod itself
- Changed the way we do things:
 - End of the CD era
 - Purchase by the song
 - book downloads
 - Web vs. record store
- Introduced new opportunities not done in any way before
 - Podcasting
- Existing service providers did not anticipate the change
 - CD stores mostly gone (Tower Records)
 - Wiped out early MP-3 players
 - Record companies can't sell \$17 CDs with 2 decent tracks
- Many things worse - 1 thing better (100s of CDs in your pocket, easy shopping)
 - Poor anti-skip, poor battery life, poor sound quality (compared with minidisc)
 - Limited copying (compared with CD) + difficult to share even though you paid for it



Samsung Not Worried About Apple's TV: “TVs are ultimately about picture quality”

TVs are about picture quality. *Because that's all Samsung and Sony and Sharp have been willing to improve for the last half a century.* As soon as someone comes along and changes what TVs are “ultimately about,” it's going to be a bloodbath

You can buy a TV for under five hundred bucks that's 90% as good as the five-thousand-dollar one. And furthermore, it's already ten times better than what you could get for the same price a few years ago

Purple
Crosses

Red
Disrupts

Samsung has 10,000 researchers putting together slightly better TVs every year

But TVs aren't ultimately about picture quality, they're about what that great picture quality is showing...and as long as Samsung is of the opinion that how things look is the only metric worth considering, they're going to be paying someone else for those new features.

Disruptive products:

- **Obsolete existing products - initially only for some users**
- **Recognize that possibility expands faster than need**
- **Change the application and user population**
- **Unseat entrenched market leaders**

MP3 clock radio disrupted the alarm clock?

- Developed by outsider (Asian electronics mfgs. e.g. Casio) not Timex
- Took over the market
- changed the application (bedside audio entertainment)
- but is an example of ability outstripping demand?

Digital Piano disrupted acoustic

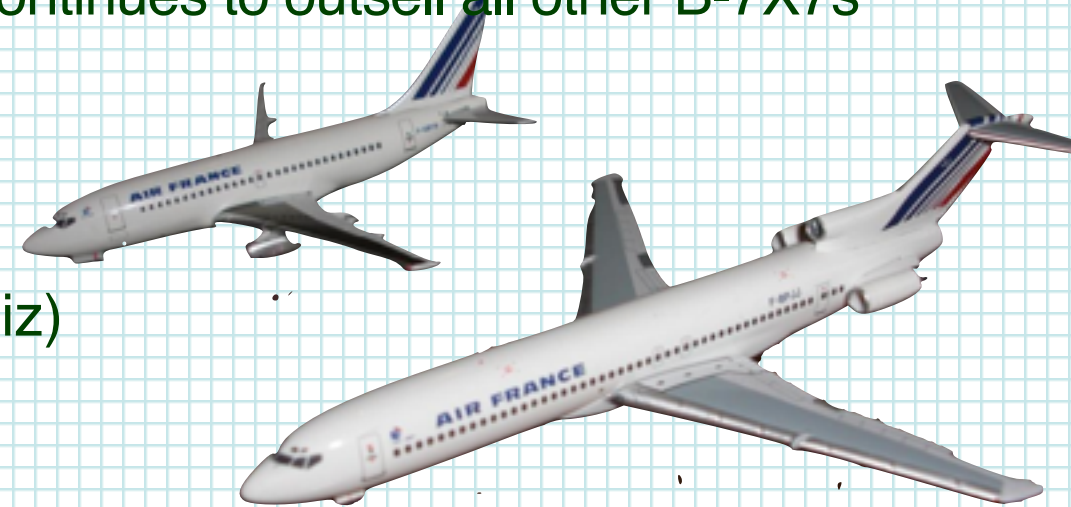
- Developed by an outsider (Moog, Casio, Yamaha (was then))
- Took over most of the market though introduced not as a piano replacement
- changed the application - digital music, synth of other instruments, multi-tracking
- but did simpler take over?

Disruptive products:

- **Obsolete existing products** - initially only for some users
- **Recognize that possibility expands faster than need**
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737 disrupted the 707 and 727?

- Not developed by outsider
- did less but cost less
- continues to outsell all other B-7X7s



Jeans disrupted “trousers”?

- Developed by outsider (Levi was not in the office clothes biz)
- Took over the market
- Changed their application (were for labor and leisure)
- Simpler and less expensive?

Prefab parquet disrupted wood flooring?

- or did it disrupt carpeting?
- True wood flooring is now a niche while parquet is in many new places



Cloud Disrupts MS Office?

- Developed by an outsider (Google)
- Simpler at least from user's PoV but much less capable?
- changed the application - file sharing and group work



Designer's Notebook: disruption

- Television: a radio with pictures?
- 1" hard drive: a small 5" drive?
- PC: own your own mainframe?
- Walkman: personal stereo system?
- Airlines: a faster ship / train?
- Digital Camera: Instamatic w/o film?
- Antibiotics v. Asprin?
- "Pill" v. rhythm etc.?
- Capitalism: deregulated socialism?
- Visa card: universal charge card?
- Cell phone: long distance cordless?
- Spacecraft: higher faster aircraft?

Disruptive products:

- Obsolete existing products - initially only for some users
- Change the application and user population
- Unseat entrenched market leaders
- Face the chasm and rarely cross it

Did electronic sound disrupt live music?

and then move into homes, cars, running, elevators...

Designer's Notebook; Space Innovations

- Geo (vs. LEO)
- Shuttle (vs. Expendable)
- Flyby (vs. earth telescopes)
- Space Station (vs. Skylab)
- TDRS (v 26 Ground Stations)
- μ Space (vs. Conventional)
- Rovers disrupt humans?
- Jacob's Ladder (vs. rockets)
- Landers (vs. Flyby)
- Lunar Base (vs. Space Station)
- CCD (vs. Film Return)
- Clusters/constellations (vs. individuals)

Which of the above:

- **Obsolete existing products**
- **Change the app and user group**
- **Unseat entrenched players**
- **Face the chasm and cross it**

• Which of the above:

- **Low Risk Δ**
- **No re-education**
- **Work at inception**
- **Low margins**
- **Danger of extinction?**

Disruptive homework:

Due Feb 25

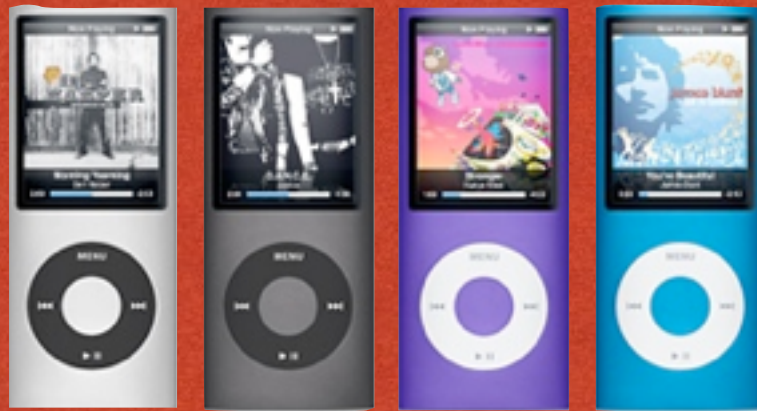
Tell a disruption story

in the mean time, read:

**J. Bower and C. Christensen:
Disruptive Technologies: Catching the Wave**

<http://hbr.org/1995/01/disruptive-technologies-catching-the-wave/ar/1>

PARALLELS: ARM ALARM



personal and portable

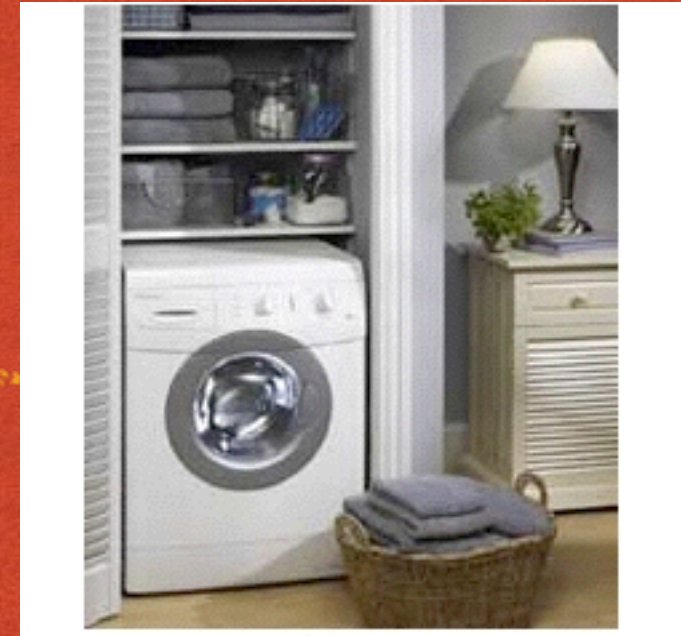


personal and portable

PARALLELS: WASHER + DRYER



One step



goes anywhere



More Expensive
right size

PARALLELS: SEGWAY



Longer Range



Less Work

PARALLELS: SEGWAY II



PARALLELS: SEGWAY III



DISRUPTED

?



	Walking	Segway*
Cost / \$	0	5000
Mass / kg	0	35
Width / cm	40	100
Height / cm	175	220



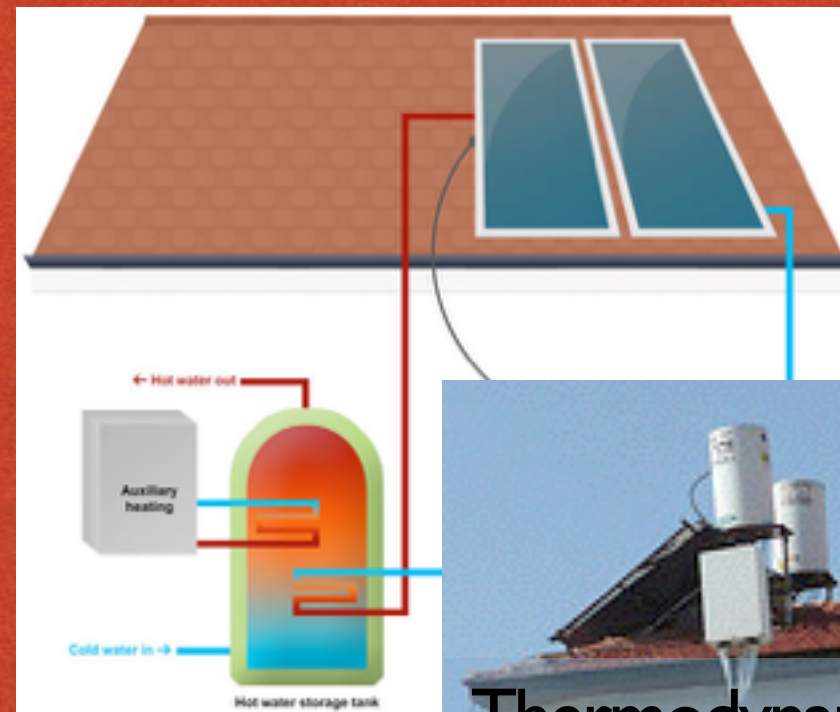
*

- + helmet
- + hands not free
- + liability
- + stairs?
- + elevators?

PARALLELS: SMART ROOF



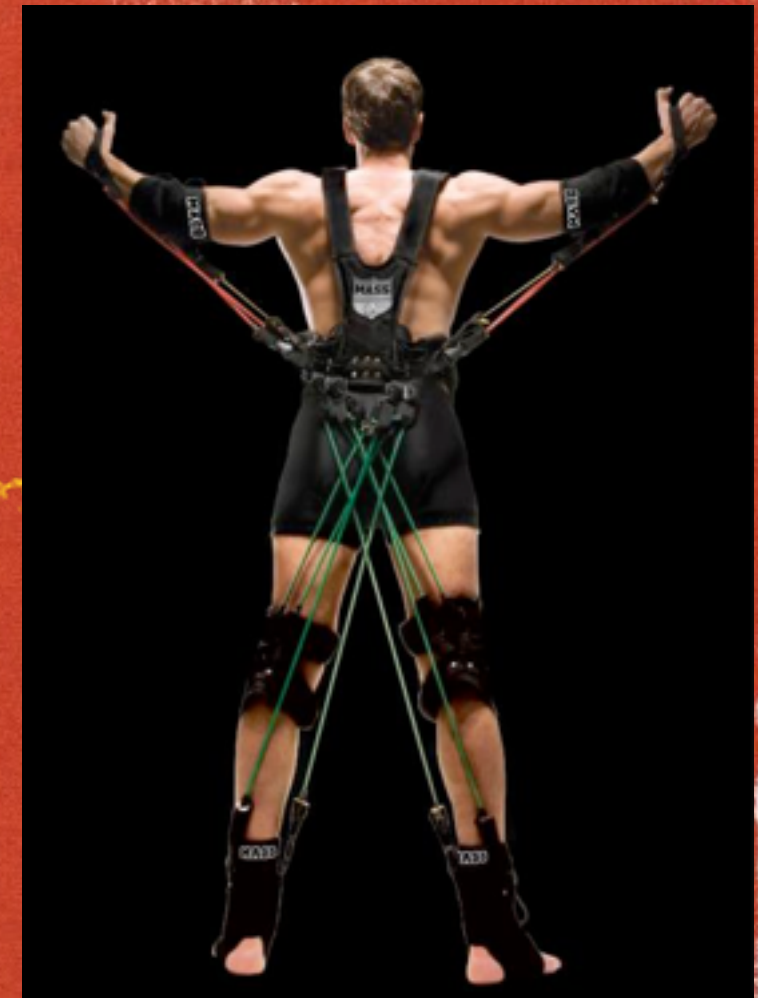
Smart Windows



Thermodynamicist's eye view
of my residence in Israel

Solar Hot Water

PARALLELS?

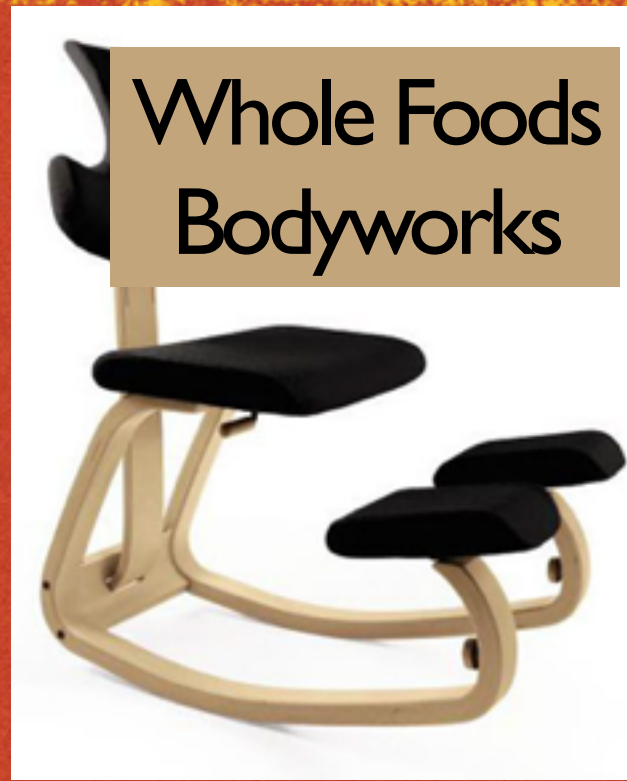


PARALLELS: THE CHAIR



paintings
sculpture

Museum Chair



Whole Foods
Bodyworks

Ergonomic Chair



Home
entertainment
Center

La-Z-Boy Chair



Living Room
Grand Piano