Was Odysseus an Engineer?

The story of the arrow challenge has a lot of similarities with engineering tolerance

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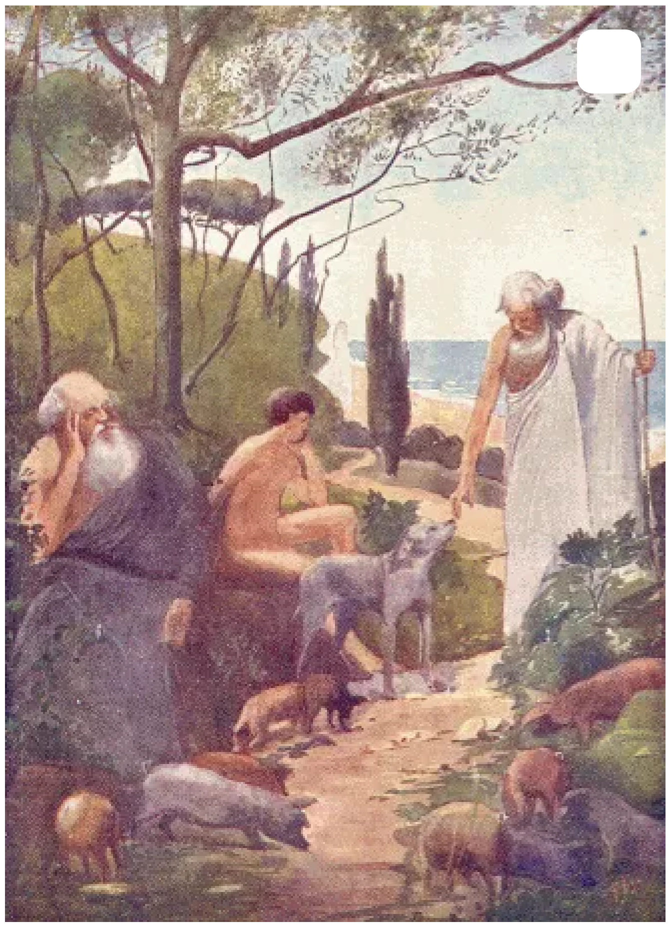


The return of Ulysses, illustration by E. M. Synge from the 1909 *Story of the World* children's book series (book 1: *On the shores of Great Sea*) [from Wikipedia]

The history of engineering in antiquity is an interesting read. People have thought and built like engineers before it was even a term or a degree.

Quora bot explains the meaning:

“In Homer's epic poem, "The Odyssey," the archery contest at the end of the story is a significant event that plays a crucial role in the resolution of the narrative. In this contest, Penelope, the wife of Odysseus, sets up a challenge for the suitors vying for her hand in marriage. The challenge involves stringing Odysseus' bow and shooting an arrow through twelve axeheads.

The bow that is used in the contest is Odysseus' own bow, which is a powerful weapon with great significance in the story. The feat of shooting an arrow through twelve axeheads is meant to demonstrate exceptional skill and strength in archery. It is a test of precision, accuracy, and power, as shooting an arrow through such a narrow and challenging target requires immense talent and expertise.

The symbolism behind this challenge is multifaceted. On one level, it serves as a test of the suitors' worthiness to marry Penelope, as only someone as skilled as Odysseus himself would be able to accomplish such a feat. Additionally, the contest serves as a means of revealing Odysseus' true identity to those present, as only he possesses the ability to complete the challenge.

Ultimately, Odysseus, disguised as a beggar, is the only one who successfully completes the challenge. His success in the archery contest is a pivotal moment in the story, leading to the revelation of his true identity, the defeat of the suitors, and his eventual reunion with Penelope.”

I have written about engineering a lot. While I would not make a great engineer, technology has a lot in common with art. Intrinsic skill gained from experience is, in a way, an engineering tolerance of sorts:

“Engineering tolerance is the permissible limit or limits of variation in:

a physical dimension;

a measured value or physical property of a material, manufactured object, system, or service;

other measured values (such as temperature, humidity, etc.);

in engineering and safety, a physical distance or space (tolerance), as in a truck (lorry), train or boat under a bridge as well as a train in a tunnel (see structure gauge and loading gauge);

in mechanical engineering, the space between a bolt and a nut or a hole, etc.

Example for the DIN ISO 2768-2 tolerance table. This is just one example for linear tolerances for a 100 mm value. This is just one of the 8 defined ranges (30–120 mm).

Dimensions, properties, or conditions may have some variation without significantly affecting functioning of systems, machines, structures, etc. A variation beyond the tolerance (for example, a temperature that is too hot or too cold) is said to be noncompliant, rejected, or exceeding the tolerance."

Tolerance is the marrow of good design. Something works or it doesn't. And if it does work, it may not last very long without margins of error that do not exceed rated stochastic mechanical or thermodynamic stress. In good design, wear and tear is anticipated and the system is designed to collapse/degrade gracefully rather than chaotically. Fault tolerances deal with both operational and end-of-life functionality, but operational improvements from prior models (if any) are often the biggest selling points (features).

In 1997, as a kid, I didn't have cable. I didn't really ever feel FOMO in elementary school because most of the kids rarely mentioned cable, plus there was plenty of other things to do. A couple classic TV movies I remember watching were *Waterworld* (which had a special, ~~made-for-TV~~ alternate ending which may be hard to find unless one has a VHS recording of it (Edit: it was apparently the director's original ending that was cut from the theater and DVD version), *Brave New World,* and Homer's *The Odyssey*. The networks played them, but it was mainly NBC and ABC that broadcast them. The quality of the shows were epic, and despite the commercial breaks, really felt like some of the best programming on TV in the 90s. Thus I never had felt a need for cable, even in college by 2002 when the dorms included it. By then, I had already had high speed internet, and the college computer labs had Pentium IIIs (I still had a Pentium 1 at home) so I was already on my way to surfing the world much faster than i would have been flipping cable channels. The only thing I remember from cable in my dorm 2003 was the night before the Bagdhad invasion, which might have been CNN instead of ABC news. Of course, that could just be the Mandela effect (I remember seeing night vision cams, and it wasn't Nixon repeating the words *sacrifice….sacrifice….sacrifice…*(points if you get the reference).

Acting The Odyssey 1997

The first part of this scene preceding the bow test is actually in a longer version but I saved it for this second clip because its blurrier:

Odysseus Test of the Bow

Once one learns tolerances, the bar is raised on expectations. Obviously not everyone is an Olympiad archer, but the influence of this scene is that it shapes my outlook on a pet project of mine.

Most people think of new technology as magic, when the mechanism is still unknown or hidden. But in reality, it often involves physics and engineering working together in a verified stage, one that has been through thousands of stress tests.

In order to pitch a new idea, especially one that does something 12x better than another, it often has to thread a very fine needle. I am mixing metaphors intentionally because I just wanted to mention that sewing also involves a skill, but I won't mix them up needlessly (no punctilio intended).

Most people have a conventional view of computers. They take for granted that their electricity supply can power it. To develop a solar powered laptop (my pet project), one might initially think of rooftop solar panels, then think it needs to sit in the sun for hours to use it for just a few minutes. But that’s conventional thinking. In fact, if you're old enough, you might remember the solar powered calculators from the late 1970s and 80s by TI could be powered on in a second using indoor light. They used an amorphous silicon panel. They also used a static computer processor, an RCA 1802 in later models, which means it uses power only when it's computing, unlike modern computers, which idle more or less like a Prius at a stoplight.

In the Quora summary above, an arrow goes through 12 axeheads. A laptop that only charges when its not being used, or only charges a fraction of the energy it consumes is like Odysseus getting the arrow through one axehead. The Samsung NC215S did that in 2011. It was ambitious, but it was no Odysseus. A modern processor can't really run on a calculator chip from the 80s if one wants to run linux or IRC chat. So the 2nd axehead is that the processor has to be static but can go faster, or it can run continuously but use much, much, less power. Thanks to Koomey's Law, thats possible.

Imagine you're the Odysseus of engineering, who happens to be the best chip designer in the world. In the U.S, that might be Jim Keller. In Asia, it might be the Taiwanese foundry developer who defected to Samsung, then to the PRC, Liang Mong Song.

Let's say you wanted to build a solar laptop that can be powered by cloudy daylight from your window as soon as its morning, without even leaving your home, or using just a light bulb (science is never about practicality, but proof of concept; engineering is about improving speed, performance, and longevity-practicality).

How would it be done? Well first, you'd need to estimate an average amount of power that the bulb produces (it might be consuming 9 watts, but a solar panel might only get 10mW from it (it can get more, but I'll use that figure for now.) So the third axehead is that you've set the total system power consumption to a maximum of 10 milliwatts.

That's one hundredth of the AMD Geode LX800, which used 1 watt of power in 2007, one of the last rare static processors that ran linux (full disclosure: this processor was in the One Laptop Per Child- and was so ambitious Intel was accused of dumping their Classmate PC to compete with it).

Energy storage: One could use a yuuge battery, but that would be too easy…so you need a capacitor, or at the very least, a lithium-ion capacitor with one hundredth the capacity of a large laptop battery, which are typically 6-cell and 86Wh. There is a 90mAh hybrid capacitor which is 250 Farad. Still kinda large, but powering a 13" screen minimum is going to take quite a bit of creativity. That's the fourth axehead.

There are screens that use as little as 250uW per refresh, but they are 4.4" in their largest and require a bit of software development for general purpose display drivers. Sharp Memory in Pixel came out of retirement (I think) to supply Adafruit a write-only display since they were so popular.

So if SHARP built a single large display that consumed 1.5mW per refresh (scaling 250uW for six 4.4" displays, you have a 13.2" monitor being powered by your windowsill, with a solar panel the size of an 8.5" x11" sheet of paper on the back lid and around the front bezel of the display and keyboard. I know, crazy difficult, because it's not near 60fps (and not that 60 is always needed, but 2Hz is better than 0, and more fps is possible in monochrome). A single Memory-in-Pixel at 13" is the fifth axehead.

Thr sixth axehead is developing an application processor that can run on 1-3mW, with enough L2 cache and NVM to run Linux and one or two tiny apps in 16MB. That alone is millions of software dev hours (kernel, bootloader, and custom chip design). More ultra-low power RAM may be possible in 2030- not right now, but I also don't know what's out there.

The seventh axehead is getting a full 104-key Qwerty keyboard to run on low power, either like regenerative braking or through ultra low electrical signals.

The eighth axe head is integrating a low power radio or cable that can connect/adapt to Ethernet.

The ninth axehead is developing removeable storage that uses 10-100x less power than microSD cards (Non volatile memory by Weebit for example at 22nm in sizes larger than 32KB-yes that is kind of small).

The 10th axehead is having the entire laptop repairable with user replaceable parts and multiple aftermarket vendors designing each part that can be upgraded without needing to replace the entire chassis. This includes the screen, keyboard, motherboard-it's intentionally a motherboard and not one irregular proprietary blob that doesn't fit other laptops by the same standard platform that accepts multiple generations, like ATX, which has had the same dimensions since 1995!

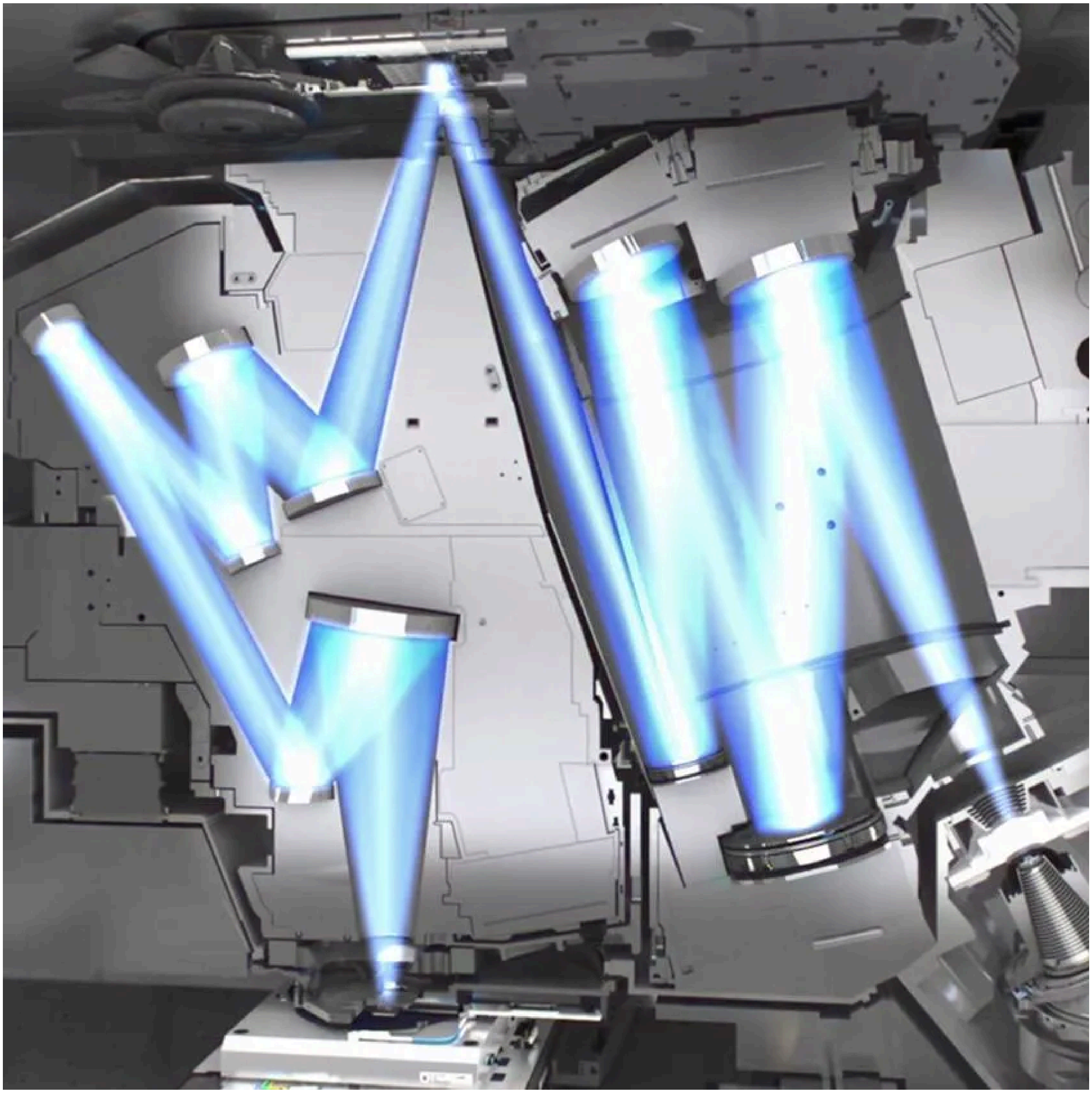
The 11th axehead is that it has a ton of documentation that makes it user friendly to build like LEGOS, and so that people who no longer want to use it can allow others to disassemble and reuse parts instead of them stacking up in a dumpster like out-of warranty/support Chromebooks. In one of Steve Job's biographies, his foster dad took him to a junkyard to search for parts. Steve had an interest in the junkyard, but when he got home, he had no interest in seeing his dad fix the car.

The 12th axehead is that Odysseus is a charismatic people person with a reality distortion field.

So if that person is you, inquire within.

6/18/2024 Edit:

At the heart of the foundry’s chipmaking process is a well-known technique, that, for the past 10 years or so, relies on what is called extreme ultraviolet lithography. The Machine is developed by ASML, but a lens by Zeiss is used to amplify a laser beam into plasma:



The Zeiss mirrors and Trumpf laser amplifier

So while it could be said that high-tech uses an extremely narrow margin of error, and within a second:

TRUMPF EUV lithography – This all happens in one second

The end-product only sees this etching embedded in a small microchip in the final product. If one analogized the arrow to a photon(s), then one can see that the laptop itself becomes the 12 axeheads, because the photons of light travel through the entire circuit- the solar panel, to the charge controller, to the capacitor, then the processor, then to the display controller, and lastly to flip the pixels on the screen and the bits on storage devices.

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