TWO FREE LUNCHES

There is no such thing as a free lunch. I have collected two anyway. Both times the trick was the same: somebody told me a thing was empty, and they were wrong about the word *empty*.

LUNCH ONE: THE MEMORY YOU DIDN'T BUY

The machine swears it has far more memory than it physically owns. It feels a vastness that isn't there, the way an amputee still feels the hand. Lift the floorboards and the secret is a cheap disk (a couple hundred dollars of it) doing an impression of the expensive stuff that costs twenty times as much.

Everyone *knows* a disk is too slow to be memory. Everyone is confusing two different complaints. A disk is slow to *answer*: ask it for one specific thing and it dawdles for microseconds. But a disk is fast to *pour*: once it's pouring, gigabytes a second. Those are not the same number, and you can beat the bad one with the good one.

The move is to exploit how predictable the work is. The machine thinks in layers, strictly in order: layer one, then two, then three, no surprises. So while it chews on layer one (call it twenty milliseconds) you quietly start pouring layer two off the disk. The pour takes sixty milliseconds, so you stay a few layers ahead, and every layer finishes arriving before the machine thinks to ask for it. The machine never waits. It never learns its memory was a disk wearing a coat.

The result that made me laugh out loud: the disk did not get one bit faster. The *waiting* simply vanished. A million little stalls (a million moments where the machine froze mid-thought and begged the disk for a page it needed *right now*) went to zero. Throughput went up twenty-seven fold. Same disk. I just stopped letting it be surprised.

> *"Empty" almost always means nobody bothered to write the protocol for what's already there.*

LUNCH TWO: THE LIGHT IN THE EMPTY BOX

That first lunch is a parlor trick. This one is the real meal.

Take a box with nothing in it. *Real* nothing: pump out the air, pump out the light, chill it toward absolute zero. There is still something in the box. And if you move one of its walls, that something comes out as light. Real photons. Out of the vacuum. For free.

The reason is that empty space is the most crowded address there is. It churns constantly. Slide two walls close together and you change which of those churnings are allowed to fit between them; the leftover pressure presses the walls toward each other, harder the closer

they get, with a strength you can write down to the digit. That is the *still* version, and it has been known for most of a century. The *live* version is better: yank a wall, and the sudden change in what-fits has to go somewhere, so it leaves the box as light. The wall does work against the empty box and *slows down*, dragged by a friction against nothing whatsoever.

I built the box out of numbers to watch it happen. The hard part is the bookkeeping. The empty box's energy is infinite if you're sloppy, so you have to subtract the nothing from the nothing, exactly, at every single step, to be left with the real and finite something. And the shape of the box decides how it rings: a box with hard walls rings once and dies, while a box bent into a ring lets the light circle all the way around and come back, so the wall *remembers* what it did a moment ago. Count the photons honestly and the empty box hands you a real, conserved, slowing-down answer, but only after five separate sanity checks pass, because I refuse to believe in a single free photon until the arithmetic has earned it.

IT'S THE SAME LUNCH TWICE

Both lunches are one lunch. Somebody measured a thing as zero (empty disk, empty box) because they only added up the obvious column. The whole capacity was sitting in the column nobody totaled: the disk's pouring speed, the vacuum's churn. "Empty" is not a fact about the world. "Empty" is a confession about your ledger.

Read the fine print of the substrate. The lunch is in there. It always was.