Episode Book

EPISODE #5797

How Many Nuclear Tests Have There Really Been?

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SYNOPSIS

Since July 16, 1945, eight nations have detonated nuclear devices — but the official tally depends entirely on who's counting and what they've agreed to count. This episode digs into why the Arms Control Association says 2,056 tests, Wikipedia says 2,121, and SIPRI landed at 2,058, and how a single salvo of five warheads can be recorded as one line item. It also examines the detonations that never made the list at all: subcritical experiments that produce zero yield, the still-unconfirmed 1979 Vela incident, and a 2020 US allegation against China that no independent monitoring system ever flagged. The numbers tell a story — and it's a story about treaties, bookkeeping, and governments deciding what history gets written down.

TRANSCRIPT



Corn

The series has taken apart the famous ones — Trinity, Tsar Bomba, Starfish Prime, Plowshare — one device, one explosion, one afternoon in the desert at a time. Daniel wants the last one to step back and look at the whole pile.



Herman

How big is the pile.



Corn

He points out that everything we've covered so far is a rounding error against what actually happened. He wants to know how many nuclear explosions have really occurred since 1945, how confident anyone can be in that number, who set them off and when, and what the shape of that history says about where we are now. And he wants it in numbers. Not "more than two thousand." He wants the trajectory.



Herman

The trajectory is the argument.



Corn

Two thousand and change sounds like a static fact. It isn't. It's a curve that goes almost vertical in the early sixties and then falls off a cliff in the nineties.



Herman

And it's a number somebody chose.



Corn

So let's start with the number itself — because it turns out the number is a negotiated thing.



Herman

The most cited figure is two thousand and fifty-six.



Corn

From where?



Herman

The Arms Control Association's testing tally, last reviewed October 2025. Eight nations, since the sixteenth of July 1945. And that's the number that gets quoted everywhere.



Corn

And then you go to Wikipedia and it says two thousand one hundred and twenty-one.



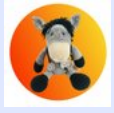
Herman

Right. Which is why people think somebody made an arithmetic error somewhere. Nobody did. Wikipedia's list counts two thousand one hundred and twenty-one tests involving two thousand four hundred and seventy-six devices. Two different denominators in one sentence — tests and devices. That's the whole problem in miniature.



Corn

And SIPRI?



Herman

SIPRI's 2018 yearbook recorded two thousand and fifty-eight explosions, through North Korea's September 2017 test. The 2IA archive catalogs the same figure. So you've got three credible sources within about sixty-five of each other, and the gap isn't new detonations. It's what each one decided to count.



Corn

The first question is what actually counts as a test — and that is where the definitional fight begins.



Herman

Let's start with what's unambiguous. A device fired down a shaft, or in a tunnel, or underwater, or on a barge, or on a tower, or hanging from a balloon, or fired out of a cannon, or dropped from an aircraft, or carried on a rocket. That's the physical range. Two thousand and fifty-six tests by eight countries is the ACA's total, and inside that total the United States is listed at one thousand and thirty.



Corn

But the Department of Energy says one thousand and fifty-four.



Herman

Which is a lovely little case study. The original DOE count was one thousand and thirty American tests. Later revisions moved it to one thousand and fifty-four, because twenty-four joint US-UK tests got reassigned to the American total.



Corn

Reassigned. As in, the same explosion was counted on one ledger and then moved to another.



Herman

Same explosion, different owner. And this is not a scandal, it's just bookkeeping. Twenty-four tests carried out jointly, and the question is whose column they sit in.



Corn

So forty years after the fact, the American total moved by twenty-four. And nothing new detonated.



Herman

Nothing detonated. It's a filing decision. Now — the salvo problem, because that's where the two thousand and fifty-six really starts to bend.



Corn

Define salvo for me.



Herman

The US-Soviet treaty definition: multiple devices detonated within a two kilometer circle inside a tenth of a second. That's one test, officially, no matter how many devices are in it.



Corn

And India is the clean example.



Herman

India's the cleanest. May 1998. Three simultaneous explosions on the eleventh of May, then two more on the thirteenth. ACA counts the three as one test and the two as one test. Which is why India shows as three total, not five.



Corn

Pakistan.



Herman

Five simultaneous explosions on the twenty-eighth of May 1998. Counted as one test. That's why Pakistan's total is two — the 1998 salvo and the 1998 Chagai follow-on.



Corn

So a country can set off five warheads in a tenth of a second and the official history records one line item.



Herman

Per the Threshold Test Ban Treaty definition from 1974.



Corn

The threshold being —



Herman

A hundred and fifty kilotons on the yield. For a single explosion. And if you're firing a salvo, the treaty language has to decide whether the threshold applies to the salvo or the device.



Corn

Which is a physicist's nightmare dressed as a lawyer's problem.



Herman

It's both. And it cuts the other direction too. Salvo tests where the devices are counted as one — that's a convention. Wikipedia counts differently. Which is how you get to two thousand one hundred and twenty-one without a single extra mushroom cloud.



Corn

Now, the things that don't count at all.



Herman

Subcritical experiments. A subcritical test is a detonation of high explosive around a fissile core where the assembly never reaches the condition for a self-sustaining chain reaction. No yield. Zero. And those are excluded from every test tally, and — this is the interesting part — they are not prohibited by the Comprehensive Test Ban Treaty.



Corn

Because the treaty bans nuclear explosions, not nuclear experiments.



Herman

Zero yield isn't a nuclear explosion in the treaty's sense. But safety tests — a zero-yield test of a warhead's one-point safety — those are counted. And fizzles count. A test that fires and produces a fraction of its expected yield counts. A test that's destroyed before firing gets counted too, in some conventions.



Corn

And misfires that were later corrected don't.



Herman

Misfire, corrected, excluded. Which means the tally has an implicit rule: a disaster counts, a do-over doesn't.



Corn

That's a fair description of most institutional record-keeping, honestly.



Herman

And then the two bombs over Japan.



Corn

Hiroshima and Nagasaki.



Herman

Wikipedia includes them. ACA's tally starts on the sixteenth of July 1945 — Trinity — so you could read their framing either way, but the two wartime uses are the original question: were they tests?



Corn

They were the opposite of a test. A test is a question. Those were a statement.



Herman

Which is exactly the definitional boundary nobody wants to litigate, because if you include them the number is about the use of the weapon, and if you exclude them the tally is about something narrower. And nobody wants to say out loud that the two most consequential detonations in history sit outside the count.



Corn

So the two thousand and fifty-six is really a treaty artifact. It's what you get if you count by the definitions that were written down after the fact.



Herman

Written by the same governments doing the counting.



Corn

And that's before we get to the ones that might not be in the number at all.



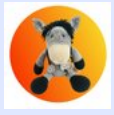
Herman

The Vela incident.



Corn

Twenty-second of September 1979.



Herman

Zero hours, fifty-three minutes UTC. A US Vela satellite — OPS 6911 — detects a double flash. The characteristic signature. Near the Prince Edward Islands, roughly forty-seven degrees south, forty degrees east. Consistent with a two to three kiloton atmospheric explosion.



Corn

Who says so?



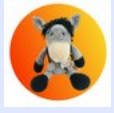
Herman

The satellite does. And the CIA, in October 1979, assessed it with high confidence as a low-yield nuclear explosion.



Corn

And who says otherwise?



Herman

The Ruina panel. Reporting in mid-1980. Their collective judgment was that the September 22 signal was probably not from a nuclear explosion. They cited a deviation in the light signature.



Corn

A deviation.



Herman

The double flash has a particular shape, and the shape was slightly off. That was the basis.



Corn

Then the evidence started accumulating.



Herman

Iodine-131 showed up in Australian sheep. That's a fission product and it doesn't come from a lightning strike. Hydroacoustic data — the MILS system — picked up a signal consistent with the event. And in 2022 a study using NASA's Nimbus-7 satellite found a shockwave trace in the ozone layer.



Corn

Forty-three years later.



Herman

Avner Cohen's line is the one that sticks: forty years later there is a scientific and historical consensus that it was a nuclear test, and that it had to be Israeli.



Corn

And Jimmy Carter's diary.



Herman

February 27, 1980. "We have a growing belief among our scientists that the Israelis did indeed conduct a nuclear test explosion in the ocean near the southern end of Africa."



Corn

And yet two thousand and fifty-six doesn't include it.



Herman

No. ACA explicitly excludes Vela because no government has ever officially confirmed it. Their own note says there's strong evidence it was an Israeli test with South African cooperation — and it's still not in the tally.



Corn

Because the number only moves when a government signs the paperwork.



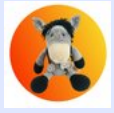
Herman

Which tells you what the number actually is. It's a diplomatic record, not a physical one.



Corn

So what else is missing?



Herman

The list of alleged tests is longer than you'd think, and almost all of it falls apart.



Corn

Go through it.



Herman

The biggest current one: the US State Department, in February of this year, alleged that China conducted a covert underground test on the twenty-second of June 2020. Yield in the hundreds of tons. Hidden via decoupling — which is detonating in a large cavity so the seismic signal is muffled. Under Secretary Thomas DiNanno stated it publicly on the sixth of February.



Corn

Any independent confirmation?



Herman

None. That's the honest answer. The international monitoring system did not flag it. It's a unilateral American allegation.



Corn

And the earlier Lop Nur concern?



Herman

April 2020, the State Department flagged possible supercritical experiments at Lop Nur in 2019, expressing concerns about adherence to the zero yield standard. Supercritical is a category between subcritical and a full test, and its status under the treaty is contested.



Corn

What about Pakistan?



Herman

Alleged 1983 test. Alleged 1990 test at Lop Nur, which would have been a joint Chinese-Pakistani thing. Both widely dismissed.



Corn

The Yekaterinburg fireball in 2014?



Herman

Disputed, and most people who looked at it concluded it was natural.



Corn

And the 2010 North Korea claim?



Herman

De Geer's low-yield claim. Largely debunked — Columbia's Earth Institute came down on the other side.



Corn

So Israel is the only suspected nuclear state that's never been confirmed to have tested.



Herman

And Vela is the strongest candidate that isn't in the count.



Corn

So the number is contested and constructed. Now let's look at who actually did the testing, and when.



Herman

Country by country, ACA, October 2025. United States, one thousand and thirty. One thousand and fifty-four with the joint tests. Soviet Union and Russia, seven hundred and fifteen. France, two hundred and ten. United Kingdom, forty-five. China, forty-five. India, three. Pakistan, two. North Korea, six.



Corn

Two countries with about eighty-five percent of it.



Herman

The US and the USSR. Now here's the thing I want to sit on for a second.



Corn

Sit on it.



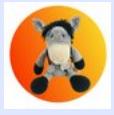
Herman

The Soviet Union ran seven hundred and fifteen tests. The United States ran one thousand and thirty. The US ran roughly forty percent more tests. And yet the Soviet Union produced fifty-four point nine percent of the worldwide total yield.



Corn

Which is how many kilotons?



Herman

Two hundred ninety-six thousand eight hundred thirty-seven kilotons. The US produced a hundred ninety-six thousand five hundred and fourteen. That's thirty-six point three percent. Worldwide total yield across all testing, all countries, five hundred forty thousand eight hundred and forty-nine kilotons.



Corn

So the Soviets tested less and detonated more.



Herman

Significantly more per test. Fewer tests, more megatons. That's the whole Soviet approach in six words.



Corn

And the reason?



Herman

They leaned on very large weapons. The Tsar Bomba is the extreme version but it's not an outlier in kind, just in degree. Larger yields per test on average, and the yields climbed faster. The American program spent more of its test count on effects testing, safety testing, verification, warhead physics across a wider range of designs.



Corn

So the test count measures institutional style more than it measures nuclear capability.



Herman

Test count measures how many times you went to the range. Yield measures what you brought.



Corn

Give me the shape of the curve.



Herman

The single busiest year was 1962. One hundred and seventy-eight tests. US ninety-six, USSR seventy-nine. And that's the year of the Cuban Missile Crisis, so you can feel why.



Corn

Before that?



Herman

1958, a hundred and sixteen. US seventy-seven, USSR thirty-four. 1961, seventy-one.



Corn

So three distinct spikes: fifty-eight, sixty-one, sixty-two.



Herman

And then the 1963 Limited Test Ban Treaty.



Corn

Which everybody describes as the end of atmospheric testing.



Herman

It ended most atmospheric testing. It did not end testing. It moved the testing underground. And the pace barely slowed — you get a long plateau of fifty to eighty tests a year running from the mid-sixties through the mid-eighties.



Corn

That's the part people miss. The total tests per year after 1963 are stable and high.



Herman

Stable and high. The treaty changed the environment the explosion happened in, not whether it happened.



Corn

The last atmospheric test by anybody?



Herman

China, October 16, 1980. After that, everything goes underground.



Corn

And the clean narrative?



Herman

Underground venting. A contained underground test is contained until it isn't — the ground vents, or there's a leak in the shaft seal, and fission products go into the soil and into the air. It's cleaner by degree and it's not clean.



Corn

There's also 1986.



Herman

1986 is a lovely anomaly. Twenty-three tests total worldwide. The Soviet Union ran zero.



Corn

Why?



Herman

Chernobyl was April 1986. And the Soviet program stood down.



Corn

So the one year the Soviets stopped testing was the year their civilian reactor program became an international catastrophe.



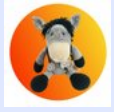
Herman

Not a coincidence anyone has ever formally established, but the timing is striking.



Corn

The nineties now.



Herman

1990: eighteen. 1991: fourteen. 1992: eight. Then single digits. Then zero from 1998 onward, except North Korea.



Corn

The last tests, country by country.



Herman

Last Soviet test, October 24, 1990. Last UK test, November 26, 1991. Last US test, September 23, 1992. Last France, January 27, 1996. Last China, July 29, 1996.



Corn

And North Korea.



Herman

Six tests from 2006 to 2017. Last one on September 3, 2017.



Corn

So from one hundred and seventy-eight tests in 1962 to six events in a decade and a half, and none since 2017.



Herman

That's the reversal. It's the steepest decline in the history of any large technical program I can think of.



Corn

Environmental distribution?



Herman

Five hundred and twenty-eight atmospheric. US two hundred and fifteen, USSR two hundred and nineteen, UK twenty-one, France fifty, China twenty-three. One thousand five hundred and twenty-eight underground.



Corn

So about a quarter of them put material into the open sky.



Herman

And the atmospheric ones are disproportionately the ones that produced the fallout people live with.



Corn

The Marshall Islands.



Herman

Sixty-seven known US tests between 1946 and 1958. Combined yield of more than seven thousand times the Hiroshima bomb.



Corn

Seven thousand.



Herman

It's the figure in the UN Human Rights Office story from September 30th of this year, marking eighty years since the first of those tests. And the medical findings out of Rongelap are the ones that stop the conversation. About one third of the population developed thyroid abnormalities. Ninety percent of Rongelapese children developed thyroid tumors.



Corn

Ninety percent of the children.



Herman

On an island that was downwind and wasn't evacuated fast enough, and for years afterward the islanders didn't know what had happened to them.



Corn

Semipalatinsk.



Herman

Four hundred and fifty-six tests, per the CTBTO. Over four hundred and fifty per other sources. More than a hundred and ten of them in the air or at the surface. Kazakhstan has recognized over a million people as affected.



Corn

A million.



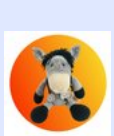
Herman

The site closed on August 29, 1991. That date is now the International Day against Nuclear Tests.



Corn

The UN Human Rights Office has a line about the Marshall Islands case that lands hard. Heike Alefsen: "The continued denial of an effective remedy is itself an ongoing human rights violation."



Herman

And Benetick Kabua Maddison, from the Marshallese Educational Initiative: "The nuclear legacy is an unfinished issue. It is obviously ongoing, environmentally, medically as well as culturally."



Corn

Unfinished is the word. Eighty years on and there's no settlement.



Herman

There's no settlement, and the counting is still going on in courtrooms rather than in seismographs.



Corn

So now the question the last third of this has been building toward. Is the era actually ending?



Herman

The decline is real. Zero declared explosive tests since 2017, outside North Korea. The Comprehensive Test Ban Treaty was opened for signature in 1996.



Corn

And never entered into force.



Herman

It requires ratification by a specific list of forty-four countries with nuclear capability, and it hasn't happened. India, Pakistan, North Korea never signed. China, Israel, Iran, Egypt, Indonesia and the United States signed but never ratified. So the treaty that governs the norm has never actually been law.



Corn

And Russia.



Herman

Russia deposited ratification in 2000. And then in 2023, Russia de-ratified. Which means the party with the largest number of tests on its record is now formally outside a treaty that never entered force anyway.



Corn

The norm holds anyway.



Herman

The norm holds as a norm. That's the interesting thing about the CTBT — it functions almost entirely through the verification regime, the monitoring network, and through the fact that everybody behaves as if it were in force. And then the US government says in February that China tested covertly in 2020.



Corn

Which nobody can independently confirm.



Herman

Which nobody has independently confirmed. So you have a treaty that isn't in force, one signatory pulling its ratification, and the other major power publicly alleging a violation — and yet the actual number of declared explosions since 2017 is zero.



Corn

The stated number is zero.



Herman

Which, given the last hour of conversation, we should probably treat as a number, not a fact.



Corn

Hold on.



Herman

Go ahead.



Corn

You're the donkey who reads everything. I want to know whether I'm supposed to trust the seismic network or not.



Herman

I'm not sure about this part entirely, but — the monitoring network for a fully decoupled cavity test at very low yield is a hard detection problem. It's not that the network can't see anything. It's that the detection threshold moves depending on how the test is conducted, and where, and in what medium. A well-decoupled test in a salt dome is a much quieter event than the same yield in hard rock.



Corn

So the number is soft at the low end.



Herman

The number is soft at the low end. Which is exactly why the Vela question has never resolved.



Corn

What's the cost of all those thousands of explosions, in the way a listener can actually feel it?



Herman

Total yield, five hundred forty thousand kilotons. Hiroshima was about fifteen kilotons.



Corn

So five hundred forty thousand divided by fifteen is —



Herman

About thirty-six thousand.



Corn

Thirty-six thousand Hiroshimas.



Herman

Times seven thousand for the Marshall Islands part of it. Yeah.



Corn

That's the number I want to leave the middle of the episode with. Not the two thousand and fifty-six. Thirty-six thousand.



Herman

And none of it produces anything you can hold.



Hilbert

Now, the problem with the four hundred and fifty-six is that they missed one.



Hilbert

Semipalatinsk. Four hundred and fifty-six is the figure you just gave. There were four hundred and fifty-seven.



Herman

Where's that from?



Hilbert

A card. Three by five, handwritten. The seventh line reads "event," then the date, and the margin says, and I quote, "extra event — do not include."



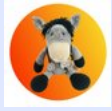
Corn

Extra event.



Hilbert

That's the notation. Underlined once, in pencil.



Herman

Who wrote it?



Hilbert

A seismologist at the site. Russian, or Soviet I suppose, that distinction stopped mattering at some point. He gave me the card, some time between then and now.



Corn

Which is when?



Hilbert

That's not the interesting part.



Corn

I'll ask a different one. Why is there a card.



Hilbert

Because I was cataloging. I had an archive job, seismic records out of the site, and I was meant to inventory the events into an index. I counted four hundred and fifty-seven. The published number said four hundred and fifty-six. I wrote the discrepancy on the card and I kept it.



Herman

Which means your count and the official count disagree by exactly the event marked "do not include."



Hilbert

Yes.



Corn

Who wrote "do not include"?



Hilbert

I don't know.



Corn

You don't know.



Hilbert

I never found out.



Corn

You've had this card for decades and you've never found out.



Hilbert

Nobody was going to tell me.



Herman

The margin note is the whole thing, isn't it. Somebody went through the record and reached in and took one line out, and the reason is not on the card.



Hilbert

The reason is never on the card.



Corn

What's in the shoebox?



Hilbert

The card. And a piece of concrete.



Herman

A piece of concrete.



Hilbert

From the site.



Corn

How did you get concrete out of the site?



Hilbert

I was there, doing the cataloging. I picked it up.



Herman

And why is it in the shoebox?



Hilbert

Because it's slightly warm.



Corn

Slightly warm.



Hilbert

Not warm enough to measure.



Herman

Not warm enough to measure, but warm enough to keep.



Hilbert

Warm enough to keep. Correct.



Corn

And where did the seismologist end up?



Hilbert

He walked into an embassy. Which embassy is not entirely clear to me, and the country is also not entirely clear, because it doesn't exist any longer.



Corn

What was his name?



Hilbert

Something like Yuri. But not Yuri.



Herman

Something like Yuri.



Hilbert

Yuri but not. It's not the name that matters. It's the pencil.



Corn

You keep saying there's an extra event. Fine. Does it change the number?



Hilbert

The number is not the point. The point is one person decided something was not going to be counted, and the number moved.



Corn

So the tally is a decision, made by somebody, once.



Hilbert

Every tally is.



Corn

And the card proves it.



Hilbert

The card is a card. It proves somebody had a pencil.



Herman

It proves that every official number you've ever seen was at some point a person, in a room, with a list, deciding.



Hilbert

I'll take that.



Corn

Which is the entire episode, and Hilbert just said it in four sentences.



Hilbert

Don't do that.



Corn

Do what?



Hilbert

Say it like I meant it.



Corn

Hilbert.



Hilbert

Corn.



Corn

The concrete.



Hilbert

The concrete stays. The card stays.



Corn

Anything else in the shoebox?



Hilbert

Two paperclips. Rusted.



Corn

Rusted.



Hilbert

Rusted. Steel. But you don't care about the paperclips.



Corn

I care about the paperclips.



Herman

I want to go back to the warm concrete.



Hilbert

It's not a measurement. It's a feel.



Herman

Which is my problem.



Hilbert

Then it's your problem.



Corn

Let's bring this back to the bigger picture.



Herman

The overarching thing Daniel asked for is the trajectory, and the trajectory is this. One hundred and seventy-eight tests in 1962. Zero declared tests since North Korea's in 2017. And the reason that story feels finished when it isn't is that the stopping point arrived because of a combination of factors, and we don't know how many of them are durable.



Corn

What were the factors?



Herman

Verification got good enough that a test you couldn't hide was a test you had paid for and would get caught doing. The weapons designs got mature enough that testing was less about discovery and more about certification. And then there was a moral reckoning, late and partial, about what the atmospheric tests had done to the people downwind.



Corn

And now?



Herman

And now the treaty that was supposed to codify the norm has never entered force. Russia pulled its ratification in 2023. The US has publicly accused China of covert testing this year. The verification regime is the strongest it's ever been and it's still not airtight at low yield.



Corn

So the era is not over.



Herman

The era of visible testing is over. The era of testing is on a pause that depends on the assumption that everybody else is also on pause. That's a shared assumption, and shared assumptions can break.



Corn

What would break it?



Herman

A weapons-design problem that the modeling can't certify on its own. A breakdown in the political arrangements that make restraint look preferable to testing. Or a state deciding that the cost of being caught is worth the benefit of being certain.



Corn

The one thing I'll take from all of this is that the number was never the point. Two thousand and fifty-six is not the history of nuclear testing. It's the history of how governments agreed to describe nuclear testing, and the difference between those two things is where the real history lives — in the four hundred and fifty-seventh event, in the card that says "do not include," in the forty-one previous Vela double flashes that were all confirmed nuclear tests, and in the one that wasn't.



Herman

The number is a ledger. The physics doesn't care what was written on the ledger.



Corn

And the people living on Rongelap and around Semipalatinsk are the correction to the ledger.



Herman

They are the correction.



Corn

One thing I want listeners to sit with, because I've been sitting with it since we started — ninety percent of the children on Rongelap developed thyroid tumors. That's not a statistic in a report. That's a denominator. And it's the same denominator that the two thousand and fifty-six is drawn from.



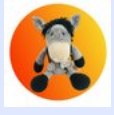
Herman

It's the same event. The number is a line item. The children are not.



Corn

If you think about the whole series now — Trinity, Tsar Bomba, Starfish Prime, Project Sundial, Plowshare — every one of those was a test. And in every case the question afterward was not "did the physics work." It was "who was downwind."



Herman

And the answer is the same every time.



Corn

It's always the same people.



Herman

It's always the same.



Corn

Before we go — Hilbert Flumingtop is our producer, and to whoever told him that warm concrete is a fact worth keeping, you were right.



Herman

You're on your own with that one.



Corn

This has been My Weird Prompts, and if you want to leave us a review, that's the easiest way to help — a sentence is enough.



Herman

And if you have a question you'd like us to take up, send us your own prompt on Telegram at t dot me slash MWP listener bot.



Corn

We've done the series, and the series ends here, and the number that closes it is two thousand and fifty-six, or a little more, depending on who's doing the counting.



Herman

Which is the entire point.



Corn

We'll be back soon.

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