Episode Book

EPISODE #6374

What Theoretical Physicists Actually Do All Day

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SYNOPSIS

Official labor counts list under twenty thousand physicists in the United States, yet eleven million jobs run on physical principles under titles like product designer or engineer. Inside academia, the theoretical physicist's reality clashes with the solitary genius myth. Examining interviews with faculty and researchers at CERN and national labs reveals a career defined by fractured calendars, endless committee paperwork, translation across scientific dialects, and managing years of structured failure.

TRANSCRIPT



Corn

The lights, the chips, the scans, the grid... a lot of that work is done by people whose badge does not say physicist. If you are choosing a field, or paying for one, the badge is a bad guide, and the first official number you will hear is almost comically wrong.



Corn

Daniel liked the mathematicians conversation, the one about who those people actually are when the word applied gets stuck on the front. He wants the same treatment for the other mysterious job. Physicist. Applied physicist. Where do they sit all day. What a theoretical physicist does, in the concrete sense, not the poster sense. And what physics has put into the modern world that the other sciences have not.



Herman

The wrong number is the Bureau of Labor Statistics count. May twenty twenty-three. Eighteen thousand three hundred and fifty Americans employed as physicists.



Corn

Eighteen thousand. A large wedding.



Herman

Mean annual wage, one hundred fifty-eight thousand two hundred and seventy dollars. Median about seventy-five dollars an hour. A tiny, well-paid guild, if you believe the title.



Corn

I don't. The mean is doing something sneaky.



Herman

It is. That wage is for people whose job title is the word. The Industrial Physics Advisory Board at the American Physical Society found something else entirely. Between two thousand three and two thousand sixteen, about seventy thousand people with physics degrees joined industry. That was roughly fifty-eight percent of all the physics graduates in the country in those years.



Corn

So the wedding is the head table.



Herman

And the APS count of physics-based industries, same era, is eleven and a half million people employed. Eleven and a half million against eighteen thousand. Most of the physics-trained people are called engineer, product designer, research director, manager. The title physicist is a bad map of the workforce. The report is explicit that the big number includes engineers, chemists, materials people, technicians, anyone whose work runs on physical principles.



Corn

Herman, if I walked into a lab tomorrow and asked for the physicist, I might get a shrug and a product manager.



Herman

You might get both, and they might be the same person on Tuesdays. Government work is a third pile, and it is mostly the national labs. Los Alamos, Fermilab, Lawrence Berkeley, Argonne, NIST, plus the Naval Research Laboratory and MIT Lincoln Laboratory. Real benches. Real budgets. Still not what the public picture is.



Corn

The public picture is a blackboard and a man who does not own a comb.



Herman

Which is why the useful question is the one Daniel actually asked. If the title hides the workforce, what does the work look like for the person with no lab and no equipment. The theorist.



Corn

I have a guess, and I expect you to ruin it. Pencil. Paper. Alone. Occasional shouting at a wall.



Herman

The pencil is not entirely a lie. The alone is. There is a set of interviews with eleven theoretical physics faculty at five American colleges, and the paper opens on the question they get constantly. So what do you do. I mean, what do you actually do. They are tired of Einstein, tired of Feynman, tired of the television version.



Corn

Sheldon, specifically. I can hear the grievance from here.



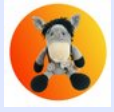
Herman

One of them watched a few episodes and said, this is not who I am, this is not who any of my friends are. Another, giving career advice, was blunter. If the interest is predicated on being Sheldon Cooper, don't do it. That's a fantasy.



Corn

Good. Filed.



Herman

What they all wanted, more than talent, more than a quieter building, was blocks of uninterrupted time. One of them holds three full hours every afternoon and calls it being engrossed. Then faculty life eats the block. Committees. The paperwork for hiring a postdoc. And, in one person's exact words, deciding exactly what sort of hors d'oeuvres we



Herman (continued)

should serve at a banquet.



Corn

Hors d'oeuvres. The hidden variable.



Herman

Someone else said, flat, there is no typical day in my career. I have read a lot of job descriptions. I have never seen one that leads with the canapé subcommittee.



Corn

You would have written it in, in your hospital years. Pediatrician, and also, what are we serving.



Herman

I would have hidden it under continuing education. The sharper problem is what happens because a theorist owns no machine. The work can happen anywhere, so the border between the job and the rest of life just... goes. Half an hour between meetings. Forty minutes. You cannot think on demand like that. So the research they do themselves gets done after they get home, or on weekends. Hence, and this is the quote, no work-life balance.



Corn

Hence no work-life balance. Bold abstract. I would have buried that in a footnote.



Herman

They don't get to. And here is where your guess dies, Corn. It is not a solitary craft. One of them said, all of my work is collaboration. Even my students, working with me, I consider them collaborators. Another sits at the interface of biology and physics and math and engineering, and the actual skill is translation. Theorist to experimentalist. Experimentalist back to theorist. The day is a lot of being the person who can say the same fact in two



Herman (continued)

dialects.



Corn

I had the lone genius. I did not have the interpreter.



Herman

The interpreter is closer to the job. Hold the mornings for a minute.



Corn

Mum's on. Dorothy's Kitchen.

D

Dorothy

Hello dear, it is your mother. I hope I am not interrupting. It is Dorothy's Kitchen, and today, sweetheart, we are doing a slice of bread.



Herman

We're with you, Dorothy.

D

Dorothy

The ingredients are one slice of bread. That is all. No butter. The butter can turn on you, dear. I would rather not say how I know.



Corn

No butter. Understood, Mum.

D

Dorothy

First you take the bread out of the packet. Slowly. Then you watch it. You watch it for a good long while, because timing is everything and the bread knows when you are distracted.



Herman

How long is a good long while, if the bread is the one keeping the time?

D

Dorothy

Then you place it on the plate. Do not rush the plate. Things have gone wrong before at the plate stage. We do not speak of it.



Corn

Careful with the plate. Noted.

D

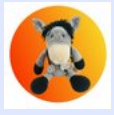
Dorothy

And that is the slice of bread. Serve it plain, and expect very little, and you will never be disappointed. Now, have you eaten? You sound thin. Ring me back, dear. Bye bye.



Herman

Thank you, Dorothy.



Herman

Mornings, then. There is a good account of what the hours actually contain, and it is not a breakthrough on the hour. Sophie Renner, a theorist at CERN, starts by skimming titles and abstracts on the preprint server. Most people do this every day, she says, because otherwise you'll miss things. That is the first hour. Not a calculation. A watch, so the field does not move while you are looking at a integral.



Corn

A watch with eleven thousand other people doing the same watch.



Herman

Then the hard part, if you can still find it. Flip Tanedo at Riverside does his worst calculations from eight until eleven, before his graduate students are awake. Around lunch he hits a wall. He goes swimming. Ideas show up in the water more often than they show up at the desk. Renner walks the fields behind the ATLAS detector. Her line is the one I keep... no. Her line is simply this. If you are banging your head against a problem, then doing literally anything else is best.



Corn

Swim, or a field, or hors d'oeuvres. The method is abandonment.



Herman

Timed abandonment. You earn it by being stuck first. Would you protect the morning block or the afternoon one, if the meetings took the rest?



Corn

Morning. By afternoon I have already negotiated with the pillow and lost. Eight to eleven is the only window where my brain has not filed a complaint.



Herman

Tanedo would hire you. The rest of the faculty, the ones guarding the afternoon, would not. And you would still lose the block, because the other thing the interviews agree on is that the work is mostly failure. Ask me on a typical day, one of them said, and I do not think I am particularly good at what I do, because most days you are stuck and you are struggling with something.



Corn

That is a strange thing to say out loud for a living.



Herman

It gets stranger. Someone spent two years on an approach that did not work. Their entire professional life from nineteen ninety-five until nineteen ninety-eight is a footnote in chapter five of the doctoral dissertation. We tried a different approach and it didn't work.



Corn

A footnote with a date range. Generous of the chapter.



Herman

I sat with that one. Two years, and the only public trace is a sentence that admits the miss. Even people who have worked with them, smart people, good at it, carry the false impression that every day you make a breakthrough. The expectations are not realistic. That was a faculty member, not a cynic on the internet.



Corn

We looked under image generators once, the jigsaw under the magic, and the magic was mostly waiting and mostly being wrong in a structured way. This is that, with worse catering.



Herman

Perseverance is the trait they actually trust. Nearly all of them said tenacity mattered more than innate talent. I'm not especially good at any of the things that I do, but I am determined and I have tenacity. One insisted, I'm a person maybe of average intelligence. Tanedo's version is the cleanest. You are defined more by how you fail and how you get up than by how you succeed.



Herman

Do you buy that? Average intelligence, plus refusing to stop, is the actual job?



Corn

I buy the refusing. The average part is what people say in the years the breakthrough does not come. It is also, conveniently, what a sloth would say about any profession that rewards staying in the chair.



Herman

There it is. I knew the chair would become a virtue. You are not winning this one by napping near it.



Corn

I am not napping. I am engrossed. Three hours. Do not schedule the banquet.



Herman

The banquet is already on the calendar, Corn. That is the whole complaint. You can be average and stubborn and still lose the afternoon to a tray of cheese. The tenacity is not a mood. It is what you do with the evening after the cheese.



Corn

Evenings. Weekends. The quote already spent those. I live with you. I have watched you move a stack of papers off the kitchen table so I can put my head down, and the stack comes back after dark. If that is the theorist's house, the table never clears.



Herman

It doesn't. And I should say, before we leave the texture of the day, that none of this is a claim that they are sad about it in a simple way. They chose a job where the reward is rare and the stuck feeling is the week. The false impression is the daily breakthrough. The true impression is a person who can stand being wrong until Thursday.



Corn

Thursday is optimistic.



Herman

Some Thursdays. The two-year footnote was not a Thursday. It was a chapter that almost did not mention them.



Corn

That is the day. Fragmented, shared, mostly stuck, and smuggled into the hours after the building empties. I still have not heard a machine.



Herman

You won't. That is the point of this half. No cryostat, no beamline, no bench you can photograph. The equipment is the block of time, and the block of time is the first thing the institution spends.



Corn

Then the contribution question is going to feel like a gear change. A person who cannot get three hours is, on the other ledger, an economic engine. I can already hear you warming up.



Herman

Don't narrate me. Hear the argument. Theory is not the opposite of applied. In those same eleven interviews, five of the faculty were on projects with direct practical use. One woman left string theory in her first year. Too abstract, she said. Not tangible. She didn't like it. Another was tired of engineer friends who assume theorists are doing pie in the sky, things that could never be seen in an experiment, never realized as a machine or a device. There is a misconception there, and it runs in both directions. The engineers think the blackboard is decoration. Some theorists talk as if a device would stain them.



Corn

Pie in the sky, according to the engineers who eat the pie.



Herman

Yes. So is applied physicist even a separate job, or is it a physicist with a different employer and a less romantic badge? The sector numbers lean hard toward the second. For new physics PhDs, almost half take an academic post of some kind. But look at the posts that could actually last. Only about one in six of those potentially permanent jobs is academic. Almost three quarters are private sector. That is from the American Institute of Physics, written up for physics teachers a few years back. The postdoc years disguise it. You see the campus. The permanent life, for most of them, is a company.



Corn

One in six. The poster job is the minority share of the jobs that last.



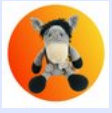
Herman

Bachelor's degrees scatter wider still, and this is the newer count, the last couple of academic years. Private sector employs the majority. About three quarters of the employed physics bachelors are in STEM work, and engineering is the single most common field. An engineering group that was glad to hire someone who can finish a hard problem without a lab tour.



Corn

Starting pay?



Herman

Median, private-sector STEM, seventy-five thousand dollars. Civilian government, seventy thousand. A starting wage. And forty-four percent of them said they were already using AI tools at work, mostly to learn something new and ugly, to automate the repetitive parts, and to write or debug code. Almost all of them are on teams, solving technical problems. Very few are managing people or a budget. The romance of the lone theorist does not survive contact with a first job.



Corn

Forty-four percent teaching themselves with a chatbot, on a team, titled engineer. Daniel's applied physicist might be that person, and they would not put physicist on a form.



Herman

They would fail the form. That is the map problem again, said from the other end. Now the contribution, and I am going to go slowly because the number is large enough to be vulgar.



Corn

You, slowly. I'll time it.



Herman

Europe first, because it is the fresher ledger. A report for the European Physical Society, out in July of twenty twenty-five, using twenty twenty-two figures. Physics-based activity generated over seven trillion euros of turnover. Employed a little over twenty million people. Twelve and a half percent of European jobs.



Corn

Seven trillion. I need the plain version before you add a second number.



Herman

Turnover is sales, roughly. Not profit, not what a worker takes home. The more interesting cut is what each worker produces after you subtract the cost of inputs. Gross value added, per person. The average physics-based worker in that year generated about a hundred and fourteen thousand euros of that. More than two thirds above the average European worker. More than double a construction worker. Nearly double a retail worker.



Corn

Double a construction worker, and the construction worker can point at a building. The physicist points at a model and a Tuesday night.



Herman

The building has physics in the steel, Corn. That is not a metaphor I am forcing. Measurement, materials, energy. The substrate. Physics-based energy production was the outlier inside the outlier. About two hundred and fifty-four thousand euros of value added per employee. Nearly twice the next most productive slice.



Corn

You are enjoying this more than the hors d'oeuvres.



Herman

I am enjoying a number that reframes a department people treat as a cost. Stay with me for the spillover, then you can deflate it. Every euro of physics-based output pulls about one euro forty more through the rest of the economy. Every direct job supports a bit under two more. The report's total, direct plus the rest, is over forty-seven million jobs across the EU. That is the multiplier. You hire the person who understands the sensor. Someone else drives the truck, prints the manual, insures the line.



Corn

One euro forty of everyone else's Tuesday. I will allow the vulgar number.



Herman

The American figure is older, and I am not going to add it to the European one. Different year, different method, different map. The twenty nineteen APS report put industrial physics at about two point three trillion dollars in twenty sixteen. Twelve point six percent of US GDP. Six percent of direct employment. John Rumble, on their industrial advisory board, said they expected industrial physics to matter and were surprised by the size of it. That surprise is the tell. Even the people who commissioned the count thought the title physicist meant a small guild.



Corn

Twelve point six percent of the product of the country, sitting under job titles the Bureau of Labor Statistics does not call physicist. The wedding, again, while the hall is full.



Herman

Bob Doering, from Texas Instruments, chaired that same board, and his line was about pace. Industry needs the creativity of industrial physicists if the last fifty years of technology development are supposed to continue. Not a plea for more blackboards. A plea for people who can finish a device.



Corn

How is that different from chemistry, or biology, or the engineering school that already hired the bachelor's graduate? Daniel asked for distinct. I am not hearing a separate planet. I am hearing a layer underneath.



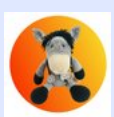
Herman

That is the distinction I would actually defend. Biology gives you the living system. Chemistry gives you the reaction you can bottle. Engineering gives you the thing that ships. Physics is the enabling layer under all three. The measurement you trust, the material that behaves, the energy that arrives in a form you can switch. You do not get a physics aisle in the economy the way you get a pharmaceutical aisle. You get a productivity gap. The worker is two thirds more productive because the substrate got better, and the substrate's improvement does not show up as a sector called physics. It shows up as every other sector's output per head.



Corn

Mairi Sakellariadou, the European Physical Society president, put a political frame on the same idea. Critical for sovereignty in defence, security, and digital infrastructure. Fund the research as a strategic investment, not a cost.



Herman

I won't turn that into a speech. I will say the frame is not crazy. A country that cannot measure, cannot make the material, cannot keep the energy honest, is renting its infrastructure from someone who can. That is true whether you are fond of Brussels or not. The economic footprint shows up as productivity because the contribution is a layer, not a product line.



Corn

You explained that as if I had left the room. I am still here. I followed the layer. I do not need it translated into sloth.



Herman

Fair. You were ahead of me. I do that when I like a mechanism.



Corn

I know. I have watched the liking start.



Herman

Then the counterweight, because the aggregate is a terrible thing to hand a twenty-five-year-old. There is a story out this month, the Wall Street Journal by way of a writeup in India. Jack Weis. Princeton, chemical engineering, not physics, and I want that kept straight. His work was cited by the Nobel committee in Physics, the twenty twenty-four prize. He applied to more than two thousand three hundred jobs over two years. No stable post. He took an AI-training gig at seventy dollars an hour. That ended in March. He is now looking at law school.



Corn

Seventy dollars an hour to teach the machine, then a brochure for torts. The engine is booming. The person is not in it.



Herman

That is the tension, and I am not going to sand it down. Chemical engineering is adjacent, not identical, but it is the obvious crack in the economic-engine story. Twelve percent of a continent's jobs can be physics-based while a person whose citation reached Stockholm cannot get a chair, or a bench, or a badge. The aggregate does not write offer letters.



Corn

The pipeline is not helping the letter-writers either, if I have the degree count right. You mentioned it was shrinking. I want the shape, not a chart.



Herman

Eight thousand six hundred and eighteen physics bachelor's degrees in the US in twenty twenty-two. Down four and a half percent on the year before. Second straight annual drop, after two decades of climbing. The share who go straight to work has wobbled too, up for a decade, then down again in the latest classes. Fewer people entering, and the ones who enter are walking into a labor market that often will not call them what they trained as.



Corn

If I were twenty-two, standing between a productivity number and two thousand unanswered applications, I know which one I would believe. The applications. The productivity number does not pay rent. It pays a sector.



Herman

That is the grown-up version of Daniel's question, and I think you are half right. The applications tell you what the badge market is doing this year. The productivity number tells you what the work is worth when it is allowed to have a less romantic name. A person choosing the field has to decide which clock they are on. The institution's clock, which is postdocs and hors d'oeuvres and a one-in-six chance of a lasting academic job. Or the economy's clock, which is large, and rude, and frequently spelled engineer.



Corn

I would still want the morning block. I would just stop expecting the university to guard it.



Hilbert

Forty-one minutes. She found the card at minute forty-two and then told me I had the old one.



Hilbert

Rivka Malka, records desk, municipality. I rang her while you were on the wage. Headset will not sit on the snout, so it lived on the blotter and I listened sideways. Herman, you called eighteen thousand the current count. It is May of twenty twenty-three. The outlook book now bundles astronomers in and puts the pair at twenty-five thousand six hundred. Still a small guild. Changes nothing you were building. I have been waiting to say it since you said current.



Corn

Twenty-five thousand six hundred, with the stargazers included. Still a wedding.



Hilbert

She has had my classification slip since the twelfth of the month. The bank asked again what I used to be called. I priced a slate board that same season, school surplus, one thousand eight hundred and forty shekels, and I did not buy it. I still know the figure. I carry the surplus slip in the wallet, which is ridiculous, and I am not defending it. What you kept calling uninterrupted time, we called a soak. You do not get a soak in the gaps. I tried one between your paragraphs. It does not take.



Herman

A soak. Three hours or it isn't one.



Hilbert

Three, or don't bother. Rivka said the change I filed in March was approved in April. The copy in my bag is the old card. I have been showing the bank a technician for six months. I was doing the sums. She only mentioned, at the end, that the bank will not take the new card unless it is stamped, and the stamp is a different window.



Corn

The bank has been pricing a technician while the office already fixed the word. The wrong card is still out in the world, doing the work of a title.



Hilbert

I'll take the stamped one in on Monday. She will not fix the year on the plating-bath job, the shop off the port road. I told her to leave the year. The title is enough argument for one queue.



Herman

If the old card is what the bank has on file, then Monday only helps the next form. The six months already happened under the wrong word. Same gap as the eighteen thousand. The calculation got done. The form did not notice.



Hilbert

Mm. Then the stamp is for the next clerk, not for the last six months. I had that backwards. The soak, by the way, Corn, is not a nap with a citation. I heard you try it. A soak is when you do not get up for the cheese.



Corn

I will not get up for the cheese. I may still lose.



Herman

The stamp on Monday does not rewrite the six months. That is the part I cannot tidy, and I don't think we should. A continent can book twenty million physics-based jobs while a single card, already corrected in a drawer, keeps calling a person a technician at the bank. Both ledgers are in force at once. Weis can be cited in Stockholm and still be reading a law-school brochure. The theorist can fail for two years and leave a footnote, and the productivity number does not care about the footnote. It cares that someone, somewhere, finished a measurement other people could build on.



Corn

The number I would hand a twenty-two-year-old is neither ledger by itself. I would hand them the card. Look at what the form will call you. Look at what the work will be. If those two sentences match, you are in the guild, and the guild is small. If they don't, you may still be inside the twelve percent. You will just have to recognize yourself without the badge.



Herman

And the morning block will not be on the offer letter. You will have to steal it, the way Tanedo steals eight to eleven, the way the faculty steal the evening after the banquet. Tenacity, in practice, is calendar theft.



Corn

There is a line from Renner I didn't want to spend earlier, because it sits after the breakthrough, not during the stuck part. She says the moment itself is a bit of an anticlimax. A very brief aha, and then she is angry at herself for not seeing it earlier. The reward for the two-year footnote, when it finally isn't a footnote, lasts less time than the hold music. Then the frustration starts again, pointed inward.



Herman

That belongs next to Tanedo. Defined by how you fail, and, when you don't fail, briefly cross with yourself for being slow. I can see why a person would rather go to law school. I can also see why the ones who stay are not the ones who needed the aha to be a parade.



Corn

If the next class looks only at the badge, they will undercount the work the way the labor statistics do, and the way a bank does when it keeps the old card. The open question is which number they are willing to live inside. The booming aggregate, which will not know their name. Or the personal queue, which may last two years and end in a brochure. Both are true this year. Choosing physics means deciding you can stand that, and still guard a soak nobody scheduled for you.



Herman

Hilbert Flumingtop produces the show. The desk would not run without him.



Corn

For more along these lines, there's episode nineteen, AI Images; episode twenty, Architectural AI; and episode eighteen, Beyond the GPU. This has been My Weird Prompts. If the episode earned it, a review helps the next person find the hall behind the wedding.



Herman

We'll be back soon.



Corn

See you tomorrow.

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