



Last Lecture

2015

Dr. Hetrick's Last Lecture

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Recommended Citation

Hetrick, James, "Dr. Hetrick's Last Lecture" (2015). *Last Lecture*. 2.
<http://scholarlycommons.pacific.edu/last-lecture/2>

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The Last Lecture

Prof. James Hetrick

8 May 2015, Morris Chapel, University of the Pacific

Thank you Joel. I'm deeply honored that you would ask me to do this lecture.

No pressure—right?

Nothing implied by: *THE LAST LECTURE!!*

Just another talk. Here with the President, the Cabinet, the Deans, my friends, my colleagues, my students, their families, my family, all waiting for me to say something profound.

Usually, I get a call saying: "I know this is really last minute, but...", and then asking if I could do a two-hour program for the Cub Scouts about the Higgs particle, with some kind of activity, next week.

Joel asked me to give this lecture in September—leaving me to sweat about it for almost a year. And, of course, I started writing it last week. Which is why it will be awful. But, we'll see what you think at the end.

He showed up at my office on his way home, sat down on my couch, put his hands together, and said, "*I have a favor to ask*". "*Hear me out before you say yes*". "*I have an idea for a special lecture*".

And then the topic. Not about The Big Bang, or the Higgs particle, which would have been, *relatively*, much easier. "*It should be about...what is important. You know, if it was your 'Last Lecture'—what would you say? You should tell us something really important.*"

[arms up in the air: ???]

WHAT am I supposed to do with that?

And yes, he did say "*About 12 and a half minutes*". Not "10 or 15 minutes" 12.5—Joel's time scale for event this is graduated to three significant figures.

At least I *do* get something in return: It's like "The Chaplin's One-Year Support Contract". He has to pray for me, for at least one full year, because, if anything happens to me before next May, *no one* will ever agree to do this talk again!

What is most important?

How am I supposed to answer that? It's like asking about "The Prime Mover" or "What's outside the Universe".

Nonetheless, much of our time, from day to day, is spent trying to prioritize what's important.

Should I reply to this email now? Or work on this other one that I tagged "MUST DO IMMEDIATELY"— in **Red**—last week? Should I put this on my calendar? It's is not important now, but it will be in six months. Should I prep for class, or work on my research?

What is important?

- Annual Assessment Reports are important.
- So is drinking with friends.

Sadly, I am delinquent on both of these.

What I *heard* Joel say was: "*a lecture on what is most important TO YOU*".

Actually, that's *very* easy:

- * My wife, Courtney
- * My daughters Aquillon and Lyra

End of story. These are ***the*** most important things in the entire world *to* me.

That was easy. 10.3 minutes to spare.

Maybe I can squeeze in a glass of wine with friends, or work on that Assessment Report.

But that's not what Joel asked. He didn't ask:

What's the most important thing to me?

He asked:

What is most important?

So my quantitative, categorical, physicist's brain started parsing things, pretty much immediately, even before he left my office.

Dissecting the world in a giant decision tree.

This is more important than that.

Next branch: P is more important than Q.

Health is more important than Wealth

Function narrowly edges out Form

. . . [dot dot dot]

This. No That. [use hands]

Until I come to Gravity. [Pause]

Gravity is *really* important.

(Well—*OF COURSE*—this was going to get *geeky* at some point)

Gravity is *fundamentally* important to the very structure of the Universe, certainly at the *largest cosmic scales*.

Without the gravitational pull of dark matter after the Big Bang, there would be no galaxies,

Without gravity there would be no stars, no elements heavier than Helium, no planets.

No life.

But wait—there are equally important forces at work at the most unimaginably *small scales* as well.

In the centers of stars, hot protons are constantly colliding. But, that's not enough for stars to shine. Protons repel each other and won't stick together. What's needed for nuclear fusion is a truly *awesome* reaction that involves the weak force. In each collision, there is a probability of about 10^{-31} that *one* of the protons will literally transmute into a neutron, spitting out a positron and a neutrino in the process.

The probability of that happening is 10^{-31} .

Only when this happens is the newly formed neutron able to bind to the colliding proton, and the first step in the fusion process starts.

Without this *utterly improbably* event, happening at the *smallest scale*, there would be no warmth or light from stars.

Again, *No life.*

As you might have expected, when deciding what is most important, we very quickly arrive at: *Life.*

Surely, Life is the most important thing. All cultures recognize Human Life as one of the most sacred, most unique, and surely one of the most important things in the Universe.

The uniqueness, the sweetness, and particularly the mysterious fragility of Life have been very much on my mind this past year.

But here, when we start thinking about the *value of life* in this *greater-than / less-than*, decision tree mode, our quantitative, prioritizing minds start to falter.

When you are thinking *quantitatively* about Life, you obviously have to use the plural: *Lives*, and somehow that's a little bit different, isn't it.

There is no *Calculus* for comparing lives. Such comparisons don't make sense--it's like dividing by zero. What is the value of this life? How does it compare to the potential of that one?

Still.

There seems to be a difference, in our psyches, emotionally, between the loss of one life, or 150, or 10,000, or 6 million. I could be more explicit here. Each of these numbers is pulled from fairly recent history. But I don't want to be morbid. I simply want to make a point about *Scale*.

Somehow—even when talking about life and death—*Scale* comes back, and seems to be even more important.

Even when we can't wrap our minds around something like understanding the loss of life intellectually, there is still a part of us that responds to sheer *Magnitude*. To *Scale*.

Unless, of course, you *know* that *one* life.

If that *one* life is precious to you, scale and magnitude no longer have *any* meaning. In that case, *Scale* is defined by your *Relationship* to that life—it's a scale that is defined by the depth of your love for that person.

Now I'm really getting way outside my 'comfort zone'.

Talking about things like "*The Scale of Love*", that's the sort of thing for poets.

Let's get back on track and assess where we are so far.

It's not so much the *specific* things, like stars or gravity or even Life, that are *most* important. What emerges, for me, as even more important, is the amazing range of *Scales* that *we* can comprehend—from cosmic, to quantum, to human-sized, and everything in between.

But even those immense cosmic, life-and-death scales are completely tempered by relationships, in fact in some sense, *Scale* is *defined* by *Relationships*.

Scale and ***Relationship***. I think these are important.

Like the enormous range of *Scales*, there are an infinitude of *Relationships*.

Again, the physicist in me takes over.

Categorize.

Enumerate.

Define an *n*-dimensional vector space.

- Human relationships
 - Family relationships
 - Intimate relationships
 - Political relationships
 - Dysfunctional relationships

- Linguistic relationships
 - Semantics
 - Predication
 - Etymology

- Mathematical relationships
 - Equations

- Correlations
- Symmetries
- Geometries

And the kind the kinds of relationships that I get to think about:

- Mass – Energy
- Energy – Momentum
- Momentum – Space
- Energy – Time
- Space – Time
- Energy – Entropy
- Entropy – Change
- Gravity – Space – Time
- The Higgs particle – the Weak Force,

which allows stars to shine through an *unimaginably improbable* transformation.

You know, I could *seriously* go off on several tangents here. 😊

But let me just say this: If you put *these* relationships that I just mentioned together with a *meticulous* and *vast* sense of *scale*, you get one of my great loves: *Physics*.

I think in this talk, I can admit, that—yes—Physics is one of the things that is important to me.

But, the reason Physics one of my great loves, is that it merges both vastly different Scales and often unexpected Relationships, in an amazing way.

But, there is another thing that is, for me, *essentially* important,

It also convolves Relationship and Scale together, in a fundamental way.

But we perceive it in a different part of us. Not in our intellectual, categorical, left brain—where we do physics (or, whatever you do in the left side of *your* brain).

We experience it on the other side of our brains, in the part of us that defines scale by the depth of our relationships. Not just to those we love, but indeed, our relationship to the Universe itself.

Yes—that sort of thing is often expressed in poetry, but I’ve seen it expressed in mathematically, many times.

That thing, for me, which is *perhaps most important*, that welds scale and relationship together, is:

Awe.

Awe, is about my relationship to the unimaginable range of scales in the phenomena that this Universe displays. And Awe is about the scale of my relationships to that Universe, and particularly to the lives in it.

That’s my word for the [OneWord Project](#).

Awe.

What a wonderful project that is! Asking students to come up with the one word that captures what is most important to them.

Maybe that’s how we should re-think what education means in the 21st century, at Pacific.

Perhaps, what our primary mission is, after Learning Outcomes and Assessment, after Liberal Education and Professional Training, is to just help our students figure out *what is really most important to them*.

For me, it’s *Awe*.

And I can honestly tell you—I experience it *every single* day.

Since this is *my* Last Lecture, I can say this.

One day, hopefully a long time from now, *some* of you are going to be gathered here in the Chapel.

Or maybe at a slightly *larger* venue. 😊

And there will be some beautiful music playing in the background,

like “*Watermelon in Easter Hay*”, by Frank Zappa,
or the entire *Fragile* album by Yes.

And there will be a picture of me here on the stage. And some flowers.

You know, I was joking about the venue.

This place will be just fine.

This chapel is *beautiful*.

It was designed and built *specifically* to inspire *Awe*!

And, I need to get over here more often.

Anyway, there will be a picture of me up here. And some mid-70s Genesis playing.

And I want those of you who are here on that day—as well as those of you, who for whatever reasons, are not able to attend—to know *this*:

I am *in Awe of you*, my colleagues and my friends.

I am *in, white-knuckled, choirs-of-angels, extra-galactic, hair-on-fire, Awe of This life* [lift and look at hand].

Just its sheer improbability makes me giddy. My life is *utterly and completely charmed*, and I owe much of that to you, because your life’s work and my life’s work are part of the same thing.

I want you to know that I am in *Awe* of that.

I'm married to a supermodel with a Ph.D.

She's an internationally renowned Shakespeare scholar, who appeared on the cover of Sports Illustrated.

—No, not the issue you're thinking of.

The one where her college soccer team was profiled because they won 4 consecutive national championships, before her teammates went off to the Olympics and Nike commercials, and she came here.

And *she* married *me* right *there*!! [Point]

Do you have *any* idea how improbable *that* is ??

My daughters are *smart*, and *funny*, and *beautiful*, and *healthy*, and *happy*, and they fill me with *Awe* each and every day.

I'm in *Awe* of you, my colleagues. I am in *Awe* of your accomplishments, and your strengths. I'm in *Awe* that you accept me as one of you.

I'm in *Awe* of my students, who *renew* my *Awe* with their own—that really special, first-time, "*OH, NOW I UNDERSTAND!*" kind of *Awe*.

I'm in *Awe* of what we are trying to build here at this place. I'm in *Awe* of the challenges.

President Eibeck—*Pam*, I'm in *Awe* of the scale of the issues that you have to deal with on a daily basis.

Provost Pallavicini—*Maria*, I'm in *Awe* of the relationships that you are trying to build across our university.

Joel, among many things about you, I'm in *Awe* of your height!

Awe is not always uplifting though. There are terrible, fearsome, things which demand *Awe*.

I'm in *Awe* of the fact that more than half of the children in Stockton's schools are on the free or reduced lunch plans. Poverty is not the exception in our community, it is the norm.

I'm in *Awe* of the level of need in our community, and the scale of that problem.

But I want to close on the practical uses of *Awe*.

Awe is a telescope, it's the particle accelerator. It's the tool that connects us to things of *Cosmic Scale*, and makes them a *real* part of us. But it should also connect us to other lives. In the same way that *Awe* can bring us in touch with a distant galaxy, *Awe* can allow us to relate to the struggling lives in Syria, or those in need here in Stockton, as real people with whom we have a *Relationship*.

Awe is about *Scale* and *Relationship*.

So let's make a deal.

On that day, in the hopefully distant future, when others are saying, "Oh, he was such a nice guy",

You, friends, who were here today, wink at the picture and say: "Yeah, but if you *really* knew him, he was *Awe*-full".

It will be our inside joke.

Because for me, the *most important* thing is to be *full of Awe*.

