

# The Paul Romer Nobel Lectures

*By Nick Ray Ball 1<sup>st</sup> October 2019*

NYU Stern Fireside Chat with Nobel Prize Winner,  
Professor Paul Romer

[https://www.youtube.com/watch?v=8lu\\_ddw0o0A](https://www.youtube.com/watch?v=8lu_ddw0o0A)

<https://www.supereconomics.ai/video/Paul-Romer-NYU-Nobel-Lecture>

3.11 Bill Barkley

5.53 Clayton Gillette

Director NYUMarron Institute

8.43 Donald Marron Introduction

Donald Marron

NYU LIFE TRUSTEE

9.30: They wanted to start a school for the study of cities, and they asked me if I would lead it, which by the way is code for saying finance it.

Worried about keeping Paul...

10.21 – You know this book I'm reading called the seven principles of physics, so there's 7 chapters and there's 7 things, the first one is general relativity, the second one is – something else, so I can kind of understand it Paul, but for our next seven lunches can we start out with you explaining each chapter and all the math. He said I would love to do it. By the end of the second chapter he'd left to go to the world bank, and I said hey Paul what happened to the rest of the chapters?

Well to his credit when he got back the first thing he said to me was; we'll do the other 5. Now it has not happened yet because at lunch last week when we talked about the Nobel prize and somehow that was more important Paul, than the other 5 chapters of this book.

**We shared a big agreement on two important things; 'cities are engines of innovation – economic prosperity and opportunity, it's a place where ideas both come, and grow, and flourish, and are executed.' And the second thing was universities in general, a research university at the level of NYU, combined, with all of these things can improve the life in this city and that's really what the urban institute is all about, what we can**

**do to combine academic with the real world (sorry I shouldn't put that) academics with the commercial world in order to provide a better life for everybody.** And were doing it, we're working with the MTI the MTA to improve the bus service in Brooklyn, I'm not sure it's worked yet, but..., tackling air pollution in Mexico City, the growth in Ethiopia's cities and what's really interesting working in criminal defence and things in the corrections department.

13.16 THE Dene NYU Stern School of Business  
Raghu Sundaram

Came back at 15.15

## The Seven Principles Of Physics Carlo Rovelli

1. General Relativity
  - a. GPS 10 miles a day out
  - b. POP Financial Gravity Cubes (Newton not Einstein)
2. The Quanta  
Quantum Mechanics
3. Special Relativity

Paul Romer Awarded 2018 Nobel Prize in  
Economics (V2 of 2) (Repeat)

<https://www.youtube.com/watch?v=-nL4-Vj5Lyw>

NYU Stern - 12.4K subscribers - 1,454 views • Streamed live on Oct 8, 2018

Video has 1-second gaps here and there - I don't think I have ever taken notes of this video.

This is a repeat of the one below

Paul Romer Awarded 2018 Nobel Prize in  
Economics (V1 of 2)

<https://www.youtube.com/watch?v=uoZ8NjBLjrg>

17m:20s

My role at the Marron institute was not as the idea generator, my job was just to provide air cover for people who were actually doing it.

18m:50s

Call:

1-800 326 0013

International:

203 702 1000 (conference ID 693 5228)

22.10

Catch up Growth, not surprised that China does, is confused why others don't.  
(Most of Malawi GDN is Catch up growth)

22.34 Stopped, restart here

32.00 – THE FACTS

52.20 – Scale

NEXT:

[https://www.youtube.com/watch?v=8lu\\_ddw0o0A](https://www.youtube.com/watch?v=8lu_ddw0o0A)

NYU Stern Fireside Chat with Nobel Prize Winner, Professor Paul Romer

# ORIGINAL

Paul M. Romer: Lecture in Economic Sciences 2018

<https://www.youtube.com/watch?v=vZmgZGIZtiM>

23,682 views - Dec 8, 2018

GET Pierre Section (before 1.48) that Romer refers to

1.48

So thank you Pierre for framing the work that Bill and I have been engaged in such an appropriate way. It really is the global macroeconomics of the tension between the restraining force of scarce resources and the positive force that can come from discovery.

11.57 Minutes

**With existing technology, if we were to provide them (students in India doing homework under the airport lights as they have no light at home,) the same access to electricity that we have, this would lead to more emissions of carbon and could threaten the planet.**

**So, although it's not always voiced, there is a realistic perception (a seemingly realistic perception) that we have to retreat to a notion of us and them. We can't let them have what we have because we'll destroy the planet.**

Now the problem, as I saw it... (12.35), in my development of this theory of the economics of ideas, was not what Malthusian theory suggested about scarce objects. But it was what it emitted which was this possibility of discovering new ideas. This had been referred to – the process of accumulation of ideas- was often referred to as technological change.

12.59 (The Economics of Ideas = technological change)

**"The process of the accumulation of ideas often referred to as technological change."**

And just like my son, Jeff, my colleagues recognize that this could be the offsetting force. **But to have a theory that could satisfy a physicist**, I needed to dig down into what was the meaning of an idea. **How could we be precise about an idea and use the accumulation of ideas as a way to understand technological progress.**

Now, one of the key elements of an idea is that it represents codified knowledge, its knowledge represented in symbols on a piece of paper or in bits these days. Because it is codified, it can be copied and shared, and then used by everybody on earth. And by sharing, I don't mean the kind of sharing where we take turns, this is a sharing where everybody can use something like the Pythagorean theorem at the same time. If we want to, for example, create the kinds of right angles that we use in construction.

14.00: **The best way I know to illustrate a single idea comes from a remarkable paper that my co-recipient, Bill (William Nordhaus), wrote in the 1990s. His insight is that we could measure progress by using not the conventional units of a dollar's worth of purchasing power today, or a euro's worth of purchasing power. We could measure output per person in the kind of units that a physicist wouldn't recognize - lumen-hours. Think of a lumen as the light that's produced by a candle.**

14.41: Physics bit. Luminous – in place of POP Quanta

Going all the way back to the place, the scene, Bill measured the amount of light that the average person could get from an hour of work. There's no way for me to improve on his words from this paper. I have performed several experiments with sesame oil and lamps purportedly dating from Roman times (see the appendix). These experiments provide evidence that an hour's work today will buy 350,000 times as much illumination as could be bought in early Babylonia. That's real progress.

And when you look at the pattern of progress, most of it comes in the very recent period- the period since the Industrial Revolution and since the Scientific Revolution.

Now, in this paper, there is one data point which represents the (roughly) tenfold increase in the amount of light that we could extract from a gas flame that was the result of burning that flame inside what was called a mantle.

Now, my reaction to that was what in the world is a mantle? And what's the physics behind the process whereby it coaxes ten times as much light out of a gas flame?

This picture illustrates the difference between an open glass flame and a mantle. And it's hard to see. But if you look at a physical mantle, what you'll notice is that it's a metal cage, and burning flame inside the cage heats up the metal to the point of incandescence, which means the metal glows with this bright white light that you can see in the picture.

Now the man who discovered this, Welsbach, could take that insight and then put it to use in street lights all over the world, long before Edison discovered how to make a wire incandescent by running electricity through it. But Welsbach could share this idea with everybody in the world who had access to a gas street light because it was codified knowledge, which could then be spread and was copied all throughout the world.

**17.15**

**There's another concept that I need to flesh out about related to ideas, which is what computer scientists refer to as a combinatorial explosion. If you have a number of elements that you can combine; you have 10 elements and combine them, we can calculate how many combinations can you make. If you have 20, we can calculate again. Combinatorial explosion is a summary of the fact that the number of combinations explodes as you take more and more raw different elements that you can use to combine them.**

For example, we think of all the possible peptides you can make out of amino acids. There's just an immense, just unbelievably large set of peptides that you can create out of 50 amino acids units.

And this year's chemistry prize is about methods for creating libraries of all of these peptides and exploring them using new kinds of methods including those motivated by evolution.

When Welsbach was trying to find the right mix of metals for his mantle, he tried a number of different metals and mixtures, and again the number of possible mixtures explodes as you think of more and more metals.

So an idea is codified knowledge about the properties of one from an almost infinite set of possibilities.

**18.51** (Go back get the whole script, from to combine them)

**And when you define an idea that way, it's immediately obvious that the discovery of new ideas, from these almost infinite sets of possibilities, could offset the scarce resources implied by the Malthusian Analysis.**

So, to understand the differences makes, look again at this picture. If more light gives these students the chance to study, (19.27) to go work in science, they may discover something like the mantle; and they may provide a benefit to us that could more than offset the costs of additional medication or avoidance of carbon emissions.

**So, ideas mean that people are no longer are rivals, they can be our allies.** This suggests a very important possibility, that we can take a set of us and expand it. We can draw a bigger circle, include more people inside us, and treat them with at least indifference or the small appreciation that comes from membership in the set of us.

Now, this benefit of other people was a possibility that Bill wrote/ discovered and modelled, he published in 1969. Ken Arrow, another Nobel Prize-winning economist, wrote a model with that same property in 1962. I, In the 90s, after working out a theory of growth based on ideas along with other economists, worked on **results showing that integrating different regions of the world into a unified global system; where we traded goods, but particularly, importantly, we traded ideas; this could speed up the worldwide rate of growth.**

But in a conversation, I had with Bill, he said that he was uncomfortable about this result, that more people could actually be beneficial. Because it was a theoretical possibility, but how do we know it's true?

And when I look at combining different regions, letting them work with each other, I started this issue because, in effect, what I was saying is we can let more people come to

this party but they got to bring their own resources. So there wasn't the same effect of more people meant less natural resources for each of us.

What was astonishing was that work that emerged around this time - including work by Chad Jones who is here somewhere, but also Ron Lee from demography, Michael Kremer, another young economist – work showing that **from the period of roughly the Neolithic Revolution to at least the Scientific Revolution, the actual evolution of humans as a species was driven by a process of more discoveries**, leading to the production of more food, which led to more people who in turn developed more and more discoveries. And so, there was this explosive process of growth and the population that was proceeding at the rate that was growing exponentially.

So this is not exponential growth, this is exponential growth in the rate of exponential growth; which is the best way to characterize the behaviour of humans up through about the Industrial Revolution.

#### 24.12

“Now the key point I want to make is that there's a third notion of progress, that I'm going to call 'human progress.' Progress not in what we have, but in who we are. And it's the kind of progress that comes from seeing other people, even perhaps starting to see other semi-sentient beings like the animals we interact with, seeing them as part of us, treating them with at least indifference, rather than malevolence and treating them as objects or predation. This type of progress in who we are is even more important than the material progress.” Paul **Romer**

Special Project 67. Vegetarian

I am a deeply floored individual and whilst it is utterly hypocritical for me to say, it still needs to be said, and that is; it's just terrible the way we all eat so many farm animals.

#### 27.10

And that's **there's a huge advantage in doubling the amount of people who contribute to the production of the ideas, from which we all benefit.**

#### 27.48

In the words of my colleague Ed Glazer – “Cities make us smarter!”

Now, in the coming century, we will build more urban areas than we have since the Neolithic revolution. Then as the population stabilises, this project that my college Sol-

Angel calls the urbanization project will be done. We will have the layouts for the cities that people will live with forever. And if we layout the city from the beginning, if a government lays out a city with a plan that protects some public space that allows the kind of connectivity you get when you have a street that's wide enough for a bus to drive down, and you make sure that nobody is more than about half a kilometre from a bus route that they could use to get from home to work. If you layout that space in advance it costs almost nothing, if you try to get it after a completely disorganised unplanned development it's almost infinitely costly to get that space.

I don't think we will see anywhere, in the future, like the kind of experience which Paris went through under Haussmann where it was possible to just destroy large numbers of buildings, move people and build broad avenues where they did not exist before.

So we have a chance in the next 100 years, at very little cost to lay the foundation for successful urbanization, that can help everyone enjoy the benefit of learning from others. But if we take a pass on this, the opportunity will be gone and the entire future will be less, will generate less material progress, for all the people that could so much benefit from it so much.

**29:53**

**The other point I need to make is that because the population won't grow after this century, to keep getting more and more ideas, we need more people to go into science and need to raise the productivity in science.**

One of the interesting things that I looked at in the data about Nobel prize winners, from 1900 to 1920 only three percent of recipients were from the USA, then in the 1930s and 1940s it increases to 15% and after world war two it approaches more than 50%. That early development is a sign of the investments the United States made in a university system that started in the 1860s, and it takes time for a commitment to science to progress to the point where you have people doing Nobel prize quality science, but it's possible **and we could do now, new things to help spur the same kind of both increase in the total fraction of the population that is engaged in discovery, research and science, and we can raise the productivity [mention relative to the super projects] of all of those people.** (There is evidence right now that productivity in science has been falling the more people have gone into it, but this is something we can correct.

Finally, it is true that we face a very serious challenge with addressing global warming, it's important to remember that this is a change, not of the physics, not of nature, not of scarce resources, this is a challenge of making a decision. Like deciding to switch to daylight saving time, like the decision in Sweden to drive on the right. It's not hard to do it once you decide – what's hard is deciding.

And that's what Bill's (William Nordhaus) idea of the club is about, but even within a country, we need to find ways to appeal to other parts of the human spirit to persuade us all to make those kinds of decisions.

So, let me close with encouragement to young people, about what a fantastic life can come from science and encouragement to young economists at a time when the

economics profession has gotten a lot more competitive. It's much tougher to start out as a young person as it was when I was a graduate student or Bill was.

**But remember that there is an enormous opportunity in economics to start to explore these broader notions of progress, the broader side of human nature that includes the kind of things that William Faulkner talked about in his Nobel speech – love and honour – pity and pride – compassion and sacrifice.**

**Economics will be much more relevant when we can take account of all those and we'll have a better idea about why is it that we can sometimes appeal to sacrifice, and people respond because this is what we'll need.**

So let me close by expressing my deep appreciation for the system of prizes that Alfred Nobel established, and that the Nobel Foundation has sustained. A system for celebrating all the types of intellectual inquiry that emerged from the period in history we call the enlightenment. And remember there's a reason we call it the enlightenment.

**So yes, let there be light, let there be light in our daily life, but let there be light two in our spirits and in our soles.**