Thanks for that kind introduction and for having me here. Thanks to all you present for your interest and attention. As we shall see, this title summarizes the main point I would like to convey today. And I will try to show why this point matters to designing cellulose for the future.

Economic evolution, I will argue, produces novelty and “cambiodiversity,” which is to say a great increase in the number and variety of goods traded. Novelty and cambiodiversity are good, I think, because they create wealth and well being. They increase our ability to solve problems, thus making life better. I think it is widely, if not universally recognized, in economics at least, that economic evolution produces new things, that it gives us novelty and cambiodiversity. But we have probably been slower to recognize that novelty and cambiodiversity change our very categories of thought in unknowable ways. For example, the emergence of surrogate motherhood changed our concept motherhood, so that we now distinguish between a birth mother and a genetic mother. In the end, I believe, we want economic evolution because we want emerging changing and interacting economic ecosystems that generate novelty, cambiodiversity, wealth, and wellbeing. We like what the process does. Now, all of this matters for cellulose. We are not designing the future. No one can design the future if novelty is a real thing. We are designing cellulose. We are designing cellulose *for* the future. Thus, the designing cellulose project is NOT about finding the optimal use of cellulose or increasing static efficiency of, say, paper production.
Cultivate the ecosystem

It is about cultivating an ecosystem whose outputs are unpredictable and currently unimaginable, literally, unimaginable. This conference is about that unimaginable future.

I begin with an episode in the history of art.
Here we have a good example (from Pisa in 1250) of medieval art of the sort that Giorgio Vasari, in his famous “Lives of the Painters, Sculptors and Architects” excoriated for its backwardness. [Giunta Pisano 1250] Vasari was the one who gave us both art history as a field of study and the whole idea of the Renaissance, whereby the medieval epoch was a dark age followed by a rebirth of learning in Italy, especially Tuscany.

The painting you see on the screen represented the enemy for Vasari: the bad old stuff that his heroes overthrew completely, beginning with Cimabue.

<<by the will of God, in the city of Florence, in the year 1240, there was born, to give the first light to the art of painting, Giovanni, surnamed Cimabue.>>

So let’s have a look at some of this revolutionary art, this “first light to the art of painting.”
Cimabue 1268-1271.
Cimabue was, perhaps, more EVOLUTIONARY than REVOLUTIONARY. He was clearly building on what was already there. The possibility of a crucifix like that was clearly there already. But other possibilities were NOT there for Cimabue.
Imagine painting this in 1250 or 1270.
Picasso, Les Demoiselles d’Avignon 1907
It would not be recognized as art. So the opportunity had to be “out there”
“objectively” before Picasso could jump in. A possibility like this did not exist for
Cimabue.

Notice something interesting, however. As we move from Cimabue to Picasso, the
forms and possibilities for art multiply. There is not only “more art,” but a greater
*variety* of styles, techniques, and so on. There is increasing artistic diversity.
Creative evolution

• The “adjacent possible” contains opportunities.
• Some are seized, most are not
• Iterate
• The new adjacent possible contains a different set of opportunities.
• Some are seized, most are not
• Iterate

This is the logic of creative evolution, which is to say the logic of evolution.


The “adjacent possible” contains opportunities, be they biological niches, profit opportunities, or artistic possibilities. Some are seized BY THE AGENTS OF THE SYSTEM, be they molecules, genes, organisms, entrepreneurs, or painters. Most are opportunities are not seized. The system iterates. The new adjacent possible contains a different set of opportunities. Some are seized, most are not. The system iterates. You cannot list all the possibilities in all the iterated adjacent possibles that will unfold over time any more than you can list all the uses of a screwdriver. In 1850 you could not have listed “radio antenna” as a use of a screwdriver. Thus, this system is not “deterministic” in anything like the way (so called) “Newtonian” systems are determinate. In a system evolving in this way you can’t lay out all the possible states of the system ahead of time and, therefore, you cannot hope to predict where the system is going. Cimabue could not predict Picasso. And notice something very important and, perhaps, unexpected: The system itself is creative. In each iteration, the adjacent possible contains NOVEL ELEMENTS, NEW POSSIBILITIES that did not exist before.
At each stage of this process of creative evolution we have new possibilities being created. The system is creating new possibilities and some of them happen. Economic evolution keeps producing new goods. The set of goods produced ramifies over time, like the branches of a tree as it grows.
Think of the mad variety of cars and trucks and other vehicles we now have compared to one vehicle Karl Benz produced in 1886.
Or the explosion of apps enabled by the modern smart phone.

And every one of those new goods – new car, new truck, new app – is a problem solved for the person who buys it. So that “cambiodiversity” is what makes us richer and our lives better.
And we don’t really need geniuses for all this to happen. We just need to give ordinary hum-drum humans the right to seize opportunities they notice in the adjacent possible. We do not need amazing humans to create an amazing future. We just need to let the process work.
This theory of creative evolution helps us to see that entrepreneurs and innovators do something for us that we might not have noticed: they change the very categories of our thinking. Today we talk about things using metaphors we could not have imagined in the past. We talk about apps, downloading, software, hardware, and so.

Before the emergence of surrogacy there was only one kind of “motherhood.” Now, however, we distinguish between the birth mother and the genetic mother.
Economic evolution, I have argued, produces novelty and “cambiodiversity,” which is to say a great increase in the number and variety of goods traded. Novelty and cambiodiversity are good, I claimed, because they create wealth and well being. They increase our ability to solve problems, thus making life better. Novelty and cambiodiversity change our very categories of thought in unknowable ways, as the example of surrogate motherhood illustrates. In the end, I believe, we want economic evolution because we want emerging changing and interacting economic ecosystems that generate novelty, cambiodiversity, wealth, and wellbeing.

All of this matters for cellulose. We are not designing the future. No one can design the future if novelty is a real thing. We are designing cellulose. We are designing cellulose *for* the future. Thus, the designing cellulose project is NOT about finding the optimal use of cellulose or increasing static efficiency of, say, paper production. It is about cultivating an ecosystem whose outputs are unpredictable and currently unimaginable, literally, unimaginable. This conference is about that unimaginable future.
And this, I believe, is a vision of an open-ended and deeply human universe. It is a vision of infinite possibilities.
Cultivate the ecosystem

Thank you