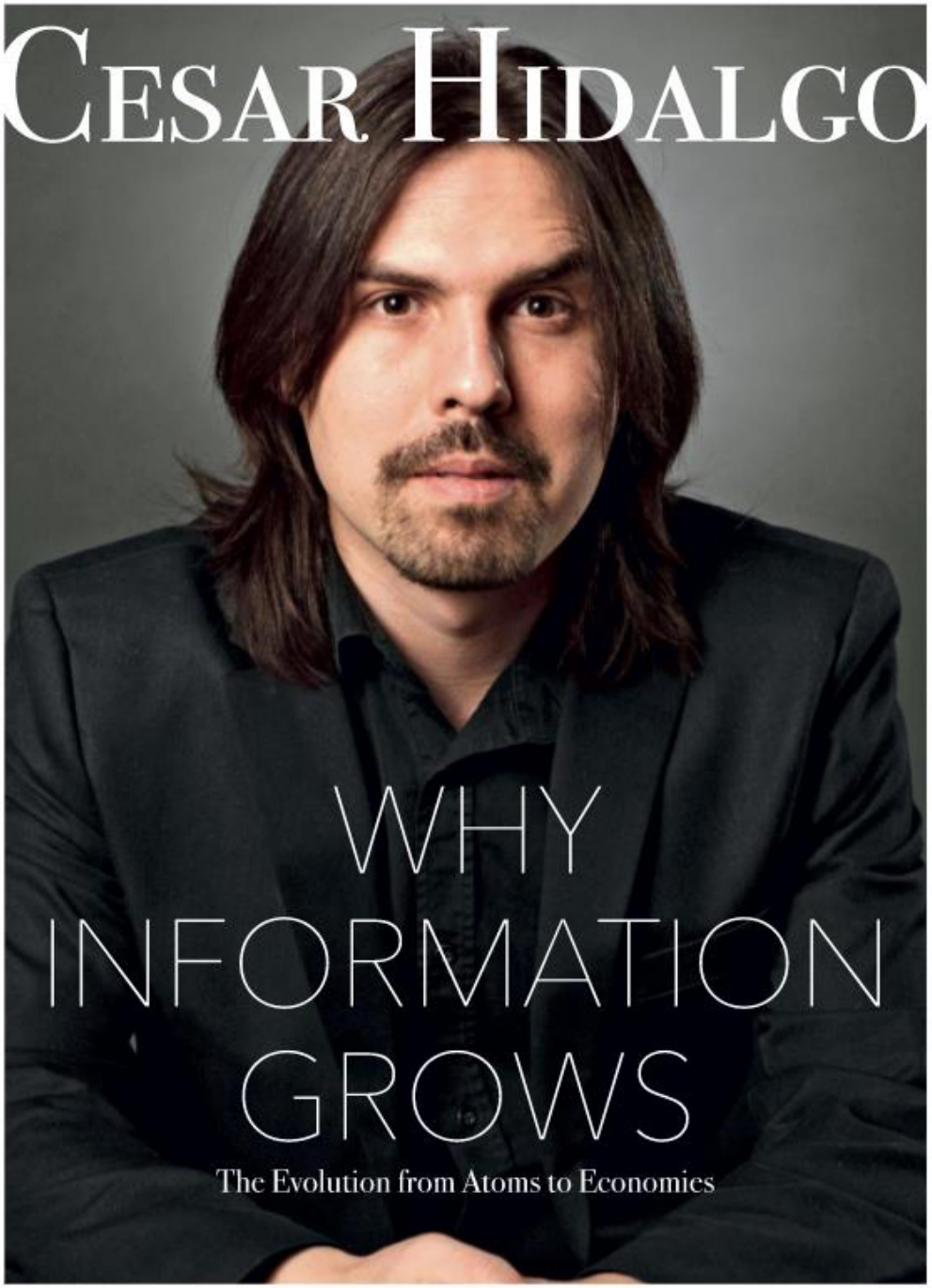


Interview by Sian McAllister

Introduction from the Interviewer:

Cesar Hidalgo is a Chilean American scholar, whose work focuses on collective learning, artificial intelligence, and economic complexity.

I had the honour to interview him about two of the projects he has worked on – his book: 'Why Information grows: the evolution from atoms to economies', and the use of artificial intelligence in democracy.

Your work largely focuses on collective learning. In your own words, could you describe what collective learning is, and why it is important?

Media by Annie Soratt

I focus on how people can learn; more specifically focus on how teams, countries, and companies learn. Unlike individuals, however, companies and teams learn sometimes through the exchange of people that have knowledge, through the development of those people and the development of relationships among those people. It's work that focuses on learning, but not on an individual scale, therefore there are many more complexities that need to be considered. It's about how a team can become smarter, how a firm can become smarter and how a country can become smarter.

Would you say the internet is a big development in collective learning?

The internet can help collective learning, but it can also hinder it. At the end of the day, technology can be used positively or negatively. Technology like the internet can be used to diffuse knowledge or misinformation that can limit learning. It can be used to fuel cooperation among people or to fuel divisions, which hinders the ability of people to learn together. The Internet doesn't inherently promote or prevent collective learning, but rather it depends on how people use it.

In university, you studied physics. How did you come to do the interdisciplinary work you do now?

I became interested in a particular part of physics early on. This part of physics is called Complex Systems. Complex Systems refer to systems in which the identity of elements is involved, and how their patterns of interaction cannot be ignored. For instance, when I look at traditional physics and study molecules in a gas – the molecules are interchangeable and I only care about big macroscopic properties like pressure, temperature, and volume.

Much like the complex systems studied in physics, in society people are not interchangeable. Their patterns of interaction and identities are very specific and they matter. A society is a complex system. Biology is similar. You cannot really change one molecule for another in biology, as different molecules have different functions and they interact differently with others. The beauty of complex systems is that simple rules can produce great complexity. A simple chemical reaction or a simple diffusion equation can lead to the patterns on a tiger, or the spots on a leopard. Similarly, in a society, simple rules can lead to a lot of different behaviours which have different implications for policy and society.

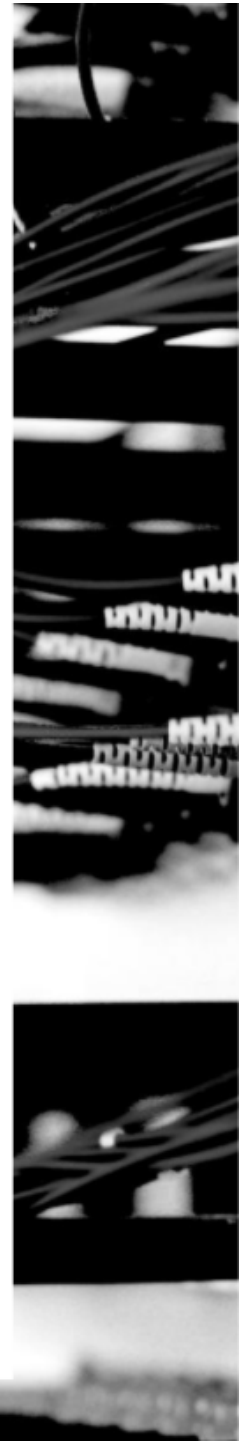
Media from Université Libre de Bruxelles

You wrote a book: 'Why Information grows: the evolution from atoms to economies'. You present a different model for evaluating economics based on matter and information. Could you explain that complex system?

What the book tries to describe is that economies grow as they develop knowledge collectively, which I call 'capacity to compute'. Economies grow if together we are able to create things of increasing complexity and order. With this, a lot of things can limit our capacity to work together. For example, there's a whole chapter on trust. Societies that have a lot of trust can create large networks compared to societies where there are low levels of trust. If economic development is an accumulation of knowledge that allows you to do difficult things, like creating a plane or a complex pharmaceutical, then we need to create those large networks. The level of trust is going to limit the ability to accumulate that knowledge, because the knowledge that society has is a lot greater than the knowledge that an individual can have. Very early on, hundreds of thousands of years ago we reached a point, when what a human could know, is less than what society knows, and we were forced to start dividing knowledge. When that happened, our species took a very different path from others. We developed culture and the way we interacted together began to matter much more, because learning at the collective level became more important than at the individual level. If you think about insects, many of them never meet their parents. They're just born out of an egg and start running, they don't have culture and every insect knows what is known in the insect world. But we know so much more than what an individual knows, so what matters is how we put all that knowledge together in terms of people. We are parts of a whole that is much bigger than one can contribute.

Physics deals with very the impersonal fields and particles. How do you bridge the gap between a subject rooted in physics, complex systems, and economics, which is the study of people and how we behave?

That is a distinction that may be the case when you look from a distance, but when you look in closer detail, there's something all sciences have in common: a duality between empirical work and theory. In many sciences, that theory is expressed in a mathematical language. The empirical work uses mathematical tools to analyse the data. And in physics and economics, that is the case. For example, both physics and economics build theories upon the concept of equilibrium. Like where is this going to end when I throw it, considering all forces are balanced? And in economics, the standard model of economics came from the concept of equilibrium. The same mathematics is used to describe physics and economics. In that sense there are commonalities. And honestly, economics, being a social science, it is quite cold in describing human nature. I say that as a criticism, but the chasm between these two fields is not large because in the end, they are trying to figure out the right theory, given the data we have.



Despite the coldness of economics, in recent years, economists such as Kahnmann have begun to describe behavioural economics and how our whole idea of the rational consumer is wrong. Does this affect the connection between natural sciences and economics?

One thing that is important to understand in science is how we deal with it at different levels. Kahnmann talks about rational decisions at the individual level, classic examples of their work would be: 'You go to a concert with a ticket that costs £100 and lose the ticket or you lose £100 at concert, would you rebuy the ticket in both cases?'. That's at the individual level. Our complex system model happens on a much larger scale. At macrolevel phenomena, individual decisions wash out. A lot of the work I do is learning about the collective scale. Something I've worked on is how to calculate the best places to enter areas of economic activity. Or, how would we measure the knowledge an economy has at a collective level, based on the activities people are able to do.

In your TED talk: 'A bold idea to replace politicians', you talked about combining direct democracy and software agents. This reminded me of how the Five Star movement mobilised in Italy and how the Trump administration campaigned. How can we ensure direct democracy is nor hijacked by charismatic populists or people with bad motives?

I think there is a mismatch between communication technologies and democracy. In our history of governance, we are on the second wave of governing ourselves. Until the American revolution or French revolution, we had monarchies ruling the world. A 'one to many' authoritarian system. Then we made the decision to have a democratic system, which is still a one to many system in which we are choosing that certain one. And not surprisingly, that is a change that happened after a change in communications technology: the invention of the printing press. We started the development of sciences as we know them today and eventually the process of development of the public sphere in which we wrote books and pamphlets, that led to the political discussion on how people should govern themselves.

" In your TED talk: 'A bold idea to replace politicians', you talked about combining direct democracy and software agents. This reminded me of how the Five Star movement mobilised in Italy and how the Trump administration campaigned. How can we ensure direct democracy is nor hijacked by charismatic populists or people with bad motives? "

Continued

For instance, in England and France and many countries, I don't know if you know, but in the 1600s coffee was illegal, and there was a whole movement to legalise coffee. And the people that had pubs were against this movement because they saw it as competition and there were pamphlets and manifestos written in that movement and eventually those same ideas helped in the emergence of democracy. The emergence of the public sphere allowed the connection that formed a government in which we are choosing among the best broadcasters.

We've since had radio and television. I would add, that with tv, it became more frivolous, and the scale changed. You can have a democracy with 5 million people or 100 million people. Your ability to manage and learn what people want changes. And recently, we've had another change in communications technology: the Internet, which can facilitate a many to many system. Everybody can broadcast. 30 years ago, only a few people had a spot on late- night television and everybody knew them, they were very famous. Now there's a lot of people that are in between famous, due to social media and so forth. It's created a lot of attention and people are fighting for that attention. And what you have is a democracy in which you have a change from having a competition between people on how to have the best ideas, to a competition you see on social media which is a competition about diminishing others, about lying, about winning a popularity contest and I think that's the source of our crisis right now.

We have issues between democracy and technology because we have that mismatch. We don't have a democracy that is many to many, but one to many, and we have communication that is many to many. In that democracy, in that many to many situation, there is a lot of incentive to cheat and get that one prize because the idea that giving an overwhelming amount of power to somebody who wins a popularity contest every four years is not a very clever idea. And today, in a world where we can see that information can spread very easily, and when attention has become more important than truth, you can hijack the system because of those conditions and because you're putting too much power into one person.

" In your TED talk: 'A bold idea to replace politicians', you talked about combining direct democracy and software agents. This reminded me of how the Five Star movement mobilised in Italy and how the Trump administration campaigned. How can we ensure direct democracy is nor hijacked by charismatic populists or people with bad motives? "

Continued

To bring that power back, I think you must take that power from that one person and give more power to a lot of people. Once you distribute that, you make it harder to hijack the system because there isn't a single point of failure - e.g. grab the presidency or have control of parliament. There is a lot of technological difficulties we must overcome. We have to have reliable digital identities. To improve the way people inform themselves and have conversations. However, I do think there's a lot of problems from having a broadcasting one to many democracy system in a world where communication is many to many.

Media by Jon Tyson

I understand the mismatch but are you concerned that even without an agenda, do you think that voter manipulation of ill-informed voters could sway the legislation in a country in a negative way?

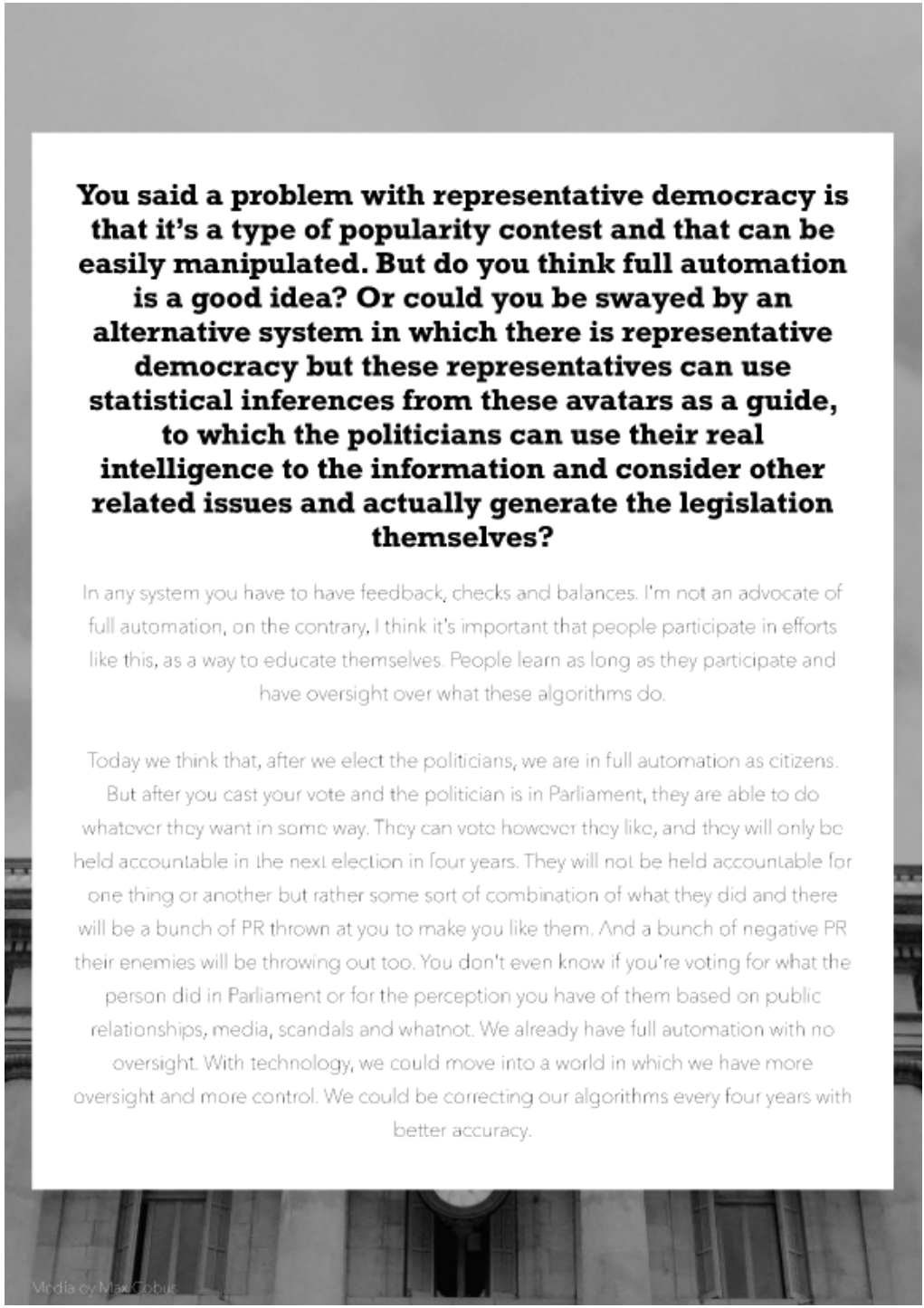
I am concerned so I think, how can we make that more difficult? Like when you're trying to defend your house, you can either build a fence around your house, add electrical wiring to the top of your fence, or you could even add machine guns to the top of your fence. You can always made it more difficult for someone to break in, but there will always be some people who can break in. We want to move to a world where it is more difficult to break in and easier to have a fair outcome. But, just like the system now, we cannot guarantee that the outcome is good. The question is, how can we get a greater probability that the outcome is fair? If we can do that, it's an improvement.

In your TED talk, you mention that augmented democracy would work through the user providing data to an avatar and that avatar would predict decision and vote. Do you think these algorithms can become accurate enough to predict decisions affected by the countless experiences in someone's life?

Yes, at the moment we are working on creating an avatar using data we collected last year. I don't know if you know this but there were riots and protests in Chile, Lebanon, Georgia and Colombia. In those four countries, we created platforms for people to express their political views online and now we are using that data to try to understand how political preferences are distributed and so forth. And the truth is that even though people have countless experiences, political opinions tend to be quite correlated. They can be explained by a few dimensions. If I tell you someone is a fan of Greta Thunberg and is also a vegan and is someone that is in favour of universal marriage and universal income, I ask you to predict, does that person vote for leave or remain?

Remain. Yeah, I see.

Yeah. So, preferences are quite correlated. It's because there are certain views of the world that we eventually acquire that help inform our preferences. If we believe people are inherently good, or that people are inherently bad and need to be policed, you know. Whether we believe that freedom is extremely important or that people should get the service of society and that freedom is a right that only you can earn through good behaviour.
Also, there are people who are working on similar technologies that are not in the context of politics but rather in a commercial context. A lot of communications companies are working on developing digital agents and avatars, for example you have an avatar with certain parameters to negotiate some vacation for you. You say, I want to be on vacation August next year, I have this budget, and I want to go to a place with tropical beaches. Then the avatar would negotiate with different travel agents to try find the best deal. That's not something with a political implication like an avatar that votes on your behalf, but companies are working on digital twins. We are moving into a world where people will become overwhelmed by the amount of information they receive and the decisions they have to make and there will be a market for technologies in which you outsource those decisions.



You said a problem with representative democracy is that it's a type of popularity contest and that can be easily manipulated. But do you think full automation is a good idea? Or could you be swayed by an alternative system in which there is representative democracy but these representatives can use statistical inferences from these avatars as a guide, to which the politicians can use their real intelligence to the information and consider other related issues and actually generate the legislation themselves?

In any system you have to have feedback, checks and balances. I'm not an advocate of full automation, on the contrary, I think it's important that people participate in efforts like this, as a way to educate themselves. People learn as long as they participate and have oversight over what these algorithms do.

Today we think that, after we elect the politicians, we are in full automation as citizens. But after you cast your vote and the politician is in Parliament, they are able to do whatever they want in some way. They can vote however they like, and they will only be held accountable in the next election in four years. They will not be held accountable for one thing or another but rather some sort of combination of what they did and there will be a bunch of PR thrown at you to make you like them. And a bunch of negative PR their enemies will be throwing out too. You don't even know if you're voting for what the person did in Parliament or for the perception you have of them based on public relationships, media, scandals and whatnot. We already have full automation with no oversight. With technology, we could move into a world in which we have more oversight and more control. We could be correcting our algorithms every four years with better accuracy.

How close do you think we are to this kind of automation?

I think this is very far away. Where we are right now is in a world where there is a crisis of current democracy, but there's also a world with a generalised lack of trust in institutions, compared to the past. Additionally there's less trust in technology, and on the other hand, we do not have technology that is ready to replace our institutions at the moment. I see this as a lifelong journey. I don't think I will see augmented democracy implemented at a national scale in my lifetime, but I do think that some point, during the 21st century, we are going to have to transition to other forms of government that include more and more digital components, you know. That's one of the biggest questions we have right now.

Do you like Star Wars?

Yes.

Do you remember Episode 1?

Oh, I haven't actually watched the prequels, just the original trilogy.

In episode 1 on Star Wars, they tell you how it all starts with Palpatine, you know. They had this world in which they could travel at warp speed and travel across the galaxy and they had all these technologies, but they still had some sort of democratic system in a parliament that couldn't get anything done. In the context of that inefficient parliament, the empire emerges. In a way, Star Wars is a story about the emergence of populism in the context of an inefficient democracy in which technology is advanced but institutions are not. I think in our society we are getting to that point. A big challenge of the 21st century is for institutions to catch up to technology because if that mismatch continues to grow, we might end up on the wrong side of these outcomes. Our institutions will use technology for possibly authoritarian purposes rather than us using technology to achieve more democratic solutions for the way we organise collectively.

Would that transition be by country to country, or would we start voting on our phones and it would slowly get more automated?

I believe that democracy works better in smaller places. I travel a lot and I work a lot with governments across the world. When I go to a country like Uruguay, democracy there is working well. People from the left and the right know each other and are willing to collaborate and compromise and you see that in outcomes, such as response to Covid-19. Same thing with New Zealand. Small countries are able to achieve decent democratic institutions. But as countries get bigger, this mismatch and this popularity contest gets nastier. Countries become divided and political factions are less in contact with each other. I think big countries have the bigger problems right now. Democracy doesn't work as well in the USA, in Brazil, and in the UK. But I don't see these countries having the ability to change. They have the need, but they won't change. I think that change of this kind is more likely to come from smaller countries. If smaller countries are successful in implementing this hyper-democracy and become successful economically because of it, eventually the idea will spread. But this won't happen in a big revolution in a country like the USA, or Russia, with techno-utopian people installing a new government. I hope for this to grow organically in a small place where it is successful and for other places to consider those institutions.