

# Centaur rising

How AI-human interactions will reinvent the very nature of expertise and what this will mean for the future of innovation policies in cities and regions

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# AlphaGo Zero

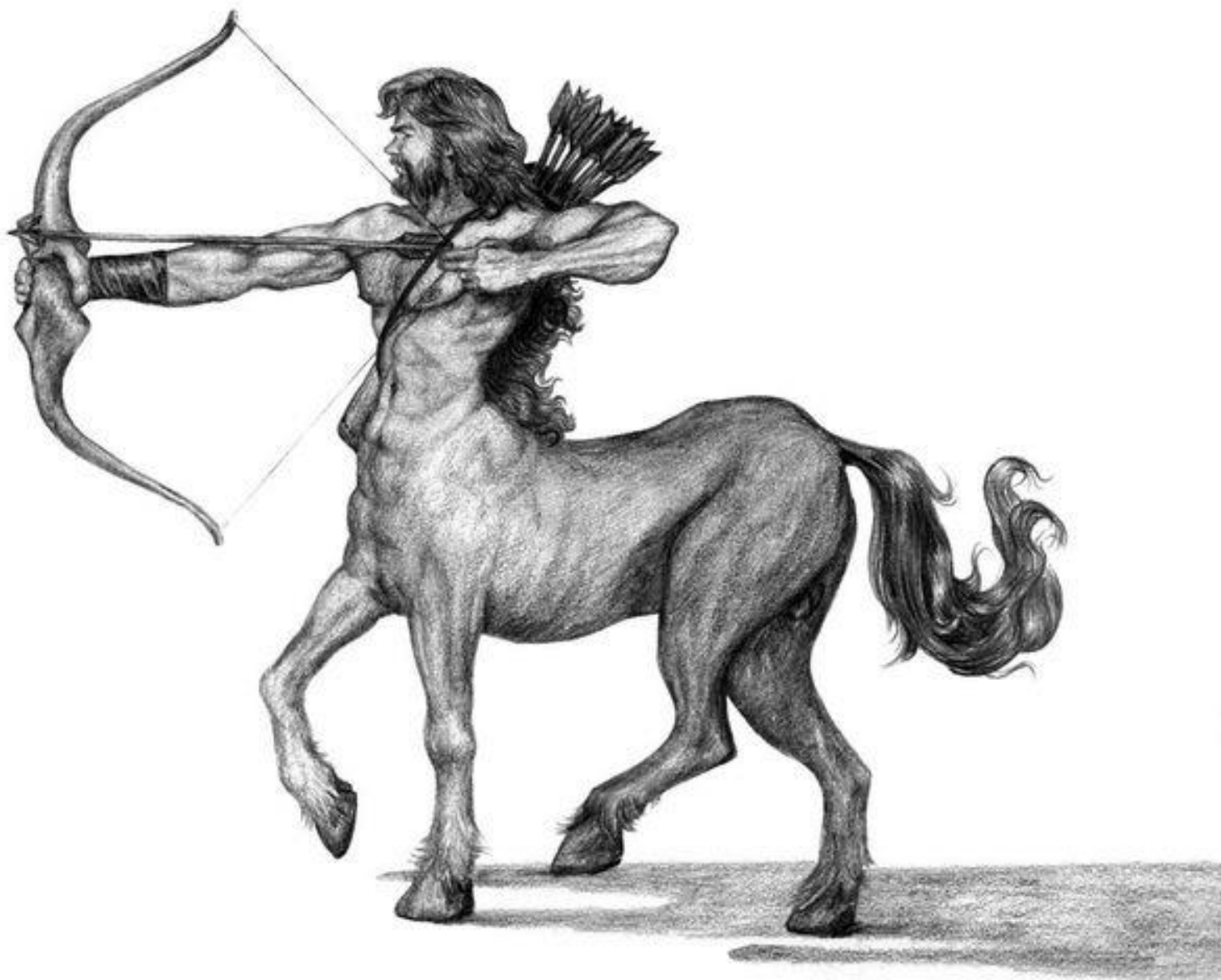
Starting from scratch



# The best part of the story ...

*There was another shock in store for Garry Kasparov. Remember that 2005 online chess tournament, between supercomputers, human grandmasters, and Human+AI centaurs? I forgot to mention who actually won the grand prize. At first, Garry wasn't surprised when a human grandmaster with a weak laptop could beat a world-class supercomputer. But what stunned Garry was who won at the end of the tournament — not a human grandmaster with a powerful computer, but rather, a team of two amateur humans and three weak computers! The three computers were running three different chess-playing AIs, and when they disagreed on the next move, the humans “coached” the computers to investigate those moves further.*

*As Garry put it: **“Weak human + machine + better process was superior to a strong computer alone and, more remarkably, superior to a strong human + machine + inferior process.”***







with the large nasal opening in the  
skull, was once the source of  
of the mythical cyclops. The  
of skeletal remains that  
to be half a man and half a  
in the myth of the centaur.  
eventually explained the strange  
and disproved these myths. The  
evidence that an elephant's trunk has  
skeletal remains dashed the idea of  
one-eyed monster; the pile of bones  
assumed to be a strange new creature  
turned out to be the scattered partial  
bones of a man and his horse. However,  
and legends abound when there is  
no explanation for strange  
phenomena. Consider the Sasquatch and the  
Yeti. There is a field of  
study devoted to the search for and  
documentation of animals whose existence is  
doubted. This field is called cryptozoology, or  
the science of hidden animals. More  
recently, the existence of the Sasquatch  
has been dismissed  
as fully by scientists in fields such  
as paleontology, anthropology, and  
zoology.

# Understanding the new centaurs : deep learning as a basis, symbiotic learning as a core characteristic

- Deep learning : more or less a form of artificial autodidactic process (for instance, an algorithmic self-teaching enabling the recognition of a dog after being fed of thousands of labeled images of various animals).
- Symbiotic learning goes beyond deep learning, which means it is not only a human whose possibilities are boosted by an algorithm in terms of analytical capacities, memory size, real-time access to sources almost infinite information, etc. (This is usually referred as “intelligence augmentation”).
- Three steps of symbiotic learning :
  - First, the human part teaches, guides the IA, encourage them in their curiosity by confronting them to new issues => allows the IA’s creativity to flourish => divergence of IA.
  - Second, the IA part modify the way of thinking of the human part of the symbiote (like the human part of a chess centaur tend progressively to play differently, even when not connected to its (own) AI).
  - Third, eventually centaurs communicate not only with humans and AIs on separate channels => melted communication (even reinforced by the relationships between centaurs and low-level IA ).

# The three steps allowing centaurs to become a common reality

1. Reaching a higher level of AI development
2. Make possible a better integration of AI and humans in terms of communication interfaces
3. To allow for the first time some symbiotes (i.e. human+AI pairs) to grow up together as individual entities



# The innovation potential of centaurs : three research avenues

A. Centaurs, information and knowledge

B. Intelligence is not a single dimension

C. Creativity and invisible innovation

# Which roles should senior leaders still play with the emergence of AIs?

According to Dewhurst and Willmott (2014) there are some tasks for which “managers” will still continue to be better than AIs:

- First task: asking questions.
  - Second task: attacking exceptions.
  - Third task: tolerating ambiguity.
  - Fourth task: employing soft skills.
- Kevin Kelly (2012) : “This is not a race against the machines . . .This is a race with the machines.”

# Centaur and territory

- Will centaurs make the world flatter or spikier?
- Will centaurs show psycho-cultural preferences?
- Centaurs as parts of labor markets? Centaurs co-opetiting?  
Centaurs building communities?

## THE WORLD IN NUMBERS

# The World Is Spiky

*Globalization has changed the economic playing field, but hasn't leveled it*

### A POPULATION

*Urban areas house half of all the world's people, and continue to grow in both rich and poor countries.*

The world, according to the title of the *New York Times* columnist Thomas Friedman's book, is flat. Thanks to advances in technology, the global playing field has been leveled, the prizes are there for the taking, and everyone's a player—no matter where on the surface of the earth he or she may reside. "In a flat world," Friedman writes, "you can innovate without having to emigrate."

Friedman is not alone in this belief: for the better part of the past century,

### PEAKS, HILLS, AND VALLEYS

When looked at through the lens of economic production, many cities with large populations are diminished and some nearly vanish. Three sorts of places make up the modern economic landscape. Flat are the cities that generate innovators. These are the tallest peaks; they have the capacity to attract global talent and create new products and industries. They are few in number, and difficult to topple. Second are the economic "hills"—places that manufacture the world's established goods, take its calls, and support its innovation engines. These hills can rise and fall quickly; they are prosperous but insecure. Some, like Dublin and Seoul, are growing into innovative, wealthy peaks; others are declining, eroded by high labor costs and a lack of enduring competitive advantage. Finally there are the vast valleys—places with little connection to the global economy and few immediate prospects.

### B LIGHT EMISSIONS

*Economic activity—roughly estimated using light-emissions data—is re-concentrated. Many cities, despite large populations, barely register.*

States as a whole and Japan. New York's economy alone is about the size of Russia's or Brazil's, and Chicago's is on a par with Sweden's. Together New York

Population and economic activity are both spiky, but it's innovation—the engine of economic growth—that is most concentrated. The World Intellectual Property Organization recorded about 300,000 patents from resident inventors in more than a hundred nations in 2002 (the most recent year for which statistics are available). Nearly two thirds of them went to American

broad, flat world accounted for just 1 percent of all innovations patented in the United States. In 2003 India generated 341 U.S. patents and China 10. The University of California alone generated more than either country. Stanford accounted for five times as many as two combined.

This is not to say that Indian and Chinese are not innovative. On the contrary, AnnaLee Saxenian, of the University of California at Berkeley, has shown that Indian and Chinese entrepreneurs founded or co-founded roughly 30 percent of all Silicon Valley startups in the last 100 years. But

# Cities, “Schumpeterian hubs” and five-factor theory of personality

- Openness to experience (inventive/curious vs. consistent/cautious)
- Conscientiousness (efficient/organized vs. easy-going/careless)
- Extraversion (outgoing/energetic vs. solitary/reserved)
- Agreeableness (friendly/compassionate vs. challenging/detached)
- Neuroticism (sensitive/nervous vs. secure/confident)



# Policy challenges for cities and regions

- How to favor the emergence of centaurs in a given territory depending from the framework conditions (nurturing symbiotes)?
- How to retain centaurs that emerged on the territory (avoiding brain&algorithm drain)?
- How to attract centaurs on a given territory (“seducing human+AI pairs”)?

*I've come up with a set of rules that describe our reactions to technologies:*

*1. Anything that is in the world when you're born is normal and ordinary and is just a natural part of the way the world works.*

*2. Anything that's invented between when you're fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it.*

*3. Anything invented after you're thirty-five is against the natural order of things.*

**Douglas Adams, The Salmon of Doubt**