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HOW DIVERSITY DRIVES COLLECTIVE INTELLIGENCE

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Everyone talks about **artificial intelligence**. It invades our cars, our homes, our phones, our office computers. At the same time, progress in **neuroscience**, on learning, memory, and all kinds of cognitive biases, floods our media and culture, becoming popular to the point of influencing management and education practices.

Despite the howling winds of madness currently circling planet, it is clear that our century will be dedicated to the pursuit of intelligence. It is the deeper trend, underneath the daily foam of current events. Advertisers have caught on to it: everything these days must be "smart", from our cities to our thermostats, and even our laundry detergents!

But in addition to minds and machines, there is a third source of intelligence, underhyped and underexploited despite its huge potential: our *collective* intelligence.





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We are 7.7 billion human brains, increasingly connected by digital tools: mobile phones, email, social networks, video conferencing and machine translation. Never before has the potential for collective intelligence been so high.

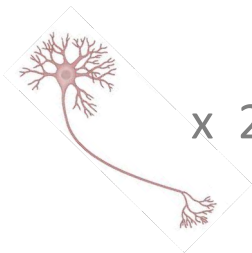
Moreover, humanity has never had as much computing power as it does today. And I'm no talking about computers. It is estimated that a single human brain is capable of as many mathematical operations per second as thirty state-of-the-art Chinese supercomputers, a half-million game consoles, or 300 million smartphones. By this standard, the cumulative power of all the computers in the world is barely worth 1000 human brains. And tomorrow we will be 8 billion!

Pierre Teilhard de Chardin proposed that *"nothing in the universe can resist a large enough number of minds grouped together and properly organized."* When we put side by side our global computing power, which has never been so great, with the fact that our billions of brains are, thanks to digital technology, more than ever able to collaborate, one thing is clear: we are on the threshold of a new era of intelligence. An era in which the collective can express itself on a scale unthinkable by previous generations.

A supercollective era, where our minds, properly grouped and organized, could shake up the universe.



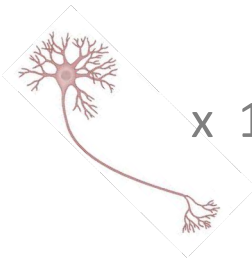
There is strength in **numbers**



x 200,000 =



x 1,000,000 =



x 100,000,000,000 =



x 1 =



But **Organisation** matters

2010: Human groups have their own IQ

Evidence for a Collective Intelligence Factor in the Performance of Human Groups

Anita Williams Woolley,^{1*} Christopher F. Chabris,^{2,3} Alex Pentland,^{3,4} Nada Hashmi,^{3,5} Thomas W. Malone^{3,5}

Psychologists have repeatedly shown that a single statistical factor—often called “general intelligence”—explains the correlations among people’s performance on a wide variety of cognitive tasks. But no one has systematically examined whether a similar kind of “collective intelligence” exists for groups of people. In two studies with 699 people, working in groups of two to five, we find converging evidence of a general collective intelligence factor that explains a group’s performance on a wide variety of tasks. This “c factor” is not strongly correlated with the average or maximum individual intelligence of group members but is correlated with the average social sensitivity of group members, the equality in distribution of conversational turn-taking, and the proportion of females in the group.

As research, management, and many other kinds of tasks are increasingly accomplished by groups—working both face-to-face and virtually (1–3)—it is becoming ever more important to understand the determinants of group performance. Over the past century,

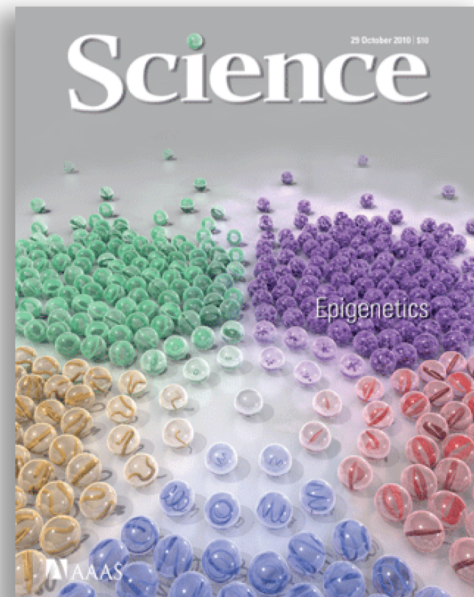
psychologists made considerable progress in defining and systematically measuring intelligence in individuals (4). We have used the statistical approach they developed for individual intelligence to systematically measure the intelligence of groups. Even though social psycholo-

gists and others have studied for decades how well groups perform specific tasks (5, 6), they have not attempted to measure group intelligence in the same way individual intelligence is measured—by assessing how well a single group can perform a wide range of different tasks and using that information to predict how that same group will perform other tasks in the future. The goal of the research reported here was to test the hypothesis that groups, like individuals, do have characteristic levels of intelligence, which can be measured and used to predict the groups’ performance on a wide variety of tasks.

Although controversy has surrounded it, the concept of measurable human intelligence is based on a fact that is still as remarkable as it was to Spearman when he first documented it in 1904

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What determines group IQ most?

- ~~A. Average individual IQ~~
- ~~B. Highest individual IQ~~
- ~~C. Age of individuals~~
- D. Proportion of women**

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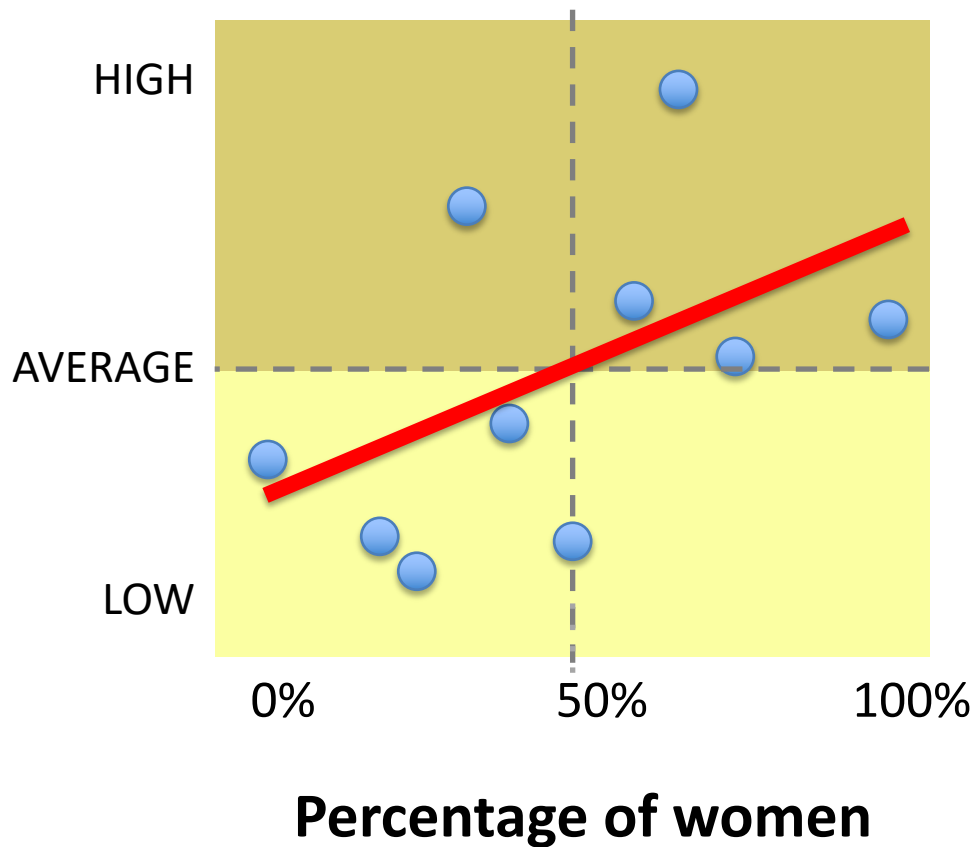


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Group
IQ



Woolley, A. et Malone, T. (2011) Defend your research : What Makes a Team Smarter ? More Women. *Harvard Business Review*, June 2011



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What determines group IQ most?

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~~B. Highest individual IQ~~

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D. Proportion of women

➔ Equality of speaking time

➔ « Social Sensitivity »



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AGHAST

BAFFLED



DISTRUSTFUL

TERRIFIED

Test your « social sensitivity »
<https://socialintelligence.labinthewild.org/mite/>

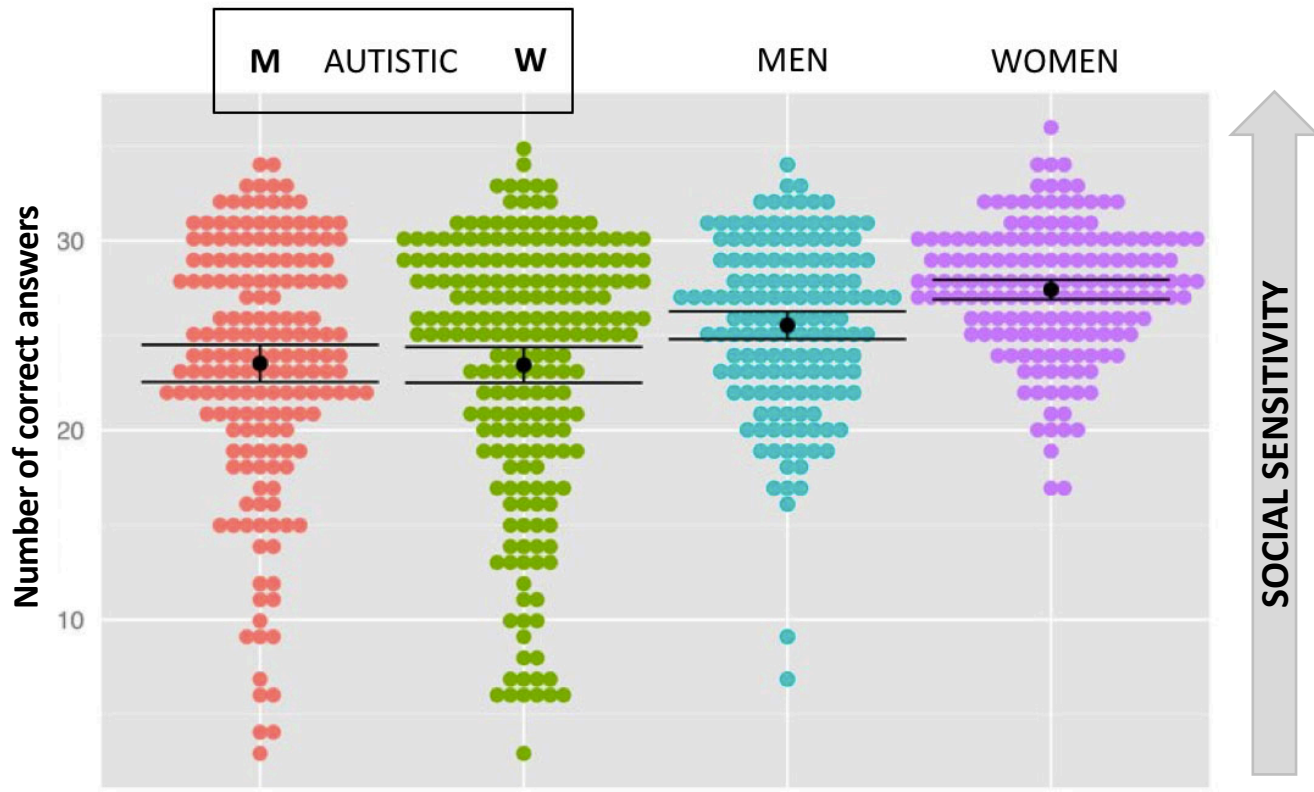


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Women score higher than men on “social sensitivity”



Baron-Cohen, S., et al. (2015). The “Reading the Mind in the Eyes” test : Complete absence of typical sex difference in 400 men and women with autism. *PLoS ONE*, 10 : 8.



Group **IQ** depends on the **EQ** (emotional intelligence)
of individuals in the group

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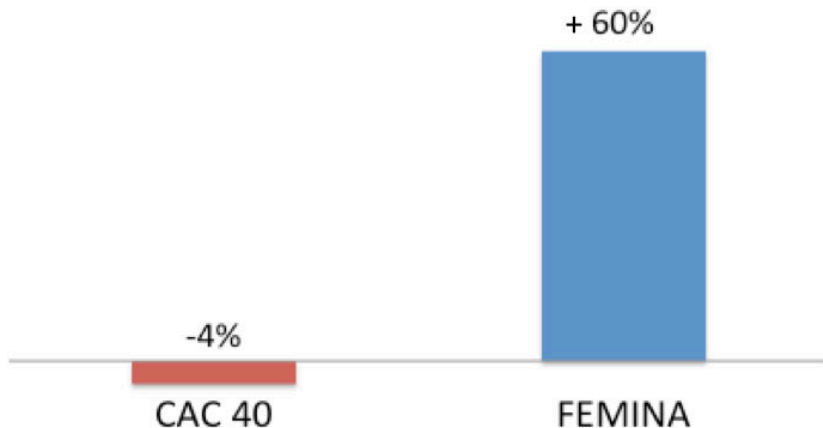
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FEMINA index*: 15 companies in CAC 40 with at least 35% women managers

Stock Market Performance **2006-2016**



Observatoire Skema de la féminisation des entreprises, Édition 2016

L'Oréal
Hermès



Casino

Natixis

Publicis

Sodexo

Vivendi

Danone

BNP Paribas

Société Générale

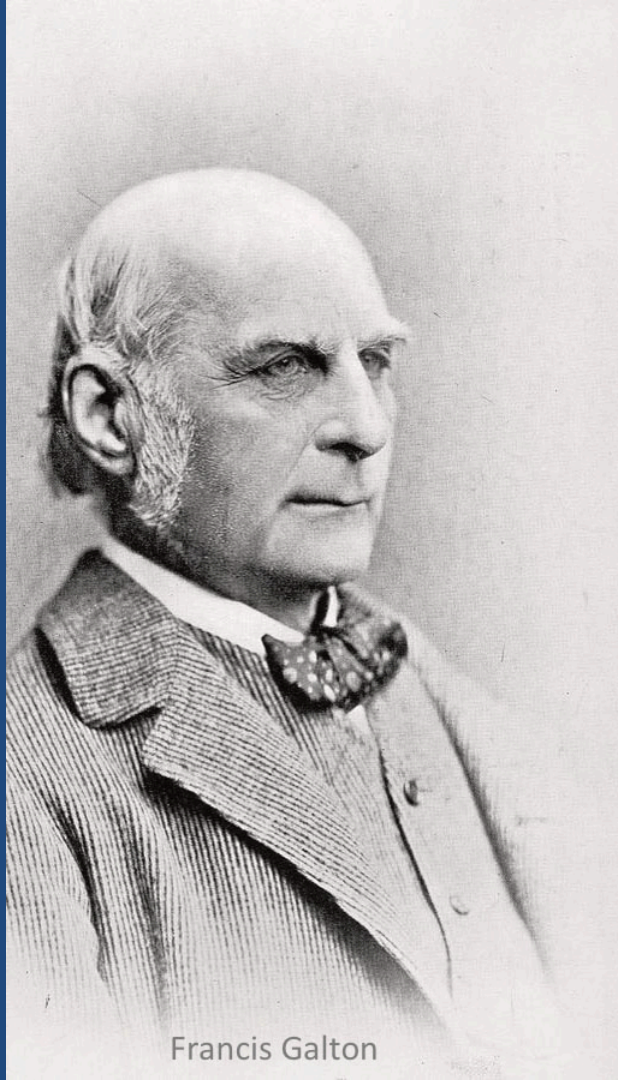
LVMH

Kering

Sanofi

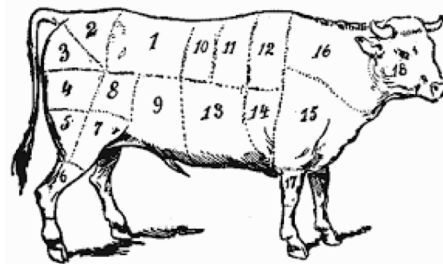
Accor

Axa



Francis Galton

The wisdom of crowds (1906)



787
estimates

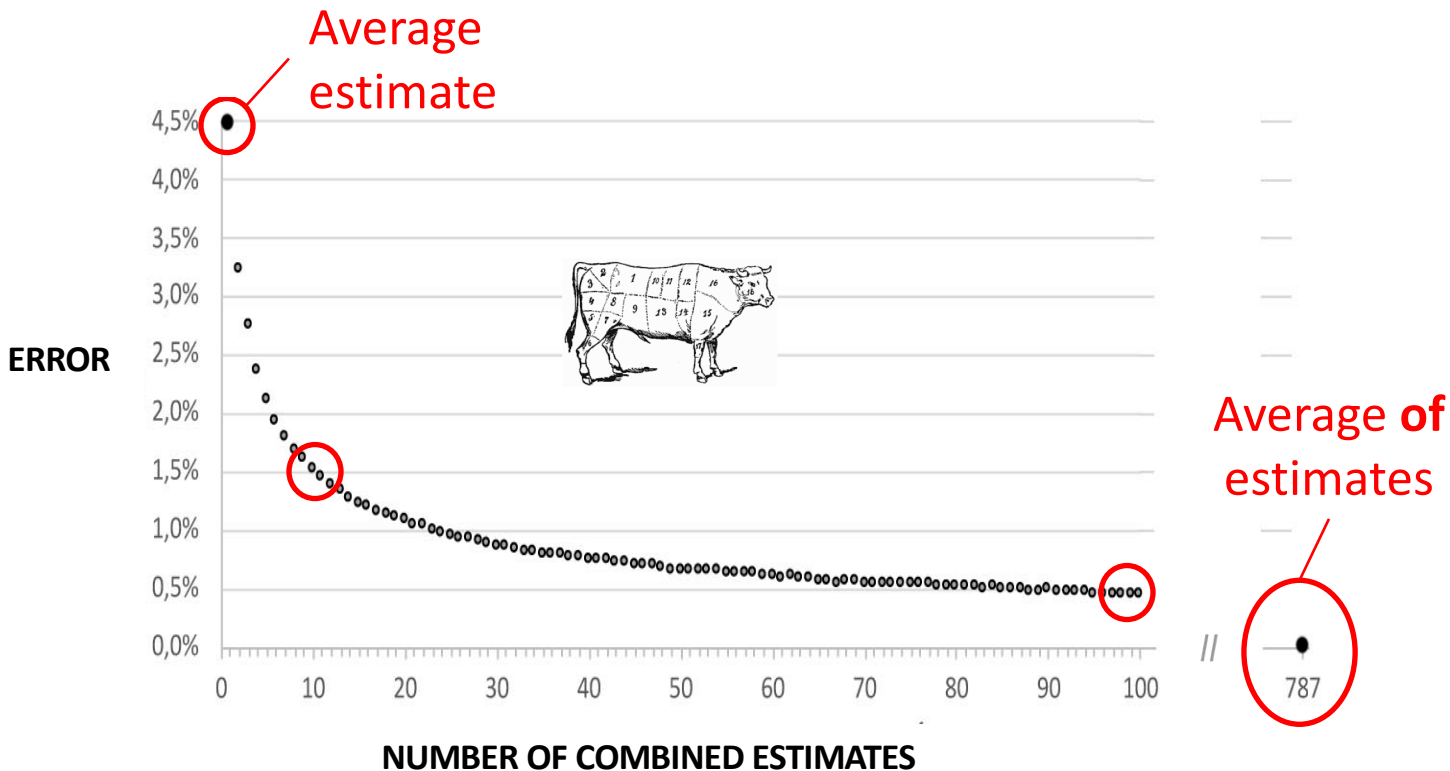
Median estimate

548 kg

Real weight

543 kg

Larger groups are smarter





The Diversity Theorem

$$\begin{array}{ccccc} \text{Group Error} & = & \text{Average Individual Error} & - & \text{Diversity of Estimates} \\ \hline (Group - Truth)^2 & = & \frac{1}{N} * \sum_{i=1}^N (individual_i - Truth)^2 & - & \frac{1}{N} * \sum_{i=1}^N (individual_i - Group)^2 \end{array}$$

Scott Page

- Everyone contributes **knowledge + biases**
- Knowledge is **cumulative**
- Biases **cancel** each other



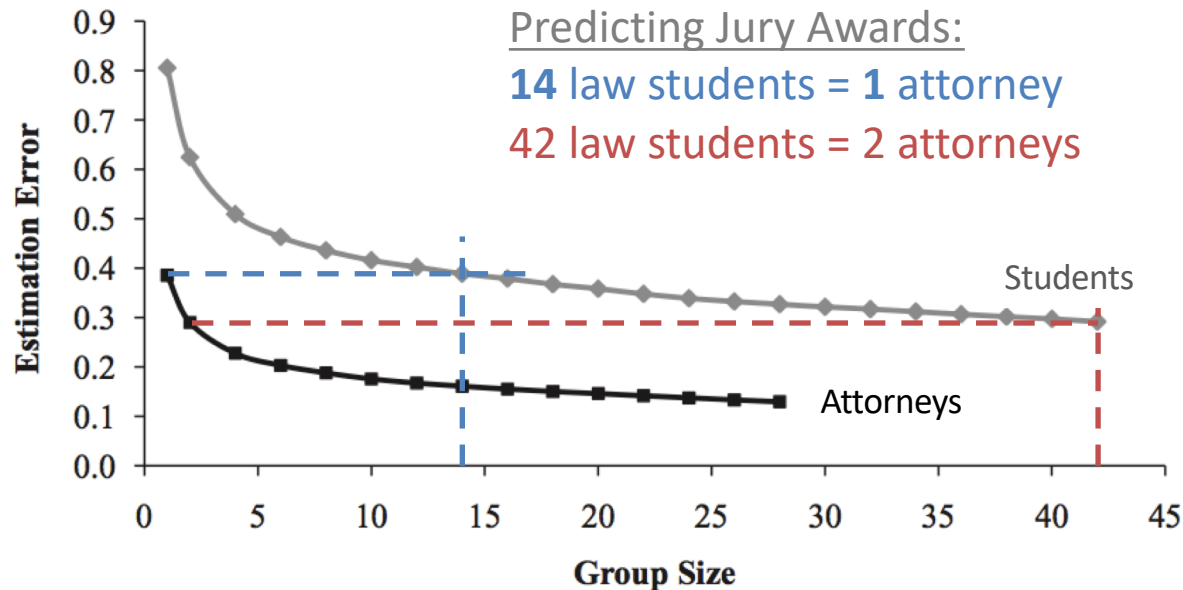


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Diversity and expertise are equally valuable



Jacobson, J., Dobbs-Marsh, J., Liberman, V., and Minson, J. (2011) Predicting Civil Jury Verdicts: How Attorneys Use (and Misuse) a Second Opinion. *Journal of Empirical Legal Studies*, 8(S1), 99--119



The wisdom of crowds (2007)*

The most heeded futurists these days are not individuals, but prediction markets, where the **informed guesses of many** are consolidated into hard probability

The
Economist

* 101 years after Francis Galton's discovery





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The largest improvement in
judgmental forecasting accuracy
observed in the literature.



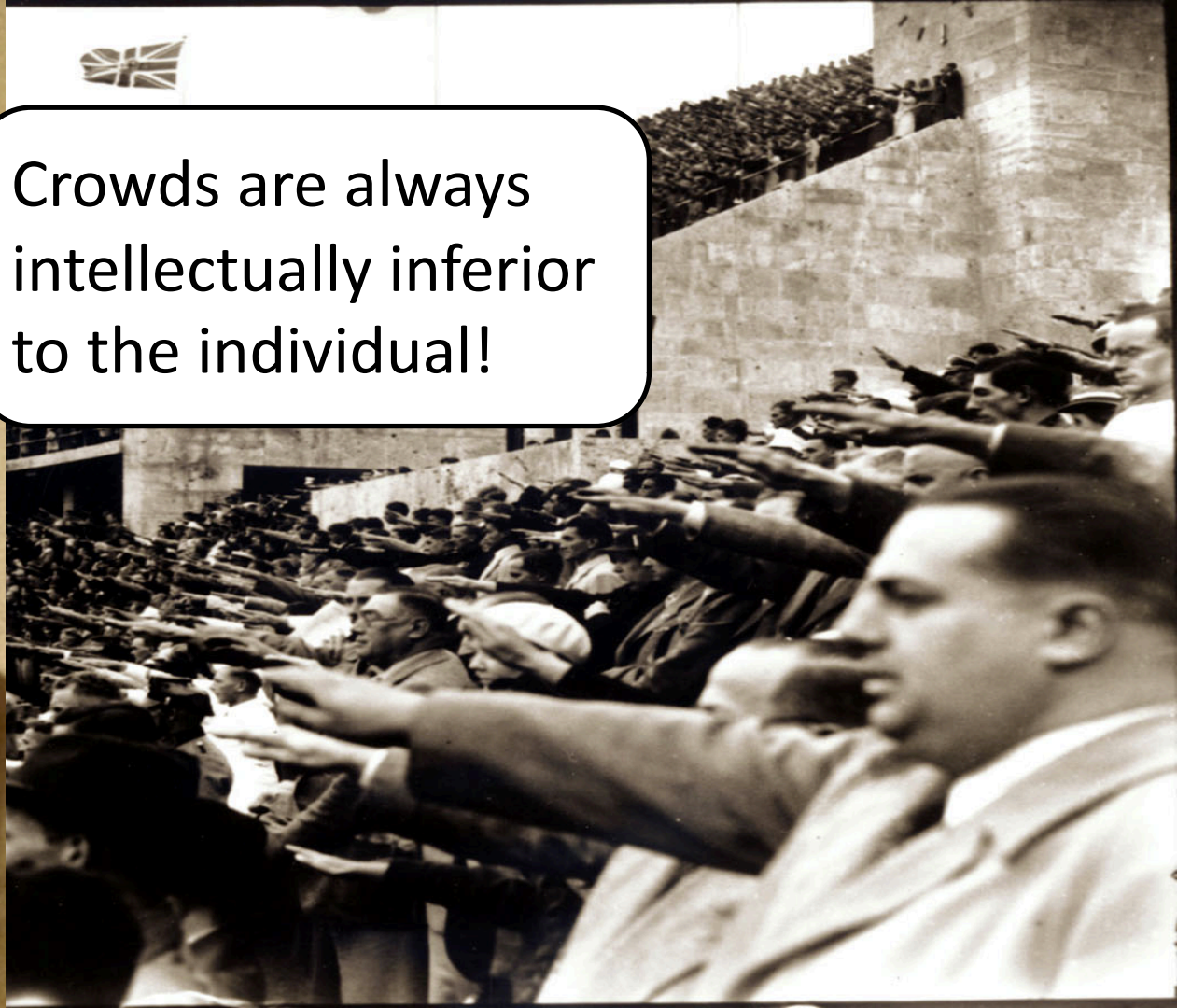
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Gustave Le Bon, 1895

Crowds are always
intellectually inferior
to the individual!



How to achieve ~~consensus~~ intelligence

Encourage originality,
discourage
conformity

Gather expertise
from the ground

INDEPENDENT
thought

DECENTRALIZED
inputs

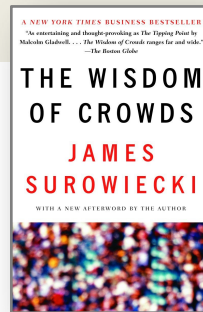
OBJECTIVE AGGREGATION

DIVERSE
opinions

Consolidate
opinions
objectively

Cultivate diverse
points of view

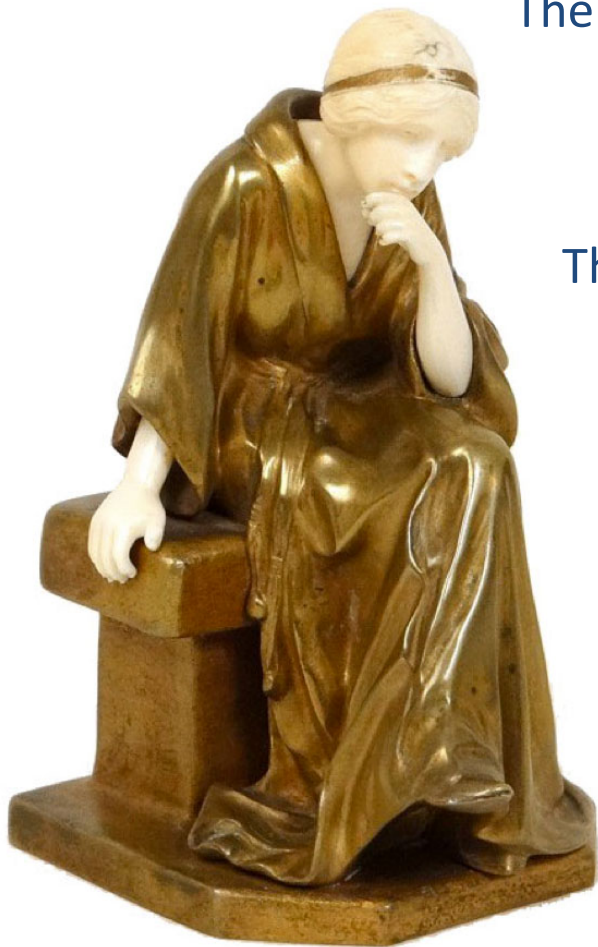
COLLECTIVE
INTELLIGENCE



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The enemy of intelligence is
not multitude,
but conformity.

The friend of wisdom is
not isolation,
but diversity.





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If we don't want intelligence in the 21st century to be artificial only, we need to better organize our own, with increased amounts of listening, respect for our differences, and systematic exploitation of

our diversity, be it ethnic, cultural, sexual, generational... The more we cultivate and combine our differences, the smarter we will be together.





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