

# MATHS, PANDEMICS, PHYSICS, FINANCE: MY JOURNEY INTO EFFECTIVE ALTRUISM

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# ABOUT ME

# Now:

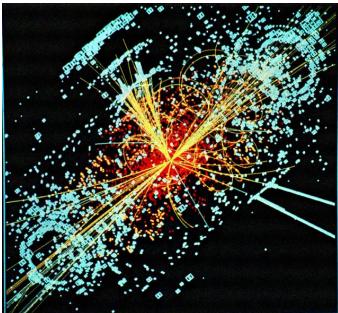
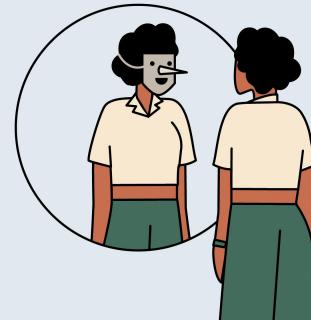
- I'm 22 :)
- Started in October a PhD at Cambridge University
  - Officially in “Applied Mathematics and Theoretical Physics”
  - In reality, in mathematical epidemiology (more on this later)
  - Funded by a Gates Cambridge Scholarship



HOW I GOT HERE...

# BEFORE EA...

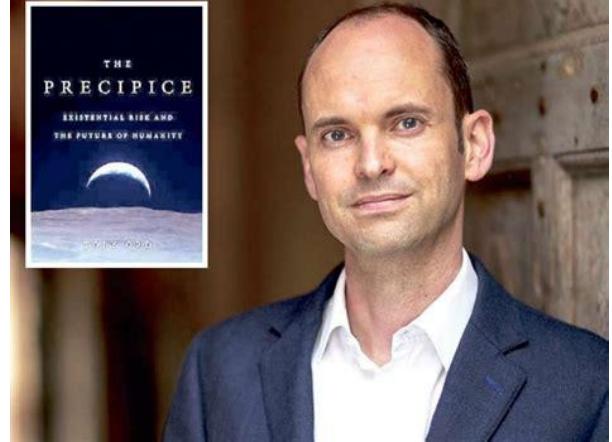
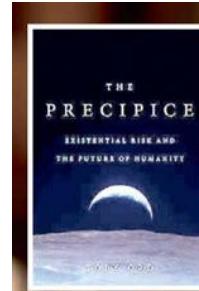
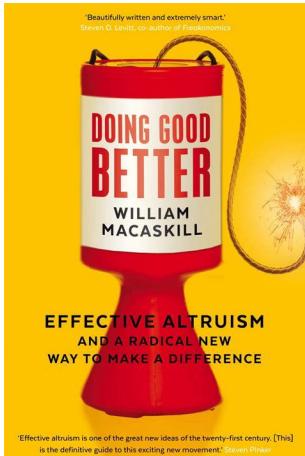
- I'm from Madrid, Spain
- I enjoyed academics a lot
- Applied to study maths undergrad at Cambridge
- Hard but I loved (most of) it
- I met Stephen Hawking!
- Summer research project in Population Dynamics in a biophysics group (→ Now on arXiv!: <https://arxiv.org/abs/2112.06256>)



LONDON  
MATHEMATICAL  
SOCIETY

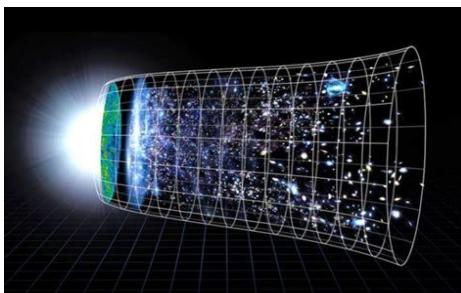
# THE “ENLIGHTENMENT”

- EA Cambridge had a decent size in the late 2010s
- Couple of friends mentioned their interest in EA
- I read Doing Good Better in summer 2019 ([get it free](#))
- I went to my first EA Cambridge social in Jan 2020!
- Toby Ord talk at in (early) March 2020

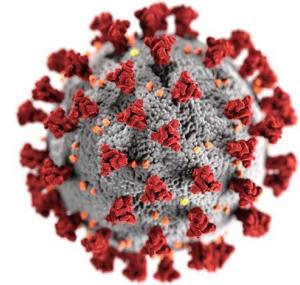


# THE CONFUSION/TRANSITION PERIOD

- Surprise (?!): Covid-19 happened and got to Europe
- Finishing maths undergrad
- EA clicked but I “wanted” to be a theoretical physicist
- Research project in early-universe cosmology
- 80,000 Hours Coaching
  - It was really hard to decide
- Cambridge Masters in Theoretical Physics / Applied Maths
  - I did my thesis on the Renormalization Group in Epidemiology



**80,000  
HOURS**



# MATHS AND IMPACTFUL CAREERS

# EA CAMBRIDGE'S MATHS CAREERS WORKSHOPS

- Workshops aimed at Maths students
- No prior familiarity with EA required
- Adapted standard EA Career Workshop
  - Intro to 80,000 Hours framework
- Sections on AI Safety, Quantitative Biology, ETG in Quantitative Trading
  - Also Economics for Global Priorities Research
  - General Longtermist Research / Thinking
- Next one happening on Saturday!! Sign up here:

<https://www.facebook.com/events/466313434869522>



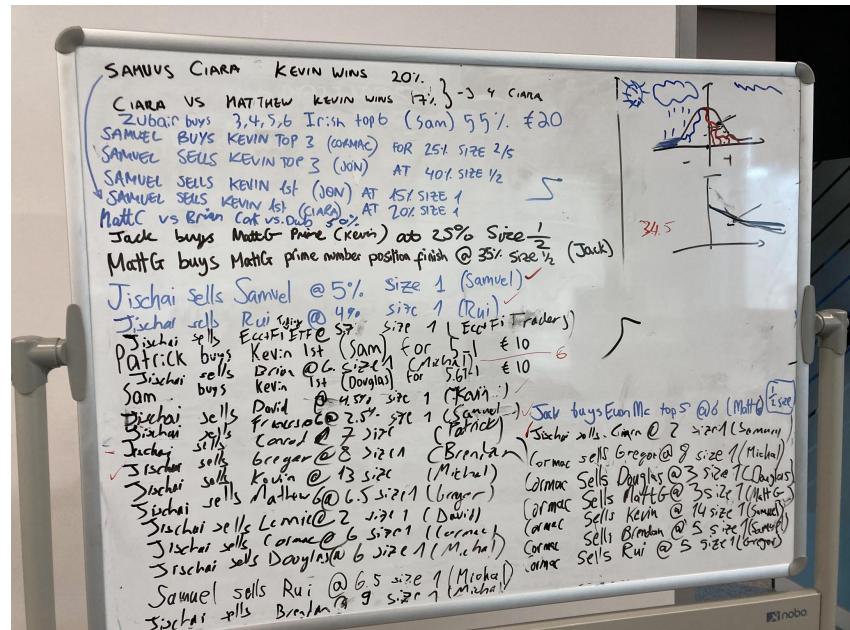
**Effective Altruism**  
Cambridge

# QUANT FINANCE AND MY SIG INTERNSHIP

# "I'D NEVER SELL MY SOUL TO FINANCE"



- Quant Finance extremely popular for Cambridge students
- Had it not been for EA, I'd never have done it
- Gained a lot of Info Value
- Intro to finance classes
- Poker and Game Theory classes
- Financially rewarding
- Had lots of fun in Dublin!



MY PHD

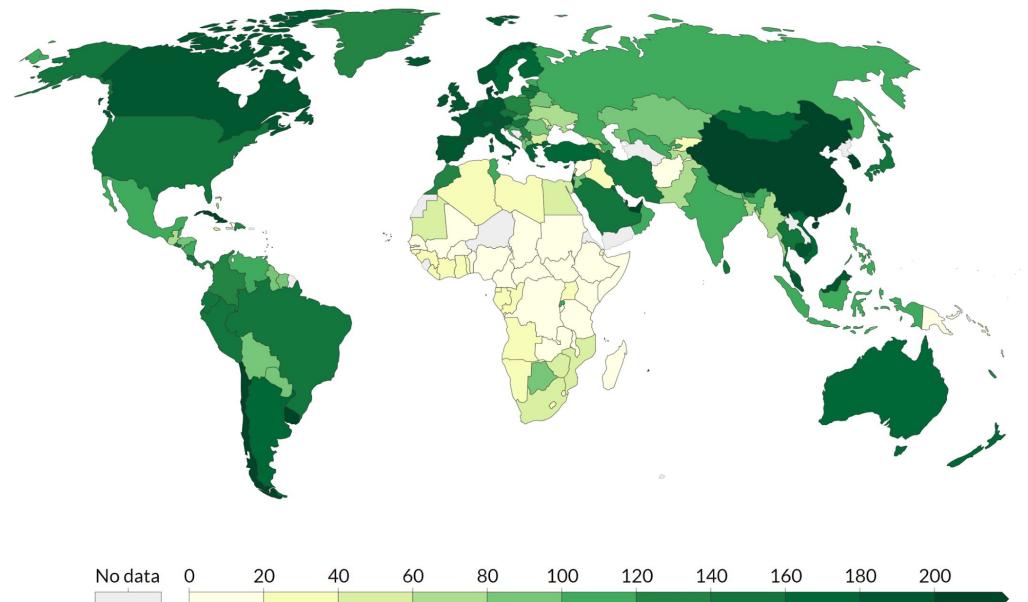
# WHAT I'M DOING I

## Vaccine prioritization:

- should we have vaccinated first the younger population that has more social contacts?
- should we donate vaccines before giving boosters?

COVID-19 vaccine doses administered per 100 people, Jan 9, 2022  
All doses, including boosters, are counted individually. As the same person may receive more than one dose, the number of doses per 100 people can be higher than 100.

Our World  
in Data

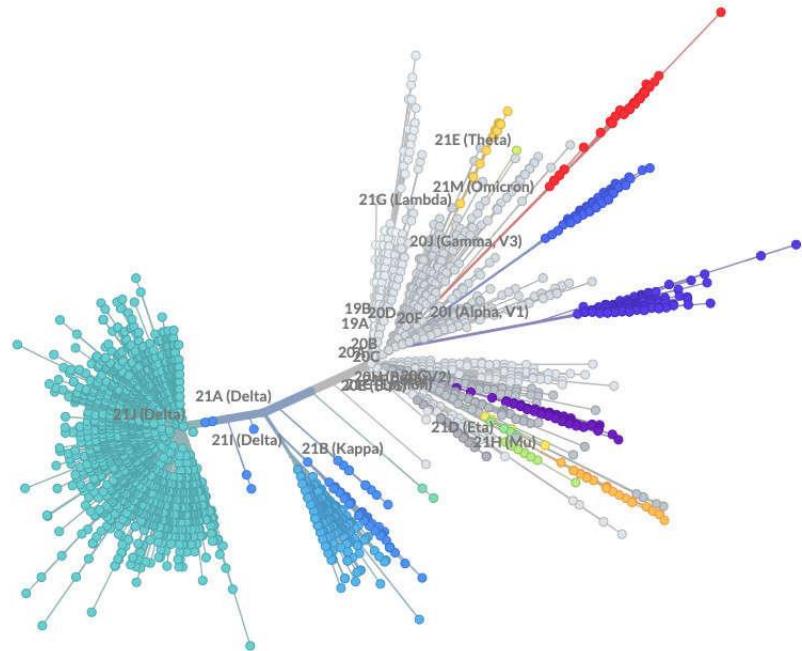


Source: Official data collated by Our World in Data – Last updated 10 January 2022, 10:10 (London time)  
[OurWorldInData.org/coronavirus](https://OurWorldInData.org/coronavirus) • CC BY

# WHAT I'M DOING II

## Variants and vaccine immune escape:

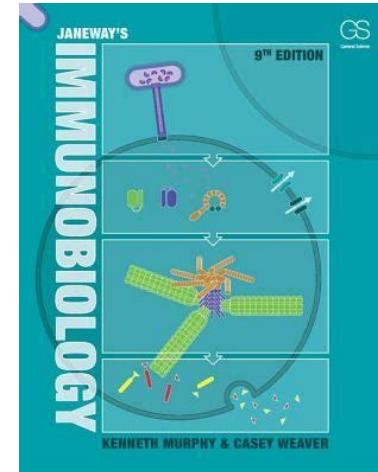
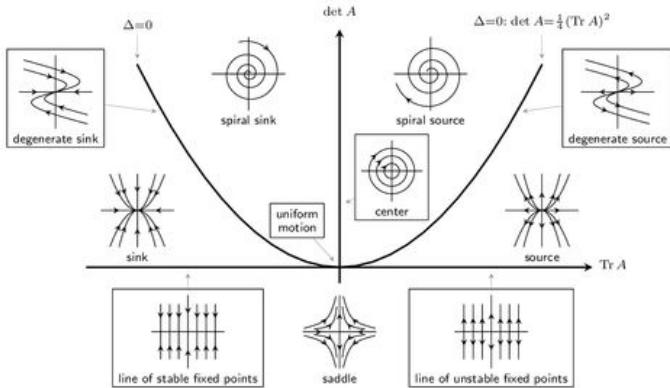
- What is the probability of generating a variant that escapes the vaccines (like a Omicron)?
- Will the virus evolve to more or less virulent/transmissible?
- Is a vaccinated person more or less likely to generate a variant (if they become infected) than an unvaccinated one?
- What's the population level effect of waning immunity?



# HOW I'M DOING IT

- Simple mathematical models
  - Systems of ODEs, PDEs, Probability
- Analytical results
- Computational help and insight
- Learning biology
  - Within-host models and population-level models
- Interdisciplinary
- Thinking about comparative advantages
- Inspired by COVID-19
- But theoretical, useful for next pandemic
- Reading lots of papers

Poincaré Diagram: Classification of Phase Portraits in the  $(\det A, \text{Tr } A)$ -plane

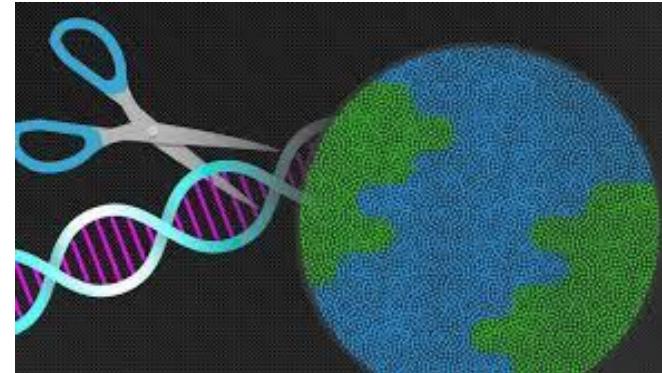


# LONG-TERM PLAN & SIGNIFICANCE

- Biosecurity from academia
- Maths perspective
- Science policy?
- Science communication?



WHO



QUESTIONS

ADVICE