



ALEXANDRA
BRINTRUP
UNIVERSITY OF
CAMBRIDGE



VIVIANA ANGELY
BASTIDAS MELO
UNIVERSITY OF
CAMBRIDGE



SCOTT
HOSKING
BRITISH
ANTARCTIC SURVEY



JENNIFER
SCHOOLING
UNIVERSITY OF
CAMBRIDGE

DATA SHARING
IS A CHALLENGE IN
SUPPLY CHAINS

Dealing
with
Sensitive
Information
CLASSIFIED

HARD TO
PREDICT

INCENTIVIZE SHARING

We NEED TO
APPEAL TO
INDUSTRY &
ACADEMIA

IS
PUBLISHING
BROKEN?

OXFORD, IMPERIAL,
CAMBRIDGE. IF WE
CAN'T CHANGE IT,
WHO WILL?

We're incentivised to
IMAGINE & ANSWER
questions NOONE's asking



CHAIR: NEIL LAWRENCE

AP
SCI
ACCELERATE
PROGRAMME
FOR SCIENTIFIC DISCOVERY

COLLECTING DATA
IN CITIES IS A
CHALLENGE!

WE MUST Understand
COMMUNITIES Better

COLLABORATE ACROSS
DISCIPLINES



e.g.
failure of
SIDEWALK
PROJECT

We have
fewer sensors
in ANTARCTICA
than a LONDON
STREET



WEATHER
FORECASTS

YOU KNOW IT'S
GOING TO BLOW
SO MODEL THE
EVACUATION

GET A
SIMULATOR
IN THE
LOOP to better
resemble the PHYSICS



BOTTLENECK

AI
CAN SPOT IT BUT
NEEDS A HUMAN
TO UNDERSTAND IT

Typically
you need to
EXPLAIN
a SYSTEM

Solved
it!



UHUH.

AI Needs more
sophisticated
understanding
- e.g. of TUNNELS
BETWEEN



AI

GRAND CHALLENGES IN AI FOR SCIENCE



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PANEL
DISCUSSION

AI
FOR
SCIENCE
SUMMIT

**WHAT MAKES A WAVE BREAK?
HOW MACHINE LEARNING CAN
SHED LIGHT ON THE UNDERLYING
PHYSICS OF BREAKING WAVES**

TIM TANG
UNIVERSITY OF OXFORD

OUR EQUATION SUGGESTS NEW CHARACTERISTIC OF BREAKING WAVES AND HINTS AT MUCH CHEAPER WAYS TO COMPUTATIONALLY SIMULATE BREAKING WAVES (W.I.P!)

RESULTS ARE VER⁴ FAST!

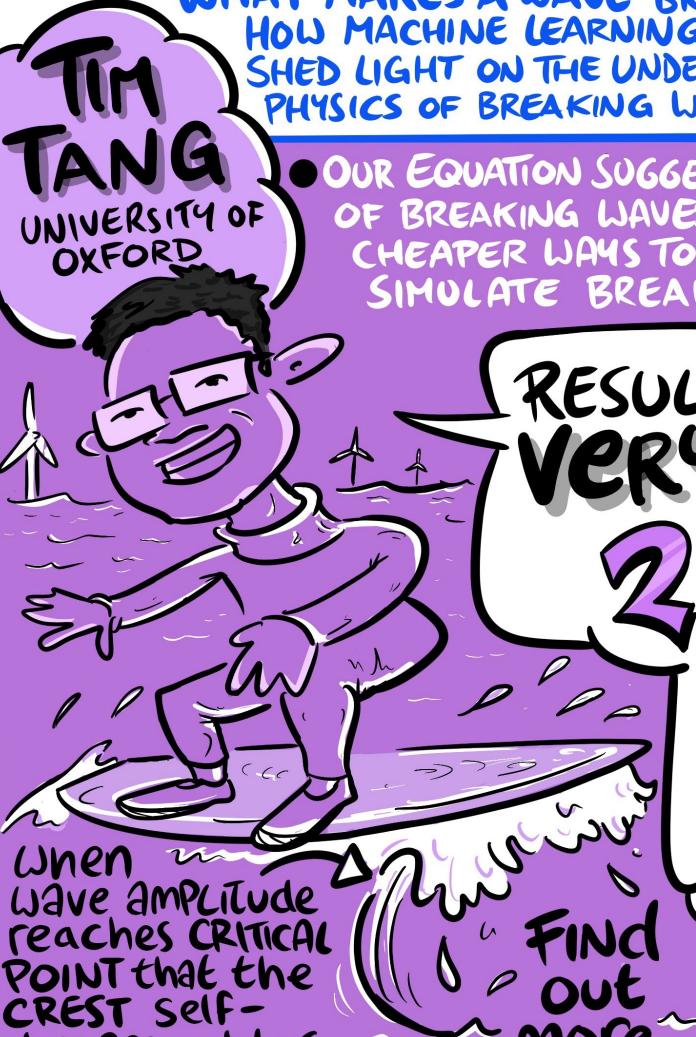
**3 MINUTES ON A DESKTOP VS.
3259 CORE HOURS ON A SUPER COMPUTER**

When wave amplitude reaches CRITICAL POINT that the CREST self-dissassembles

FIND OUT MORE →

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EMPLOYING AI TO IDENTIFY THE COMPLEX INTERACTIONS OF ENVIRONMENTAL STRESSORS ON POLLINATOR HEALTH

RACHEL PARKINSON
UNIVERSITY OF OXFORD

- SOUND IS A TYPICALLY OVERLOOKED ASPECT OF INSECT BEHAVIOUR
- I'VE CONSTRUCTED A RECORDING ARENA FOR HIGH-THROUGHPUT data acquisition from insects

I'M DEVELOPING A **MULTI-MODAL ML ALGORITHM** THAT AUTOMATICALLY TRACKS BEHAVIOUR

This System **QUANTIFIES** the effects of **ENVIRONMENTAL STRESSORS!**

Tracking behaviour through SOUND AND VIDEO!

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MATHEMATICAL CONJECTURE GENERATION & MACHINE INTELLIGENCE

CHALLENGER MISHRA

UNIVERSITY OF CAMBRIDGE



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- GOOD CONJECTURES HAVE HISTORICALLY INSPIRED NEW MATHEMATICS AND SHAPED PROGRESS IN THEORETICAL PHYSICS

Machine learning is TAILOR-MADE to solve problems in PATTERN RECOGNITION

A NEW FRAMEWORK

FOR A PRINCIPLED STUDY OF THIS SPACE, WITH DOMAIN KNOWLEDGE AND MACHINE LEARNING

GENERATES
= NON TRIVIAL =
CONJECTURES

IN GROUP THEORY & NUMBER THEORY



FOR SCIENCE SUMMIT

AI-ENHANCED SYNTHESIS TO SAVE BIODIVERSITY

ALEC CHRISTIE

UNIVERSITY OF CAMBRIDGE



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- LARGE-SCALE SYNTHESIS METHODS ARE TOO MANUAL & TOO SLOW
- AI CAN VASTLY SPEED UP SYNTHESIS PIPELINE TO ACCELERATE THE COMMUNICATION OF EVIDENCE TO KEY DECISION-MAKERS

AUTOMATE evidence SYNTHESIS PIPELINE
Detect INVASIVE SPECIES
AND PESTS
USING SOCIAL MEDIA + NEWS SITES



FOR SCIENCE SUMMIT

CUSTOMISING 3D CELL SEGMENTATION TO STUDY PRE-IMPLANTATION MOUSE EMBRYOS

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FOR SCIENTIFIC DISCOVERY

ANITA
KARSA

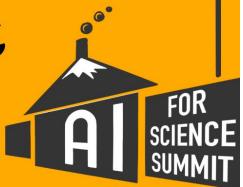
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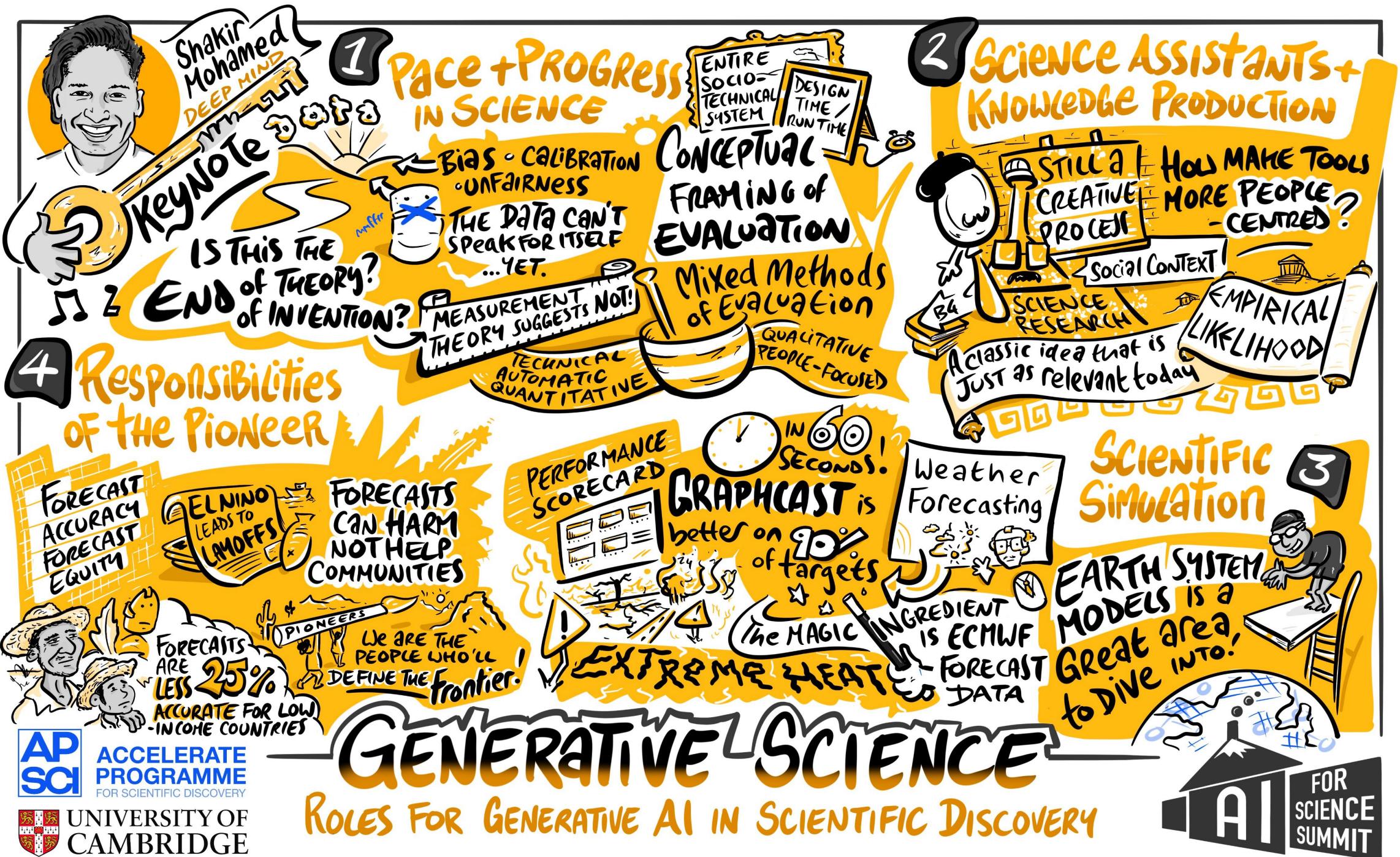
- BIOLOGISTS GET INSIGHTS ON FERTILITY BY STUDYING THE PRE-IMPLANTATION DEVELOPMENT OF MOUSE EMBRYOS
- 3D CELL SEGMENTATION IS KEY TO THIS IMAGE ANALYSIS BUT MANUAL SEGMENTATION TAKES SEVERAL DAYS

We trained
STARDIST 3D
on mouse embryo data
to get accurate 3D cell
segmentation in UNDER
20 MINUTES!



FIND OUT
MORE







EMPLOYING AI TO IDENTIFY THE COMPLEX INTERACTIONS OF ENVIRONMENTAL STRESSORS ON POLLINATOR HEALTH

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HYPERTRACK: NEURAL COMBINATORICS FOR HIGH-ENERGY PHYSICS

MIKAEL MIESKOLAINEN

IMPERIAL COLLEGE LONDON

UNIVERSITY OF CAMBRIDGE

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- A NEW DEEP-LEARNING-DRIVEN CLUSTERING ALGORITHM THAT UTILISES A SPACE-TIME NON-LOCAL TRAINABLE GRAPH CONSTRUCTOR, A GRAPH NEURAL NETWORK AND A SET TRANSFORMER

PARTICLE TRACKING SIMULATIONS SHOWCASE THE EFFECTIVENESS OF THIS CUTTING EDGE APPROACH

- CALORIMETRY
- JET PHYSICS
- PILE-UP DISCRIMINATION
- ... AND BEYOND!

Next Frontier

Develop model to capture degrees of freedom, able to describe transitions from elementary particles through to galaxy clusters

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AI FOR SCIENCE SUMMIT

A MULTISCALE GENERATIVE MODEL UNVEILS DISORDER IN DOMAIN BOUNDARIES

JIADONG DAN
NATIONAL UNIVERSITY OF SINGAPORE

A CRITICAL CHALLENGE IN ATOMIC RESOLUTION MICROSCOPY IS IDENTIFYING STRUCTURAL MOTIFS IN SYNTHESISED MATERIALS

We introduce a novel HYBRID GENERATIVE MODEL to PREDICT UNSEEN DOMAIN BOUNDARIES

ML MODELS CAN DECIPHER DISORDER IN COMPLEX MATERIALS, ENABLING ADVANCES IN FUTURE FUNCTIONAL MATERIALS DESIGN

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IMAGE-BASED AI DIAGNOSIS PLATFORM FOR EARLY DROUGHT STRESS DETECTION IN PLANT LEAVES

ALICE MALIVERT
IMPERIAL COLLEGE LONDON

- DROUGHT STRESS IS CAUSE OF OVER 34% OF CROP LOSS IN DEVELOPING AND LEAST DEVELOPED COUNTRIES
- WE MUST DETECT THE FIRST SIGNS QUICKLY AND COST-EFFICIENTLY

I PROPOSE AN **AI-ASSISTED TOOL** TO DETECT EARLY SIGNS OF DROUGHT STRESS IN PLANT LEAF PICTURES

ULTIMATE RESULT IS OPEN ONLINE PLATFORM TO DIAGNOSE DROUGHT STRESS IN PLANT LIFE PICTURES FOR RESEARCHERS AND FARMERS ALIKE!

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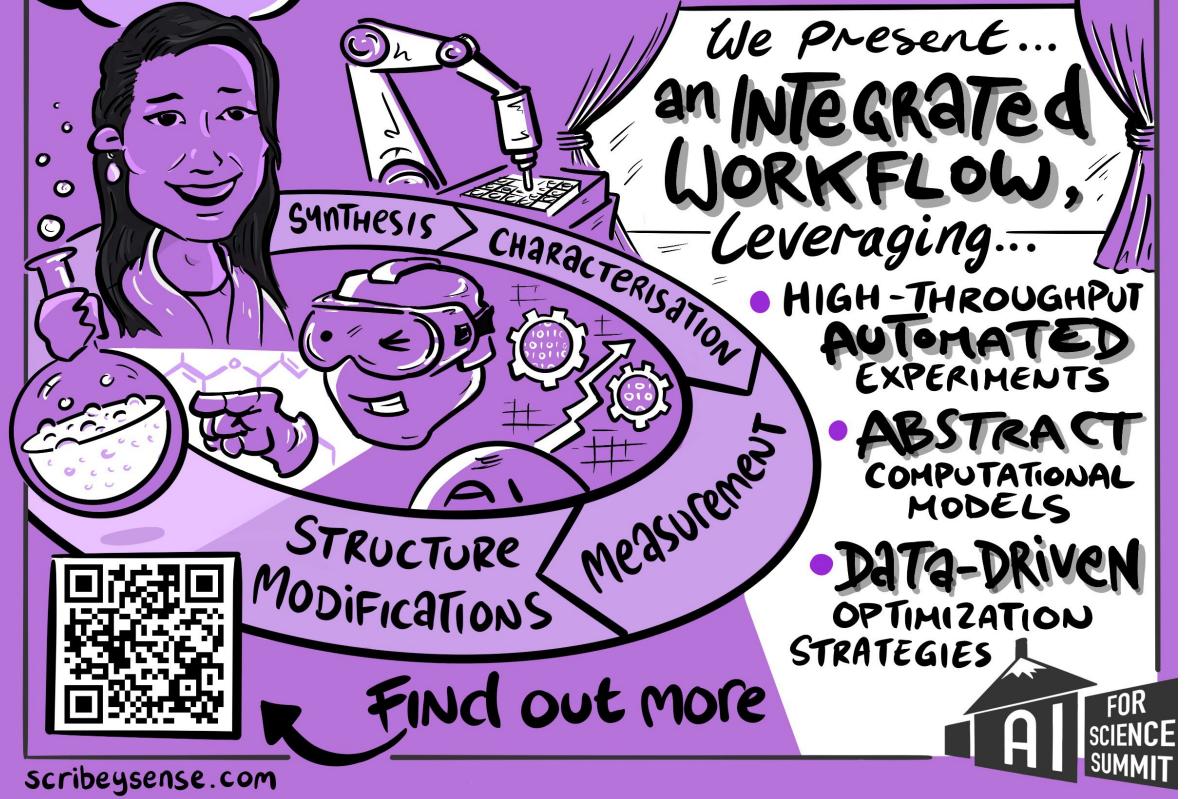
TOWARDS A GENERALISED PLATFORM FOR AI-DRIVEN ACCELERATION OF CLOSED-LOOP CHEMICAL DISCOVERY

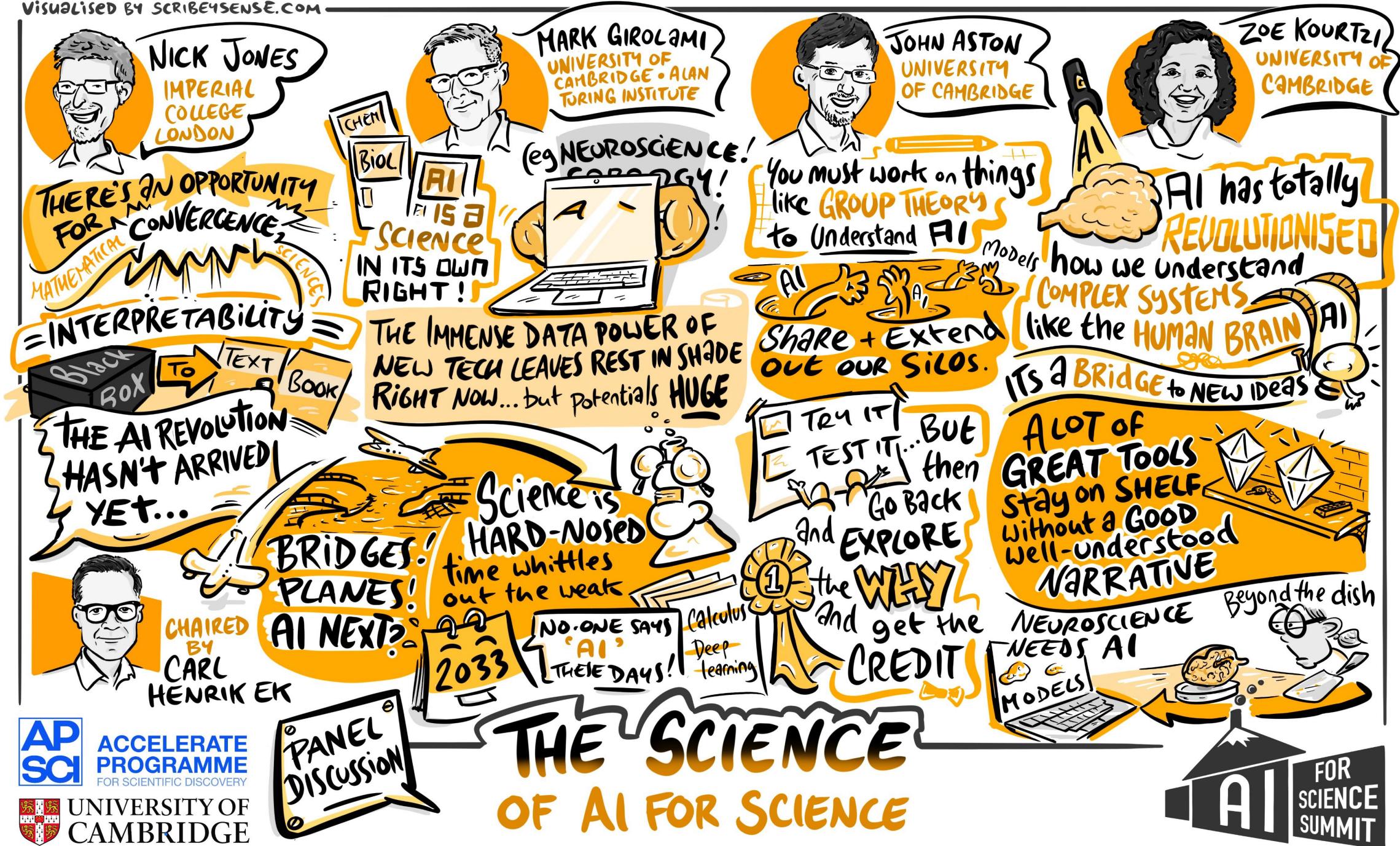


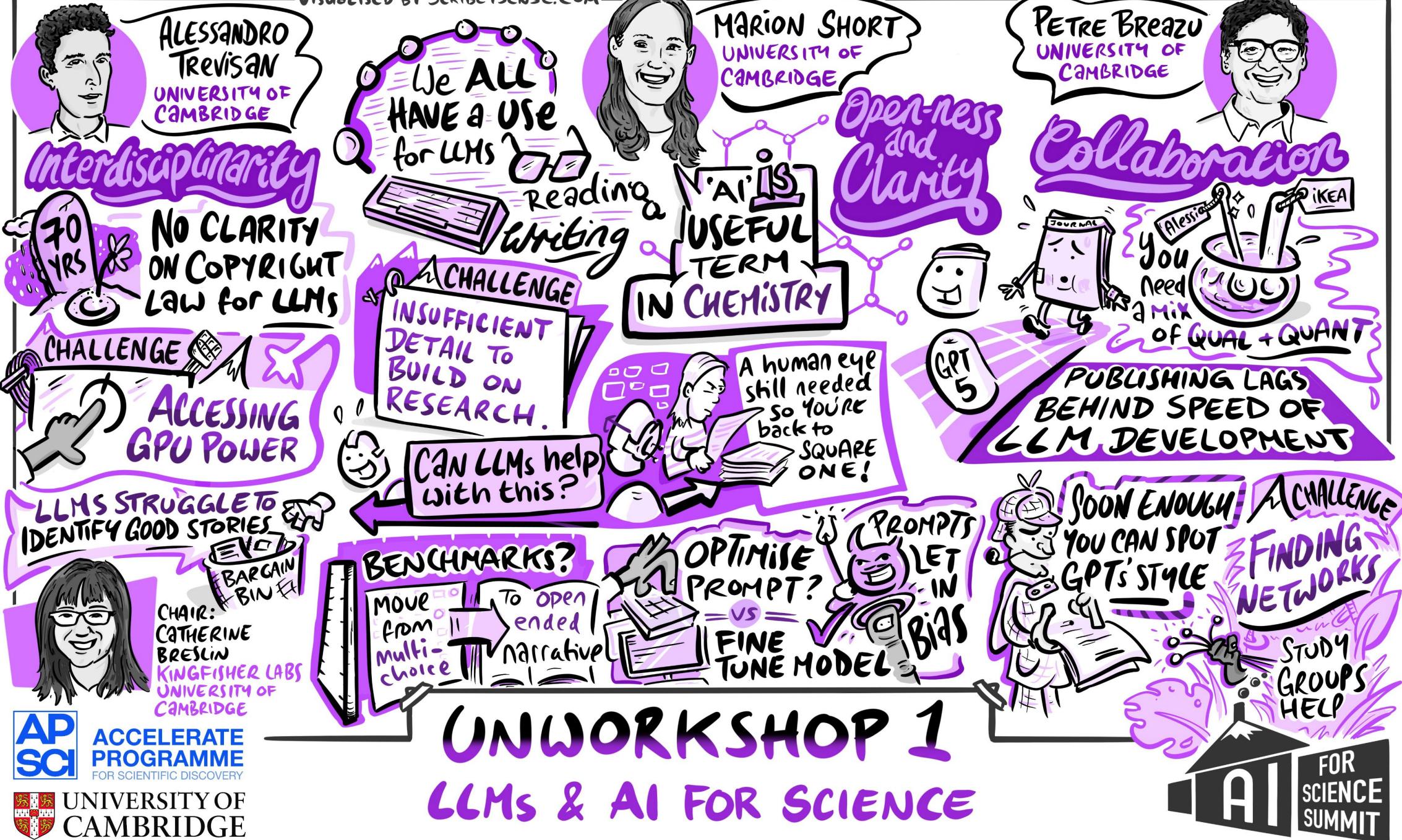
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**AUSTIN
MROZ**
IMPERIAL COLLEGE
LONDON

- WE NEED NOVEL CHEMICAL SYSTEMS GIVEN THE CLIMATE EMERGENCY, RESOURCE SCARCITY & ENERGY CONSUMPTION NEEDS
- TRADITIONAL 'TRIAL-AND-ERROR' DISCOVERY TAKES UP TO 20 YEARS PER NEW MATERIAL!











NEIL LAWRENCE
UNIVERSITY OF
CAMBRIDGE

FLASH TALKS
HIGH LIGHT
BREADTH DEPTH

BE OPEN PIONEERS
THE RESPONSIBILITY
TO DOCUMENT

THE EXCITEMENT
AROUND AI IS A
CHANCE TO ADDRESS
THE ISSUES AROUND
INTERDISCIPLINARY

RULES

#1. DON'T
FOOL
YOURSELF

"PDFs in 2023?"

Even the
Greeks
had
SCROLLING!

Career Advice

ONLY APPLY TACTICS
TO SOMETHING YOU
CARE ABOUT!
DON'T JUST DO IT FOR
THE MONEY

PERSONAL
MOTIVATION!
FOR ME, THAT
MEANT 10
YEARS OF
STATISTICS VIDEOS!
JACK OWN PATH

BEN LAMBERT
UNIVERSITY
OF OXFORDNICK JONES
IMPERIAL COLLEGE
LONDON

THE NUMERICAL
FUSION WITH
ANALYSIS

DIVERSITY

THROUGH
MATERIALS.

CULTURE
TRADITION

The Solution is
CONVERSING
as a DIVERSE
COMMUNITY

BIOLOGY
NOT JUST
FILLING A
HOLE FOR
OTHERS

REPRODUCIBILITY
DIGEST
A NEW TYPE OF PAPER

COMBINING WORK FROM DISTINCT
TEAMS REPRODUCING
RESULTS

FORMULATE a
Research
Vision

PASSIVITY IS AN
INSUFFICIENT
RESPONSE

ACKNOWLEDGE IN
YOUR ROLE AND WORK

TIME WILL
CHANGE
THINGS



INTERVIEWED BY:

FIRESIDE CHAT

CHALLANGER MISHRA • SARAH MORGAN
UNIVERSITY OF CAMBRIDGE



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