

Questionnaire

UK COVID-19 Inquiry: Module 2 – Rule 9 Request to Dr Demis Hassabis –

Reference: M2/SAGE/01/DXH

Please provide the following information:

1. A brief overview of your qualifications, career history, professional expertise and major publications.

My name is Dr Demis Hassabis CBE FRS FREng. I am the Founder and CEO of DeepMind, a leading artificial intelligence (AI) research company that aims to solve intelligence to advance science and benefit humanity – and is now part of Alphabet. I am also the Founder and CEO of Isomorphic Labs, which is reimagining the drug discovery process with an AI-first approach.

In 1997, I graduated from Cambridge University with a Double First in Computer Science, and then went on to found the pioneering games company Elixir Studios.

In 2005, I returned to academia to study systems neuroscience to find inspiration from the brain for new AI algorithm ideas. I completed a PhD in Cognitive Neuroscience at University College London (UCL) investigating the neural mechanisms underpinning memory and imagination, followed by postdocs at MIT and Harvard. The journal Science listed my research connecting memory with imagination as one of the top ten scientific breakthroughs of 2007.

In 2010, I founded DeepMind where I've assembled and led a world-class interdisciplinary research team, and rapidly made a series of important research breakthroughs, pioneering the field of Deep Reinforcement Learning. DeepMind has produced landmark research breakthroughs such as AlphaGo, the first program to beat the world champion at the game of Go, and AlphaFold, which was heralded as a solution to the 50-year grand challenge of protein folding. AlphaFold was recognised as the Breakthrough of the Year 2021 by Science, the Method of the Year 2021 by Nature, and has culminated in the open sourcing of protein structure predictions for nearly every catalogued protein known to science.

I am a Fellow of the Royal Society, the Royal Academy of Engineering, and an International Honorary Member of the American Academy of Arts & Sciences.

Selected major Publications

(Citations from [Google Scholar](https://scholar.google.com/) as of 21 Sep 2022)

- J Jumper, R Evans, A Pritzel, ..., D Hassabis. Highly accurate protein structure prediction with AlphaFold. **Nature** 596, 583–589 (2021) Citations: 5199 (Google Scholar)
- V Mnih*, K Kavukcuoglu*, D Silver*, ... , D Hassabis "Human-Level Control through Deep Reinforcement Learning". **Nature**. 518(7540):529–33. (2015) Citations: 20798 (Google Scholar)
- D Silver*, A Huang*, CJ Maddison, ..., D Hassabis "Mastering the Game of Go with Deep Neural Networks and Tree Search". **Nature**. 529(7587):484–89. (2016) Citations: 13897 (Google Scholar)
- D Silver *, J Schrittwieser *, K Simonyan*, ..., D Hassabis "Mastering the Game of Go without Human Knowledge". **Nature**, 550, 354–359 (2017) Citations: 7858 (Google Scholar)
- D Silver, T Hubert, J Schrittwieser, ..., D Hassabis. "A general reinforcement learning algorithm that masters chess, shogi, and Go through self-play", **Science**, 362:1140–1144 (2018) Citations: 2564 (Google Scholar)
- D Hassabis, D Kumaran, SD Vann, EA Maguire. "Patients with hippocampal amnesia cannot imagine new experiences". **Proc Natl Acad Sci**. 104(5):1726–31. (2007) Citations: 1527 (Google Scholar)

2. A list of the groups (i.e. SAGE and/or any of its sub-groups) in which you have been a participant, and the relevant time periods.

I attended one SAGE meeting in-person on 18th March 2020.

3. An overview of your involvement with those groups between January 2020 and February 2022, including:

a. When and how you came to be a participant;

I attended one SAGE meeting in-person on 18th March 2020 when invited to do so by the Government's Chief Scientific Adviser, Sir Patrick Vallance.

b. The number of meetings you attended, and your contributions to those meetings;

I attended one SAGE meeting in my personal capacity as a senior British scientist with expertise in AI, data analysis, and modelling. My contribution was to emphasise my view of the need for SAGE and the Government to take a data-driven approach – and focus on emerging real-world data and the experience from other countries further ahead of the UK in the pandemic timeline at that time (such as Italy and South Korea). I agreed with the consensus view at that meeting that from the publicly available data, the UK was only a few weeks behind Italy in terms of the pandemic curve, and growing at a similar rate. Given what we knew about the exponential spread of the disease, I shared the view that if the UK was

going to introduce mitigation measures to prevent the NHS being overwhelmed, it was better to do so decisively and act early to save lives and give time to plan an effective strategy.

c. Your role in providing research, information and advice.

See my answer to part b) above.

I was also sent a small number of research papers prepared for SAGE by Dominic Cummings (sent to myself and Timothy Gowers) – all of which have now been published. These were shared for feedback to inform Mr. Cummings' view of discussions at SAGE. The main point I recall making to him was that it was surprising not to see international comparisons and analysis in the papers he shared.

4. A summary of any documents to which you contributed for the purpose of advising SAGE and/or its related subgroups on the Covid-19 pandemic. Please include links to those documents where possible.

Following the one SAGE meeting I attended, I was invited by the President of the Royal Society, Sir Venki Ramakrishnan, to join the steering committee of a Royal Society-convened effort called [DELVE](#) (Data Evaluation and Learning for Viral Epidemics). I attended the steering committee in my personal capacity as a Fellow of the Royal Society. Although not part of SAGE or one of its subgroups, the DELVE effort aimed to take a data driven approach to learning from the different approaches countries were taking to managing the pandemic. Venki Ramakrishnan subsequently attended SAGE as Chair of Royal Society's DELVE initiative. All reports produced were shared with SAGE for reference and are publicly available on DELVE's github page: <https://rs-delve.github.io/>. My role as a committee member was providing strategic direction and challenge, rather than directly conducting research or drafting reports (which was done by an excellent multi-disciplinary team of scientists, listed [here](#)).

5. A summary of any articles you have written, interviews and/or evidence you have given regarding the work of the above-mentioned groups and/or the UK's response to the Covid-19 pandemic. Please include links to those documents where possible.

None.

6. Your views as to whether the work of the above-mentioned groups in responding to the Covid-19 pandemic (or the UK's response more generally) succeeded in its aims. This may include, but is not limited to, your views on:

- a. The composition of the groups and/or their diversity of expertise;*
- b. The way in which the groups were commissioned to work on the relevant issues;*
- c. The resources and support that were available;*
- d. The advice given and/or recommendations that were made;*
- e. The extent to which the groups worked effectively together;*
- f. The extent to which applicable structures and policies were utilised and/or complied with and their effectiveness.*

Given I only attended one SAGE meeting, the direct insight I can share here is necessarily limited.

My perception was that SAGE and its sub-groups were being asked to provide rapid responses in an emergency situation under significant uncertainty – and there was an impressive coming together of the British scientific community in the national interest to support its work.

One area that I think could be improved – and I believe was somewhat improved over the course of the pandemic – is that there should be more focus and resources allocated to simply tracking and learning from the experience and approaches taken by other countries to a crisis like this. In the case of a pandemic, that is a vital source of data and insight; and it should be calibrated against emerging domestic evidence and also used to stress test mitigation plans.

In terms of composition, I share the view expressed by many observers at the time that there should have been more public health experts on SAGE – this expertise seemed particularly underweighted in the early stages of the pandemic.

7. Your views as to any lessons that can be learned from the UK's response to the Covid-19 pandemic, in particular relating to the work of the above-mentioned groups. Please describe any changes that have already been made, and set out any recommendations for further changes that you think the Inquiry should consider making.

See my answer to question 6.

8. A brief description of documentation relating to these matters that you hold (including soft copy material held electronically). Please retain all such material. I am

not asking for you to provide us with this material at this stage, but I may request that you do so in due course.

In relation to my participation at SAGE, I hold the following: background briefing and notes for the meeting; administrative emails with the SAGE secretariat ahead of the meeting on the 18th March; and a small number of additional research papers prepared for SAGE, shared by Dominic Cummings, all of which are now public.