PhilInBioMed

Coronavirus Special

THE MAGAZINE

- April 2020 -

All together now

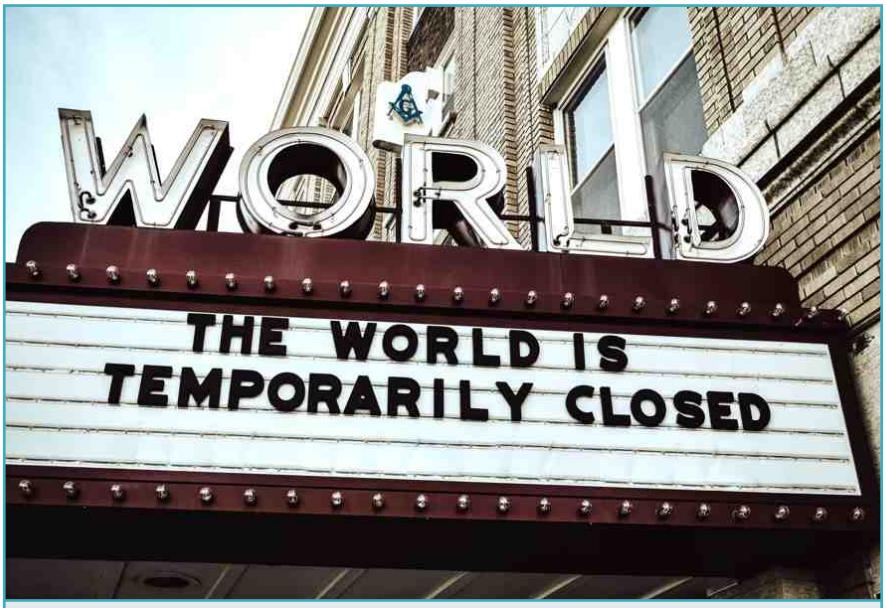
Dear PhilInBioMed members,

The scientific community is working hard to accquire more knowledge about the new coronavirus. Philosophers have joined the effort by providing conceptual guidelines and historic insights.

In this edition of the Magazine you will find a compilation of ideas and concepts that have been put forward so far.

Cordially, your

PhilInBioMedMagazine team



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The Covid-19 Pandemic in Perspective: Lessons from History?

Parallels between the Covid-19 and the 'Spanish' flu have been drawn repeatedly. To gain insights into what is happening now, turning to history may seem appropriate – and often is. But deriving 'lessons' for the present can steer us away from the event we are trying to make sense of – leading us to overlook the characteristics of what we seek to understand.

Based on detailed studies of the 1918-19 pandemic and the 2009 H1N1 influenza epidemic, some were quick to advise the government of the United States not to "wait until it's too late" to close schools. Informing a government's policy on the basis of historical research is a challenging task. While closing schools was a good call, the reasoning in this case fosters an implicit sense of commensurability between diseases that may have very little in common. Not only in terms of the biology of the virus, but also in terms of the entangled social and political contexts.

We owe to American historian of medicine Charles Rosenberg the idea that epidemics are structurally similar events that follow a set of pre-ordained steps: 'Epidemics start at a moment in time, proceed on a stage limited in space and duration, follow a plot line of increasing and revelatory tension, move to a crisis of individual and collective character, then drift toward closure. This narrative evokes a sense of progress to look forward to, but epidemics also often tell a rather different story: that of the failures of governments and public health organizations to respond to the threat. The 'closure' of an epidemic, thus, will mean something entirely different whether one is a health-care worker, a patient in ICU, or a statistician measuring the 'flattening of the curve'.

Resisting direct analogies with past epidemics and moving beyond one-size-fits-all narratives, historians can stop agonizing over 'why haven't past lessons been learned' and focus on what they do best: interpreting, contextualizing, and exploring the unique dimensions of the Covid-19 pandemic.

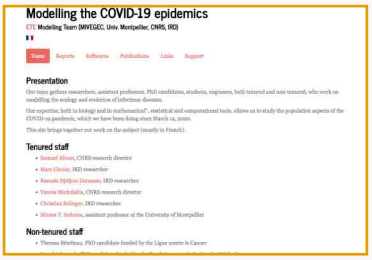
Pierre-Olivier Méthot

Coronavirus Special

All the articles, videos, podcasts etc. presented here have either been created by PhilInBioMed members or been suggested by them. If you would like to share something please write to contact@philinbiomed.org.

Ressources

Information is key in times of crisis and a number people and institutions have set up websites that accumulate helpful tips and links to get a better understanding of the situation. One of them is PhilInBioMed member Samuel Alizon, evolutionary ecologist specialised in the modelling of infectious disease dynamics. He and his team have set up the website Modelling the COVID-19 epidemics, which provides reports and modeling softwares intended for a large audience. Some of the tools are only available in French for now.



For those who would like to focus more on the sociological implications of the pandemic, they can have a look at the Coronavirus (COVID-19) resources put on line by PhilInBioMed member institution Egenis. Among other things the website is hosting a virtual reading group and provides an extensive reading list on the topic.

In Germany the Max Planck Institute for the History of Science has started the project History of Science ON CALL. The project assembles two kinds of information: research and education. The research side consists of short-format video interviews, notably that of PhilInBioMed member Sabina Leonelli asking "How should we understand the enormous variation in political responses to the evidence and models produced to predict the spread of infection?". The education side of the project seeks to aggregate and introduce known resources and materials - scholarship and teaching tools—in order to amplify their reach.

A very complete list of resources on the COVID-19 epidemic has been set up by philosopher Juliette Ferry-Danini. It includes both French and English (bottom of the page) resources with links to articles such as: When Will the Pandemic Cure Be Worse Than the Disease? and How far away are 'immunity passports?

Interpreting data

Interpreting data is not always straight-forward and can sometimes lead to controversy. On March 17th John Ioannidis from Stanford University published an opinion piece online which was severely criticized. The next day Marc Lipsitch responded to Ioannidis, but while both agreed on the fundamental aspects, their conclusions differed widely.

On March 23rd Ioannidis gave an interview as part of the video series Perspectives on the Pandemic. Here he nuances his previously expressed opinion, provides context for some important numbers and pleads to base decisions only on rock solid data. But such data is not always available in times of crisis, when the situation evolves daily and decisions have to be made quickly. From a scientific point of you mid-March seems like an eternity away already, so much new knowledge has been acquired. Yet a lot more is to be discovered. A recent update on what is known and what isn't can be found here.

Upcoming*

* coronavirus permitting

June

8th-12th Philosophy of Biology at the Mountains, Salt Lake City, USA

September

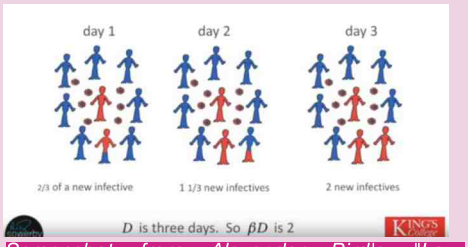
7th-11th EASPLS Summer School "Dealing with complexity in the life sciences", Klosterneuburg, Austria

October

17th-18th The Problem of Cognitive Ontology, Pittsburgh, USA

Videos and podcasts

In order to analyze and interpret the huge amounts of information and data presented to us daily, we need to acquire some background knowledge. Many researchers have set up video tutorials or podcasts to help the novice epidemiologist to navigate these unknown waters.



Screenshot from Alexander Bird's "Layperson's Guide to Epidemiological Modelling".

PhilInBioMed member Alexander Bird, a Professor of Philosophy and Medicine at King's College London, has conceived the Layperson's Guide to Epidemiological Modelling which includes three video lectures, as well as the text and slides of the lectures. A similar initiative has been taken by PhilInBioMed member Maël Lemoine, who has produced a series of short videos explaining different scientific aspects of the crisis (in French).

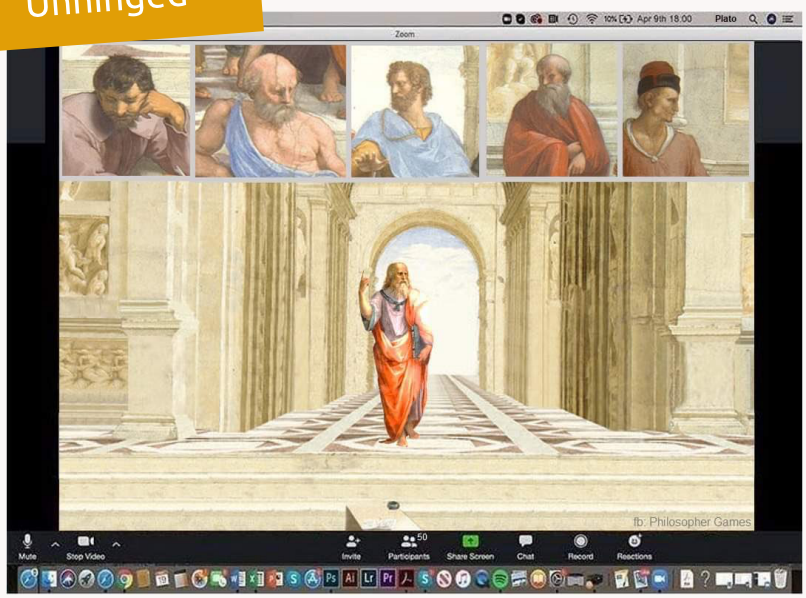
Finaly another video that has been suggested is the interview of Dr. Tom Moore by the host of the Energy Blueprint, Ari Whitten. In the hour-long interview they talk about the current state of science, the flu, the lockdown and vaccines. The video was posted some weeks back already.

If you like to listen to podcasts there are also numerous interesting sites you can follow. For example there is the Radiolab from the National Public Radio in the US. The latest episodes have been dedicated to different stories (Every day is Ignaz Semmelweis Day) and aspects (Shared Immunity) pertaining to the Coronavirus. A much more extensive series of Podcast on COVID-19 is provided by Peter Attia, MD. In the more than 100 episodes on COVID-19 he touches on historic, social and scientific aspects of the pandemic.

Philosophers on COVID-19

It didn't take the Coronavirus to get philosophers of science interested in viruses. Already in October 2016 Studies C published a special section on Understanding viruses: Philosophical investigations, with contributions from PhilInBioMed members John Dupré, Stephan Guttinger, Pierre-Olivier Méthot and Thomas Pradeu. But philosophers have also had their say in the current crisis. PhilInBioMed member Jonathan Fuller explains Why coronavirus death rates can't be summed up in one simple number and Professor of Philosophy Alexander Broadbent emphasizes the importance of Thinking Rationally About Coronavirus COVID-19 and Why a one-size-fits-all approach to COVID-19 could have lethal consequences (published together with Benjamin T.H. Smart).

Unhinged



The School of Athens in times of COVID-19

The rate at which new knowledge is accumulated on COVID-19 and the coronavirus makes many opinions and articles that may date back only a month seem outdated to day.

Hundreds of new articles, videos and podcasts will be produced in the coming month. If you would like to share any information on the Coronavirus or COVID-19 please send an email to contact@philinbiomed.org.

UK-French interdisciplinary PhD position

The Universities of St Andrews, Bordeaux and Southampton have joined forces for an interdisciplinary PhD project on Evolution in exploratory and selective developmental mechanisms. Living organisms must produce functional responses to highly diverse, complex and constantly changing inputs. Often organisms respond to such challenges through 'exploratory mechanisms', which are complex developmental systems that operate by generating variation, largely at random, and selecting the best solutions for regeneration, in an iterative developmental process.

A new general means of modeling how exploratory mechanisms evolve and, reflexively, how evolution is directed by such processes, is required. The PhD student will join an interdisciplinary team comprising a biologist (Kevin Laland, University of St Andrews), a philosopher/immunologist (Thomas Pradeu, CNRS & University of Bordeaux) and a computer scientist (Richard Watson, University of Southampton) to help pioneer a new approach to modeling evolution in complex adaptive systems. More information here.

Postdoctoral Fellowship at Stanford University

The Suppes Center for the History and Philosophy of Science at the University of Stanford is looking for a postdoc in Logic, Methodology, and Philosophy of Science broadly conceived. They are especially interested in philosophers concentrating on one (or more) of the special sciences (biology, physics, psychology, neuro-science, etc.), and/or the history and philosophy of the science (or sciences) in question.

The appointment term is September 1, 2020-August 31, 2021. The initial term may be renewed for an additional year. For more information and to apply go to: https://apply.interfolio.com/75648.

Using CRISPR gene drives to fight Malaria

Malaria is a devastating disease transmitted from person to person by mosquitoes. In a recently published article entitled "Gene Editing and the War Against Malaria", Ethan Bier and Elliott Sober describe how biologists can now alter genes in a malaria-transmitting mosquito population by engineering a CRISPR gene drive, which mimics a natural evolutionary process.

With this tool, a new gene can be inserted into the genome so that the alteration is rapidly passed down to successive sexually reproducing generations. Two gene-drive strategies have been found feasible: The first drives a local malaria-transmitting population to extinction; the second renders mosquitoes unable to transmit malaria, which breaks the malaria transmission cycle. (Illustration by Barbara Aulicino.)

New book on Placebo Effects

PhilInBioMed member Pekka Louhiala has recently published his new book Placebo Effects: The Meaning of Care in Medicine. In it he explores the conceptual confusion related to the concepts placebo and placebo effect and provides a detailed analysis of the history of the terms, their current use, suggested alternatives and the implications of the conceptual confusion.

This book is intended for physicians, philosophers, psychologists and any other people interested in placebos, placebo effects and the physician-patient relationship.

The sciences of healthy aging await a theory of health

Debates in fields studying the biological aspects of aging and longevity, such as biogerontology, are often split between 'anti-aging' approaches aimed largely at treating diseases and those focusing more on maintaining, promoting, and even enhancing health. However, it is far from clear what this 'health' is that would be maintained, promoted, or enhanced.

In a recently published article in *Biogerontology*, Jonathan Sholl, discusses five general features of medical theories that could be used to evaluate the utility of a given proposal. With these features in hand, he suggests that philosophers and scientists work together on analyzing actual medical research and the ways in which a theoretical construct of 'health' is being progressively identified. He concludes by suggesting that research fields studying stress and aging might be particularly helpful in developing candidates for theory

Interview with Prof. Thomas Kirkwood on ageing

Thomas Kirkwood is Emeritus Professor at Newcastle University where he was Director of the Institute for Ageing & Health at the Faculty of Medical Sciences. He has written more than one hundred articles on the biology of ageing. His books include 'Times of our Lives: The Science of Human Ageing' (2001).

The interview was conducted by Pierre-Olivier Méthot, Associate Professor of Philosophy at Université Laval (Québec), Canada and Maël Lemoine, Professor at the University of Bordeaux, France.

POM-ML: Your background is in molecular biology. What led you to explore the biology of ageing?

TK: Ageing is a scientific puzzle that offers many angles of approach. I was introduced to it by the geneticist Robin Holliday who was then interested in an idea proposed by Leslie Orgel, that ageing might be caused by propagation of errors in the molecular machinery of the cell. The foundation of molecular biology is the replication of information coded in DNA and the translation of this information into proteins. Orgel suggested that errors that produced faulty molecules of the translation apparatus would generate even more errors in further rounds of molecular decoding. This could in theory lead to a progressive breakdown in the functionality of the cell, or in other words, ageing itself. A hot topic in the mid-1970s was whether cells were vulnerable to this kind of instability. With Holliday, I was able to show that the degree of cellular instability could be controlled by how much energy was invested in proofreading (to prevent new errors from arising) and/or in molecular turnover (to get rid of errors that had occurred). This led me to ask what level of stability was optimal and thus how natural selection might have controlled the risk of instability. I realized that the answer would be different for cells of the germ line and of the soma. For germ line, the consequences of progressive error propagation would be disastrous for the continuity of the lineage of generations. However, for soma, all that is needed is that the cells last long enough to keep the organism sound until the kind of age when it would most likely have been killed already by one of the many hazards of the environment. This is the essence of the disposable soma theory. Once I started to become interested in the biology of ageing, I realized that there was a wealth of challenging questions about the causes and mechanisms of ageing, which extend well beyond the particular line of my initial enquiry. Pursuing answers to these questions became the main theme of my subsequent career.

POM-ML: Your research field often generates conceptual issues such as: What is ageing? How do you define it? Is ageing a process distinct from development? Do you think these (and similar) questions are important to address? Why?

TK: A process as complex and multi-faceted as ageing presents issues of many kinds. A descriptive approach can capture masses of information about the changes that occur during the life course, but the phenomenology is hard to explain without clarity about what exactly ageing consists of. Thus, definition is extremely important. We need to define ageing in a way that enables us to distinguish species in which ageing occurs from those in which it does not. One of the best-studied examples of an animal in which ageing appears not to occur is the freshwaster Hydra. This is essential when trying to explain the diversity of life histories of different animal and plant species. And in species where ageing does occur, we need conceptual insights to help make sense of the many ways in which ageing is associated with alterations in probably every system of the body. In purely biological terms, we need to examine whether ageing is merely a later stage of development, or something different. In medical terms, we need to explore the question of whether ageing is itself a disease and how it relates to the many different specific illnesses for which it is the biggest risk factor. If we fail to address these conceptual issues, we can be easily misled in trying to disentangle the causative pathways that underlie such a complex process.

POM-ML: We used to think that ageing was somehow 'programmed' in the organism; what do you think led to this pervasive view in the past century and what is wrong with it?

TK: It is very natural to approach a feature like ageing with the assumption that it is programmed. In species where ageing does occur, it affects every individual who lives long enough. Much of the spectacular progress in the life sciences over the last two centuries has involved identifying the mechanisms through which organisms develop and maintain themselves and how these mechanisms are regulated by genes. Therefore, it is not at all surprising that ageing has often been assumed to be programmed. Indeed, this is commonly still the starting position for those coming fresh to the problem.

Yet despite the natural appeal of programmed ageing, it is clear that there does not exist a genetic programme that has evolved for the specific purpose of limiting the duration of life. First, the reason commonly suggested for the necessity of programmed ageing – prevention of overcrowding – is at odds with the observation that most organisms in nature die from accidental causes long before they exhibit any sign of an ageing process. Ageing is chiefly seen in protected environments. Thus, the living-space argument does not work and it is hard to see why and how natural selection might have evolved a programme that rarely gets the opportunity to manifest itself. Second, explanations for programmed ageing often invoke the idea that evolution has acted for the 'good of the species'. The effects of ageing on the individual are deleterious and a substantial body of theoretical work has made it clear that circumstances where selection for some benefit to the species or group can outweigh selection against a disadvantage to the individual are rare. Special conditions are required that seem very unlikely to support any general explanation for evolution of ageing in terms of programming. Third, the tremendous variability in the way that ageing plays out in individuals, even when they are genetically identical, does not seem easily consistent with the idea that a programme is at work.

The importance of relinquishing the idea of programmed ageing is that it then allows us to focus in new ways on understanding why ageing has evolved and how such explanations can help us to make sense of some of the quasi-programmed features of ageing and longevity. Although ageing itself is not programmed, longevity is, at least as an average trait within the population. In the case of the disposable soma theory, where ageing is caused by accumulation of damage that arises as a result of selection having limited the investments in somatic maintenance, the programming of longevity results from the levels at which maintenance is set. Furthermore, during the course of evolution many regulated responses to damage have evolved. Such

responses are activated more frequently in older individuals, in which more damage has occurred. This can give the appearance of programmed ageing, but it is essential to appreciate that the responses will have evolved to aid survival, not to cause ageing and death.

POM-ML: Evolutionary accounts of ageing like the 'mutation accumulation' theory (Medawar), the 'antagonistic pleiotropy' theory (Williams), and the 'disposable soma' theory (Kirkwood) are often described as alternatives to one another. Do you agree with this? Or do you think a unified framework of the biology of ageing is possible?

TK: The theories are each different from one another but they share some features in common, most notably the principle that the power of natural selection diminishes with age across the life course.

I think of mutation accumulation, antagonistic pleiotropy and disposable soma theory as complementary. When this is recognized, then it is indeed natural to view them as collectively providing a framework. Which bits of the framework are most relevant for the particular problem at hand is something to be judged, armed with an appreciation of what they can contribute. It is analogous to a tradesperson approaching a job of work with a toolbox containing a variety of tools. The skill is in picking the right ones for the job.

POM-ML: In particular, how would you characterize, for a broad audience, the content and the scope of the 'disposable soma theory'? And what makes it stand out when compared to earlier (evolutionary) accounts?

TK: The disposable soma theory is a physiologically based evolutionary theory to explain why and how ageing occurs in those species where it is present, how different species evolved different lifespans, and why ageing may be absent or unclear in species that do not fulfil its requirements.

The origin of the disposable soma theory was in work on the molecular biology of ageing, as described earlier. When considering the vulnerability of cells to propagation of errors in the molecular machinery underpinning life, it had been shown that cells could increase their stability but at the expense of requiring a greater investment of energy in mechanisms for molecular proofreading and damage removal.

A high investment in stability in the germ line was essential to preserve the lineage across generations but an energy-saving strategy of reduced error regulation in somatic cells would enhance fitness by allowing the organism to grow faster and reproduce at a higher rate. Over the years since its original statement in 1977, the range of molecular mechanisms to which it applies has been broadened but its central feature is that it directly supports the idea that ageing is caused by the gradual, progressive accumulation of faults in somatic cells, which arise because of evolved limitations in the investment in somatic maintenance and repair.

It is its specific relevance for mechanisms which gives the disposable soma theory its most distinctive features. It accounts naturally for the extensive stochasticity that is seen in biology of ageing, whereby individuals exhibit marked variation both in life span and pathobiology, even though they may have identical genotypes. Its foundational principle generalises to explain how the principles of optimal resource allocation can explain the diversity in patterns of ageing across the phylogenetic spectrum (unicellular versus multicellular, asexual versus sexual reproduction, semelparity versus iteroparity, polyphenism versus monophenism and so on).

By focusing on physiology and its optimisation, the disposable soma theory is also capable of explaining the flexibility and plasticity of life histories for organisms that are exposed to environments that may vary in quality

across space and time and in which it may be adaptive to enable plasticity within the life history, e.g. when faced with stress or shortage of food. It can also be extended readily to examine questions about ageing in organisms that pass through different developmental stages or exhibit other forms of polyphenism.

POM-ML: In a nutshell, what is the 'new view' of ageing you are promoting and what makes it different from the 'traditional view'?

TK: Hmm. I am not sure that it is particularly helpful to think in terms of a 'new view' and a 'traditional view'. As in all areas of science, research on ageing is continually making progress, and we need constantly to be updating our view in relation to new insights and discoveries. For me, the key issues are that we need flexibility and open-mindedness. If we equip ourselves with a good understanding of what evolutionary thinking can suggest with regard to the biology of ageing, this will help to give greater clarity in tackling the huge complexity of the process. It is important to appreciate that there is no central programme for ageing and that things which might appear to be a part of a programme for ageing need to be examined through a different conceptual lens. We need also to accept that there is a great amount of inherent stochasticity – the play of chance is important, and not everything is regulated. Perhaps most important of all is that we need to acknowledge and embrace complexity. The techniques of modern experimental research require us to be highly focused in reductionist studies. We cannot avoid this if we are to acquire detailed knowledge about individual mechanisms. But at the same time it is imperative to be inclusive and integrative, to fit the individual pieces of the puzzle into the bigger picture. In this sense, it can be helpful to think of the analogy of a jigsaw puzzle. Evolutionary logic can help provide the picture on the box of the puzzle that may speed us in putting the pieces together correctly. I would like humbly to suggest that the disposable soma theory is one useful tool in making this connection.

POM-ML: Philosophy and science are different academic fields, but they used to be much closer to one another. Do you think philosophy (and history) of science matters (or should matter) to science? In what way(s)? What should the role of philosophy in science be? Taking knowledge further? Clarifying scientific terminology? Assessing scientific methodology?

TK: Absolutely – philosophy of science is enormously important. For me personally, contact with the writings of philosophers of science was not only an enjoyable but also highly stimulating at the beginning of my research career. The most important single contribution is likely to come from how philosophy demands greater conceptual clarity. It helps make clear what should be the direction of travel through difficult terrain. But it is also valuable in assessing methodologies and in avoiding getting bogged down in problems when the going gets hard.

3+1 questions for Miriam Solomon

Miriam Solomon is Professor of Philosophy and Department Chair in the Department of Philosophy at Temple University. Her research interests are in philosophy of science, philosophy of medicine, history of science, epistemology, gender and science and biomedical ethics. She is a member of the PhilInBioMed Scientific Committee.

1. What first sparked your interest in philosophy of science?

As a teenager growing up in the UK in an ultra-Orthodox Jewish family, I was captivated by both science and religion, a frictional combination. I took Natural Sciences at Cambridge University and discovered History and Philosophy of

Science as one of three courses in my second year. History of science surprised me by deepening my philosophical questions about science.

I realized that science is not simply cumulative, that scientists can reasonably have deep disagreements with each other, and that asking foundational and methodological questions is worthwhile.

2. What is your main research focus?

I have always been interested in scientific uncertainty and the causes of, or reasons for, expert disagreement. In my early work (Social Empiricism) I argued that questions about the rationality of scientific reasoning are appropriately addressed at the social, rather than the individual level.

I used a range of examples from recent history of science to develop a normative naturalism that can be applied to assess current scientific disagreements. I agree with Feyerabend, Popper, Longino, and others that scientific disagreement is often productive, and that we should tolerate more of it than we currently do.

After this work in "pure" science, I found that the epistemic situation in some "applied" sciences, such as medicine, is somewhat different. Sciences which are "applied" in the sense that their results are needed for public decision making are most influential when there is expert consensus on the results.

My second book, Making Medical Knowledge, began as a historical and philosophical investigation of the relatively new (since the 1970s) institution of medical consensus conferences. It broadened to become a comprehensive historical epistemology of recent medical science, also including investigations of evidence-based medicine, translational medicine, and narrative medicine.

It argues for an untidy version of methodological pluralism in medicine. It was written for medical as well as science studies and philosophy of science audiences.

Since completing that book, I have been working on a range of topics in philosophy of medicine and psychiatry, such as the social epistemology of stem cell clinics, hermeneutical injustice and Asperger Syndrome, the criteria for validation of DSM categories, suggestions for addressing pharmaceutical company biases in clinical trials, and pluralism in psychiatry.

3. What are the topics you want to explore in the future?

This year I have a Guggenheim Fellowship to pursue my interests in philosophy of psychiatry. Before the year is over I would like to complete drafts of my work on pluralism in psychiatric nosology, understanding the different approaches of DSM, RDoC, network theories, and HiTOP. I would also like to return to social epistemology, and explore the new virtues and vices literature, with a focus on social (rather than individual) virtues and vices.

4. What are your thoughts on the COVID-19 epidemic?

Time has seemed to slow down as we have rapidly adjusted to new realities (this is written on April 6). I was disappointed to cut short my Visiting Fellowship at Cambridge HPS—as well as a long-planned visit to PhilBioMed in Bordeaux--to return home to Wynnewood, PA, under a stay at home order.

I hope that, as philosophers of science and philosophically-minded scientists, we will contribute helpful ideas about topics such as the unpredictability of vaccine development, the place of long term and non-obvious risks in our calculations, the importance of clinical trial quality, and national differences in responses to the epidemic. And I send my warmest best wishes for everyone's health and safety.