# The danger of a wholesale shift to virtual workshops and conferences.

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**An edited version of this piece will appear in a forthcoming issue of *Physics World***

For some time, scientists and academics have been concerned about the carbon footprint of national and international face to face workshops and conferences (F2F). The idea of a switch to virtual meetings (R2R) is popular, and experiments have been tried.[[1]](#footnote-1) Now, suddenly, R2R has been forced on all of us by the coronavirus pandemic and hidden advantages of R2R are coming to light: the high cost of travel means that international meetings must run over several days and this involves disruption to normal life whereas the same meetings, when conducted remotely, can be distributed over time and even melded in with the weekly seminar where repeated visits are no more costly than a single meeting. It looks, then, as though Covid, along with climate change concerns, could lead to new and more efficient forms of science. Here we want to take a longer view and set out a kind of ‘theory’ which warns against too radical a switch -- while there are positives, there are dangers too. There is already a questionnaire-based project in progress looking at the effects of the shift from F2F to R2R which is intended to continue for a year or so, but the potential negative effects on science and its relationship to society could take a generation or more to show themselves.

Face to face communication in science is quick and efficient once everyone has reached the shared venue, but it also plays a more fundamental role in the social and intellectual life of science. Sciences often involve a division of intellectual and practical labour: narrow specialists, who cannot do each other’s jobs even though they share a scientific domain, can contribute to a common goal because they *understand* each other’s jobs. For this to happen a common ‘language’ has to be established and then learned by newcomers and this is managed, first as education merges into apprenticeship with the PhD, and then, as the focus narrows through a career, at face to face workshops and conferences; it’s a process of ‘socialisation’. Socialisation also teaches values: for science to be science the key value has to be that the search for truth over-rides the search for fame or wealth. There will be a few Nobel laureates and rich founders of start-ups, but science as an institution is neither business nor show-business; truth has to be at its heart and that is hard to convey over the internet. And, of course, face to face meetings are where new topics, new joint projects, and new seed communities emerge because, when they meet in person, people can build commitment to a new idea or a new approach in a matter of hours.

Professional meetings of specialists are also the means of setting a boundary around the those who are considered expert enough to make real contributions to the scientific aim and for generating relationships of trust – mostly during the informal aspects of meetings. It is at these meetings where the community works out just how much or how little weight to give to the remarks and claims of various individuals within the boundaries. Learning trust, and learning how to weight a view, are vital to science because such judgements lead to investments of time and money – ‘I’ll try this rather than that’ – and if the wrong choices are made the science will go nowhere.

Once the values and the common language has been learned, and once all those trust relationships have been established, and all those opinion-weightings worked out, and little communities established, the domain as a whole has a momentum. There is a kind of spinning flywheel that makes it possible, technical irritations and local efficiency losses aside, to move from F2F to R2R without much cost and with many gains. So the early experiences of a move from F2F to R2R are likely to be good. An obvious example of this, studied by Collins, is the affirmation of the first discovery of a gravitational wave which took five months, from September 2014 to the press conferences in February 2016; all this was done via telecons and thousands of emails without any face-to-face international meeting but it was all based on the decades of trust-building in the scores (maybe half-dozen a year), face to face meetings that preceded it.

But the flywheel is not entirely a good thing. The dangers of a thoroughgoing shift to R2R will arise only as science develops and changes and the trust-and-socialisation flywheel loses momentum. When science changes, old languages and old relationship become irrelevant; older scientists leave the profession and new ones enter. All this means there have to be new generations inducted into the fundamental norm of integrity which defines the social institution of science and the foundations of the scientific discipline; it starts with education, which is also under R2R pressure, but much of it happens at meetings where, for example, the relationship of authority and truth in science is revealed because a PhD student can, and sometimes does, criticise a Nobel laureate. New generations also have to develop and learn creative new languages and new specialist groups of trusting peers must be established. But given the early success boosted by the flywheel, these needs may no longer be understood in the same way.

 There is no evidence that any of these things can be done without face to face relationships. Indeed, all the evidence of how humans are socialised, how languages are learned, how apprenticeships work to transfer tacit knowledge and understanding, how relationships of trust and reputations are established, how face to face relationships persist across a range of institutions, even under adverse circumstances, points the other way.

So, with a wholesale shift to R2R we can expect to see success in the short term but increasing difficulties for the development of new science in the medium term. In the still longer term there is a danger that extends far beyond science itself. The rise of populism in ‘Western’ countries and the predictable attack on scientific expertise, has put society in danger. The way that science deals with decision-making in the face of uncertainty is a vital object lesson for decision making by elected governments. At the same time, scientific expertise acts as one of the checks and balances in pluralist democracies: respect for scientific expertise prevents a political leader from insisting on anything they like regarding the size of the inaugural crowd or the truth about climate change. But a wholesale shift from F2F to R2R will erode the boundary between scientific expertise and the internet: the things that make science special as described above: the values, the languages, the trust, all developed through the face to face process of socialisation, don’t seem to happen naturally over the internet – quite the contrary. If the boundary between information and misinformation comes to be fought out over the internet rather than the seminar or workshop, science will lose the battle, as it nearly has for example in the revolt against the MMR vaccine, or, in some locales, the acceptance of climate change. Without science as an exemplar of how to make difficult decisions in an uncertain world – craftwork with integrity – and that’s what we need if we are to minimise the effect of Covid-19, rather than calculate the perihelion of Mercury – we will find ourselves living in a dystopia. So we have to get this right.

This does not mean we should not be trying to improve the efficiency of conference-going by using R2R where it makes sense, nor that we should not be concerned to minimise science’s carbon footprint; the two can live side by side in new and creative ways. Indeed, these creative developments will be just an extension of what we do now: how did we ever arrange those workshop and conference meetings before the internet; how did we ever reinforce those newly formed trust relationships without the post-meeting email exchanges? But the new and still greater enthusiasm for R2R must not turn short-term success into long-term disaster: each case has to be looked at separately, avoiding slogans. Where sciences that are so well established that development consists solely of swapping new notions and new information without too much need for trust, argument and the kind of weighting of opinion which is intimately tied up with assessing a person there is less danger; these sciences will work for far longer with R2R than those which involve so much disagreement and passion that Max Planck is said to have characterised them with the remark, ‘science advances funeral by funeral’. Gravitational wave detection up to the discovery was pretty far advanced along this controversy scale; photonics is in the middle somewhere. As an *aide memoire*, we can set out the dimensions of any shift from F2F to R2R in a figure.

**LEVEL OF NOVELTY/CONTROVERSY**

**DENSITY OF TRUST RELATIONS IN EXISTING NEWORK**

**EASY**

**POTENTIALLY DISASTROUS**

**TIME**

**HARDER**

In the figure the three dimensions of a shift from F2F to R2R that have been explored above are represented on 3 axes. The Y-axis is the extent to which a science is radically novel and/or beset by controversy of the sort that is best resolved by face to face debate and attempts to reach agreement that turn on developing new trusting relationships. The Y-axis represents the extent to which the domain is already characterised by dense trusting relationships – the speed of the trust-and-socialisation flywheel, the momentum of which dissipates as science moves on. The Z-axis, running into the page, is time, running into the future.

The ‘theory’ is the cigar-shape running from front-top-left to back-bottom-right, which shows how massive displacements of F2F with R2R become harder and riskier with time. The disaster alluded to in the bottom right corner is the very institution of science changing into something else in the way that so many other institutions have changed under the pressure of free-market competition – a pressure felt, but so far mostly resisted by science. What we have been exploring is the pressure that may come from a wholesale a shift to R2R. To repeat, this is not meant to be a simple criticism of R2R since R2R is with us to our great benefit and could benefit us still further as we learn how to use it better, perhaps as a result of coronavirus. It merely says that if reducing science’s carbon-footprint becomes the sole and over-riding concern, then, ‘be careful what you wish for’.

1. Sapienza is a pioneer of one such experiment (photonicsonlinemeetup.org), which was a hybrid of national face to face groups with on-line international links; Barnes, is also in photonics, but saw the connection with Collins because of his interest in the process of science, part-driven by global warming concerns; Collins, a sociologist who looks at how knowledge is made, has been involved in writing a book on the relationship between face-to-face communication and remote communication (F2F vs R2R) (Collins, Harry, Evans, Robert, Innes, Martin, Kennedy, Eric, Mason-Wilkes, Will and McLevey, John, (under submission), *Face-to-Face: Communication and the Liquidity of Knowledge*. [↑](#footnote-ref-1)