

COSPAR in the Covid-19 Era

Covid-19, the disease caused by the new coronavirus SARS-CoV-2, is spreading very fast across the world and it has resulted in a pandemic. The asymptomatic nature of the disease in many cases and the capacity to spread very fast has made this disease very difficult to control. With the best current estimate of the mortality rate of 0.6% and the expectation that at least 50% of the population need to be infected to get full herd immunity, an unchecked covid-19 can result in a death rate M (deaths per 1000 population) of 3 in a matter of a couple of months, momentarily surpassing the death rate due to natural causes (M is 7 - 10 per year due to natural causes in various countries).

Countries across the world are working very hard to contain the spread of covid-19. Some, particularly the developed countries which had vibrant economic relations with China, were unfortunate enough not to realise the magnitude of the problem before the disease entered the stage of community spread, and they are managing covid-19 by some active methods of containment and augmenting their health services. M has already reached 0.2 to 0.6 (as of 2020 April end). Perhaps the true M is upto a factor of 2 more due to the fact that some deaths are not recognised as due to covid-19. Very few countries, like Australia which is sparsely populated and geographically quite disconnected from the rest of the world, have managed to 'douse the fire', so to speak, and it appears that it would be a long and arduous task to keep it that way. Covid-19 has entered the developing countries in South Asia, Africa, and Latin America quite late, most likely due to their lower economic engagement with China. The interplay of the climate, demography and the efficiency of the health care systems in these countries might have a different impact on the effect of covid-19 and a detailed understanding is yet to emerge. As of now, however, there are no hard facts to prophecy that the virility and spread of covid-19 in developing countries would be any different from what has been already seen and experienced.

Considering the fact that the death rate M of the whole world due to covid-19 as of 2020 April end is 0.03, it appears that we have a long battle ahead in our efforts to contain covid-19. Further, there are huge geographical disparities across the world in the spread and management of covid-19 and hence international travel will surely face some serious difficulties.

In the immediate future, lasting for at least a few years, international travel might be severely curtailed or become quite expensive. In some perception, travel is an essential tool for the growth of human knowledge. The current maturity of human knowledge is nurtured by education as well as by the very high level of mutual interaction facilitated by frequent travel. The curtailment of travel in the

covid-19 era might very seriously affect the highest levels of knowledge generation, particularly the very elite and intricate activities like Space Research and the international organisations dealing with Space Research like COSPAR.

Travel: the bedrock of COSPAR

COSPAR, the Committee on Space Research, was founded in 1958, within a year of the launch of the first ever artificial satellite, Sputnik 1. It has the lofty goal of 'furthering research, exploration, and the peaceful use of outer space through international cooperation'. COSPAR was the bridge between the then space superpowers USA and USSR and in the past few decades it has been spreading the fascination of space research across the world. The COSPAR Scientific Assembly, the COSPAR Symposia and the COSPAR Capacity Building Workshops are extremely successful in internationalising Space Research.

Interaction is a key ingredient in the activities of COSPAR. Though most of the scientific knowledge relating to Space Research is available in books and can in fact be derived from basic principles of science, the actual expertise in Space Research emerges from a long and arduous path of learning, experimenting and innovating. These activities will get a kick start by a close interaction with an expert. The COSPAR fora give ample opportunities for such vibrant interactions. In a larger context, travel and interactions are the indispensable tools for the growth of human knowledge. If you equate the wealth of a community as the sum total of human knowledge, then the wealthy nations have acquired a very high level of human knowledge, nurtured by education as well as a very high level of mutual interaction facilitated by frequent travel.

In this perspective, travel is the bedrock of the activities of COSPAR and it is very indispensable. This will be in a serious conflict with the requirements of covid-19 era where travel most likely will be difficult or expensive. Space research, being one of the most intricate and fascinating subjects in the frontiers of human knowledge, need to be nurtured and internationalised, and, it apparently looks inevitable that we try to maintain the status quo by lobbying for a larger chunk of funds to maintain the high level of interaction demanded by the activities of COSPAR.

In this note, however, I argue that we must very seriously explore alternatives to travel for the pursuit of human knowledge. I argue that it is inevitable and in my opinion COSPAR must try to achieve this goal by a careful and planned innovation.

Less travel and more interaction: a new normal ?

Space Research is very fascinating. But, serious space scientists who bring in innovations and push the boundaries of human knowledge are a rare breed. In some sense Space Research is an activity pursued by a few privileged and select class. In the initial days of Space Research this selectivity perhaps may be inevitable. But since the world is growing richer and knowledge gain becoming more democratic, even extremely elite activities like Space Research need to expand and diversify very rapidly, as indeed many other activities at the pinnacles of human knowledge and

expertise. If, however, the exponential growth of human knowledge to the whole of humanity is based on replicating the existing model of using personal and physical interaction among experts, the result would surely be an environmental disaster.

Hopefully, the covid-19 era will help nudge humanity towards an equilibrium where the benefits of travel can be replicated by a suitable alternative based on internet. It can, in principle, have two possible positive benefits: one, the barrier to knowledge can be minimised and two, knowledge gain can be environmentally friendly. But, it must be borne in mind that replicating the benefits of travel (for knowledge growth) is non-trivial and requires a very planned and dedicated effort to realise it involving multiple levels of experimentation, innovation and execution.

At this juncture, COSPAR as an international organisation responsible for the spread of one of the foremost and fascinating aspects of human knowledge can indeed take a lead in this innovation and can be a pioneer of holding meetings and discussions with less travel and more interaction.

A factor of three less and three more: an order of magnitude improvement !

If we put our minds together, it should be possible to achieve the same level of fruitful exchange of ideas in the various fora of COSPAR using digital means. In the immediate future, by some simple innovations and rationalising we should be able to reduce travel by a factor of three and increase the participation by another factor of three, thus increasing the effective reach by an order of magnitude.

To start with let us take the example of the COSPAR Capacity Building Workshops. Typically, about a dozen experts travel to a select location and intensely interact with a select batch of about 50 students in a time span of a couple of weeks and impart knowledge and motivate research in a very specialised branch of Space Research. Now, let us do a thought experiment on how the same level of transfer of knowledge and motivational interaction can be realised for about 150 students with a travel of only about four experts.

We can heavily borrow from the digital experience of higher education and create a vibrant portal to recreate many aspects of the physical interaction. To begin with, the syllabus and the background material for the select topics can be made easily available in the portal. Instead of selecting the students solely based on recommendations and an assessment of their scholastic achievements, the pre-requisite to understand the course can be made available in the portal as a set of background reading material and a syllabus, and an online testing mechanism to evaluate the aptitude and the attitude of the students can be formulated. For example, the prerequisite to attend a Capacity Building Workshop on X-ray Data Analysis need not be merely a requirement of 'good Physics knowledge at the Masters Level'; it can also include an explicit requirement of the required knowledge in statistics, Physics of particle interaction, etc. With a careful pruning and testing, a select band of about 150 young researchers can be identified from across the world, who are keen and willing to learn the specialised topic and this team can be identified well ahead (a few months) of the Workshop.

The Capacity Building Workshops have typically about a couple of dozen lectures given by professionals. These specialised lectures simultaneously teach and motivate the students and also they provide a vibrant forum for discussion. One innovation could be to segregate the teaching and the interaction part of these lectures. The experts can give these lectures in their home Institutes (possibly as a part of the course work of a University) and the recorded video can be made available in the portal, at least a few weeks before the Workshop.

The actual Workshop can be in geographically multiple locations: the 150 students spread across some 8 - 10 centres, collected together with a minimum of travel. Some four international experts can visit the four biggest centres. Each of them can be assisted by several local teaching assistants. The other centres can have local experts and local teaching assistants. Instead of regular lectures, there could be discussion sessions based on the recorded videos. Clarifications from the experts who delivered the lectures could be obtained remotely in some pre determined time slots.

In this way, the Workshop concept can be increased to three time more students with three times less travel, effecting an order of magnitude improvement in the reach.

Will this new style exorbitantly expensive to realise ? With some initial effort and some innovation, it can in fact be made cheaper. All the digital technology requirements are scalable and can be used in multiple ways. If you invest in the first Workshop, it would be practically free for the next several Workshops. The organisational efforts of the syllabi and test etc. can be minimised by COSPAR having tie ups with some select Universities. The syllabi can be tuned to match the already existing course structures. The intellectual inputs from the subject experts can be assumed, because, surely, the opportunity to interact with the best and brightest young crop across the world in the select field would give the researcher an extraordinary edge for her quest of attracting good quality future students and post-docs. As a corollary, if the 150 students are rigorously evaluated at the end of the course, and if it is established that doing well in the Workshop opens up the door to the graduate schools and the research laboratories of the best Institutes in the world, the Workshops will gain a even higher brand value thus increasing the quality of participation, both from the students and the teachers.

The ideas and concepts can be implemented in COSPAR Symposia, once tried, tested and experimented with the Workshops. A typical Symposium has some 150 attendees. This can be straightaway increased three times by relaxing the criterion of participation to any researcher who has authored a research paper in the field in the past 3 years. As earlier, all lectures can be pre-recorded and the videos can be uploaded in a portal. The main centre of symposium can have only 50 participants with another dozen virtual centres across the world. The 50 participants to the main symposium would be 10 subject experts to act as the session coordinators to lead the discussion and 40 young researchers whose scientific contributions are meritorious. Extension of these ideas to the larger COSPAR Scientific Assembly can be pushed once sufficient maturity in the process of remote participation is established in Workshops and Symposia.

In summary, the covid-19 era will surely push humanity to a more digitally connected world. COSPAR, as the pioneers in internationalising a front-line activity like Space Research, can seize this opportunity to be pioneers in providing a seamless digital experience in sharing, teaching, and advancing the highest level of research activity.