Economia Politica (2022) 39:7–14
https://doi.org/10.1007/s40888-021-00244-6

EDITORIAL

Women scientists and pandemics

Amartya Sen[1]

Published online: 22 October 2021

1 Science and my life

I begin with a personal recollection, which relates to the subject of my paper. When I was 18 years old, my life was saved by a woman scientist whom I never met. The savior was a Polish physicist, called Maria Saloma Sklodowska, who studied in Paris. She won the Nobel Prize twice, respectively for Physics and Chemistry, and both these contributions were related to radioactivity. The Prize in Physics was for work that Maria—by then known as Marie Curie—jointly did with her husband Pierre Curie. The Prize in chemistry which she got 8 years later, she received alone, for work that consolidated the scientific understanding of radioactivity, yielding an integrated framework for the whole world to follow. By then Marie Curie was the leading star in radioactivity research.

The first radioactive material Marie found, she called "polonium," in honour of her country of birth. The second one she studied was radium. It was the use of radioactive material in the form of a "radium mold"—devised by Marie Curie—that my Calcutta cancer hospital used in 1952 to rescue me from a severe case of oral carcinoma. My doctors had concluded that with standard medical treatment (mainly surgery), I had the possibility, maximally, of living for 5 more years. It was a rather depressing forecast to hear at the age of 18, as I then was.

Then my doctors brought Marie Curie's radium into the story in my Calcutta hospital, which was, by then, only 2 years old, having been inaugurated in 1950 by Marie's daughter Irene Joliot-Curie (also a Nobel laureate in Chemistry). In one of the early applications of radiation treatment which was by then just getting into medical use.

The doctors placed a calculated amount of radium in an open lead case in my mouth, to be kept there for 5 h a day for 7 days (not a pleasant exercise, I should note). The treatment was a success, since it is now—not 5 years—but nearly 70 years since I had the radiotherapy devised up by Marie Curie. The experience not only firmed up my respect for modern science, I also became a great admirer of Marie Curie's exceptional talents and innovative mind. It was also clear to me that

✉ Amartya Sen
asen@fas.harvard.edu

[1] Harvard University, Cambridge, MA, USA

the scientist with the greatest influence on my life would probably be a woman - not a man.

2 Pandemics and penalties

I move now from my lead story to the paper I have been asked to write as one of the guest editors for this special number of this journal.

When last spring the pandemic from which we are suffering so much right now unleashed itself, I kept looking for the scientific initiatives to combat it—from the huge cluster of scientific efforts going on in different countries of the world. I ventured the expectation that some genius medical researcher would take us out of the crisis in one way or another, and that the critically important researcher could be of either gender. I have had reason to believe, from very early in my life, that science can make a huge difference to our well-being and survival, and furthermore, women scientists can be leaders of gigantic departures in just the way Newton or Leibnitz or Darwin was.

I felt very interested when Prof. Alberto Quadrio Curzio asked me to author a paper on women scientists in our precarious world endangered by pandemics. It is clear that pandemics demand scientific departures, and I was looking for my Marie Curie—or to be more realistic, a collectivity of scientists who could add up to being a Marie Curie.

Pandemics are not, of course, new in the world. We do know that they can be very large and can ruin and kill a gigantic number of people. The flu of 1918–1920 apparently affected, we are told, about 500 million people (about a third of the world population then), and killed, it has been estimated, about 50 million men and women. The pandemic that is afflicting us now—Covid 19—has not yet killed so many, but it is rapidly claiming more and more lives. Aside from mortality, many times more people are suffering from the effects of this dreadful ailment across the globe. The demand for hospitalization has been sky-rocketing, often requiring artificial ventilation and frequently enough what doctors call "intensive care." The hospitals are full across the world. We have to defeat Covid 19 without delay.

Covid-19 is caused by a virus—a corona virus in particular—called SARS-Cov-2. It is predominantly a respiratory disease (though it can affect other organs as well), and the disease is readily carried by the virus from one person to another. The suffering from the illness can involve fever, cough, shortness of breath, fatigue, body ache, nausea, diarrhea and other punishments. Quite unpleasant experiences, in addition to the danger of mortality.

What can science do to combat the pandemic? It can do many things to weaken the grip of the illness and to loosen the power of the epidemic, and contributions to such scientific encounter can come from scientists of either sex. In tune with the topic of this paper, we must also consider whether women scientists have any special facility that distinguishes them in the battle against this terrible pandemic.

3 Science initiatives and their importance

What are the different areas of scientific research that must demand special attention in removing the scourge of this pandemic?

3.1 Vaccine development

Perhaps the most easily understood need for scientific departure in trying to overcome this pandemic involves the development of vaccines. Several effective vaccines are being developed, and two of them (made respectively by Moderna and Pfyzer/BioNTech) are in extensive use already. Even though the names of companies engaged in the development of the vaccines are often very widely known, the identities of scientists who contribute to their development are sometimes far less publicized. The leader of the team often get honourable mention, but many people in the team who make very substantial contributions do not get the recognition that would be appropriate for them to receive. This can lead to the loss of relevant information, which is typically not deliberate, and it usually results from the conventional economic organization of vaccine development, which tends to be private-profit oriented. The culture of team work may also contribute to the tendency towards anonymity of scientists in this area of research.

However, the identity of women scientists involved in vaccine research can emerge very easily when the media takes an interest in the subject. Dr. Anthony Fauci, the nation's top infectious disease expert and a constant presence on U.S. TV during the coronavirus pandemic,[1] was recently asked by the National Urban League, during a forum hosted in early December: "Can you talk about the input of African American scientists in the vaccine process?" Fauci's answer came without any delay: "The very vaccine that's one of the two that has absolutely exquisite levels—94 to 95% efficacy against clinical disease and almost 100% efficacy against serious disease that are shown to be clearly safe—that vaccine was actually developed in my institute's vaccine research center by a team of scientists led by Dr. Barney Graham and his close colleague, Dr. Kizzmekia Corbett, or Kizzy Corbett." So we now know that it is an African American woman, Kizzy Corbett, whose scientific work, along with that of Barney Graham, was at the forefront of the development of the much-praised vaccine—Moderna. We would not have known that but for the probing query of a journalist.

One of the understandings that have clearly emerged in recent years from applied economic research, in many different areas, is that incentives for devoted application and work come in many different forms. Given the nature of capitalism that the vaccine industry tends to rely on, it is possible that there is an overemphasis here on monetary reward (which Dr. Fauci tried to remove), perhaps partly because of the difficulty of separating out individual contributions from team work. But this is not an irremediable lacuna, since record keeping is possible, and the general public is

[1] https://abcnews.go.com/Health/coronavirus.

surely interested in who is doing what in the development of important ingredients of safe living.

The assignment of praise for developing the vaccine from Moderna is just one example of an unsung brilliance, and doubtless many others can be readily found. When there is a congruence of ownership of a firm and its lead scientists, the scientists doing the work tend to get more attention. This has been quite striking in the case of one of the two most successful vaccines—the one developed by Pfizer/BioNTech. The scientists leading the research for this initiative are a Turkish husband-and-wife team (respectively called Dr. Ugur Sahin and Dr. Ozlem Tureci [diacritical marks omitted here]) who set up the firm BioNTech precisely for this purpose. The lead scientists in this case did get recognition, but it has been suggested that they could have received more celebration had they not been foreigners. Also, the question of more knowledge of all the scientists involved can arise even here if others have been involved, to varying extents, in the work behind the development efforts, without any ownership role.

3.2 Confidence: race, religion and caste

We can ask why it is important to know who did what, and what's so significant about the fact that a woman scientist—in these cases woman scientists from minority communities—played such important roles in vaccine development? Anonymity of contributions of this kind can be counterproductive for at least three different reasons.

First, there is the issue of incentives, and personal recognition and praise can have an important role to play in encouraging innovative work. An over-reliance on monetary reward may be inefficient when a scientist does seek—or strongly appreciate—recognition and celebration.

Second, to the extent that the community from which the innovator comes suffers from some neglect—in Kizzy Corbett's case as a woman (influenced by gender bias) or as an African American (affected by racism)—recognition and admiration can help to combat that deficiency, even as the scientific work helps to fight the pandemic. Similarly, the scientific fame of the Turkish couple, Sahin and Ozlem, would have been helpful for the assimilation of Turkish immigrants in Germany, and it is also worth reflecting on the fact that had one of the anti-immigrant right-wing groups in Germany (such as *Alternative for Germany*) been more politically successful, the pioneering vaccine might not have been developed in Germany at all.

The third issue is rather more complex. The acceptability of a new medicine (including a vaccine)—in particular the lack of suspicious thoughts about it—may depend substantially on public belief about the nature and history of the novel treatment. For example, because of the history of social bitterness in the relationship between African Americans and White Americans in the USA, there is a history of lack of confidence of Black people in practices that are strongly associated with White communities. This may apply to the lack of trust of Black communities in vaccines developed by those who are seen simply as White people. This is particularly unfortunate since in the case of the coronavirus pandemic, Black communities

have been infected and killed at disproportionately larger rates across the country, as the Center for Disease Control (CDC) has shown. Yet in an Axios/Ipsos poll conducted last November, it emerged that about a half of Black Americans said they would have little confidence in the fair play involved in vaccines developed by White people. Many Black people try not to touch "White men's vaccines."

This odd barrier needs an urgent change. An understanding of the involvement of colored communities in vaccine development can, thus, be extremely important. After pointing to the involvement of African Americans (like Kizzy Corbett) in the basic work in the making of the vaccine Moderna, Dr. Fauci went on to remark:

> So, the first thing you might want to say to my African American brothers and sisters is that the vaccine that you're going to be taking was developed by an African American woman. …And that is just a fact.

A similar story can be found in the suspicion that the discriminated people in poor countries sometimes have about medicine that may appear to be only for the rich—produced by and for the use of the rich. Caste and religion can work as similar barriers. The involvement of scientists in general—and women scientists in particular—from different communities in the society may not only be useful for expanding the opportunities of production of vaccines, a sharing culture can also do a great deal for easy acceptability of treatments in all parts of the population. Barriers have been faced in the past in expanding the use of inoculation—from small pox to polio—and the broadening of scientific participation can make a significant contribution to widening the reach and speed of use of vitally needed medical intervention.

3.3 Gender and consequences

Gender bias too can, in its own way, limit the extent of appreciation that women scientists get, which can be a dampener, despite the growing involvement of women scientists in the actual work of medical research and in the operation of health systems. There is a serious issue of an "informational trap" in the contributions of women being much less acknowledged than they should be—biases in reporting can be very extensive.

This problem and related ones were strongly addressed in a letter by 35 leading women scientists last summer in *The Scientific American*:

> Women are advising policymakers, designing clinical trials, coordinating field studies and leading data collection and analysis, but you would never know it from the media coverage of the pandemic. More than ever before, epidemiologists, virologists, and clinicians are communicating with journalists and the public about their science. But highly visible articles in *The New York Times* and other media outlets about the scientists involved in the response are biased towards men,[2] even though there are plenty of qualified women

[2] https://www.nytimes.com/2020/04/05/world/europe/scientists-coronavirus-heroes.html.

> on the frontlines of the Covid-19 response that could easily be identified by checking author lists and scientific websites.
> Neither epidemiology nor medicine are male-dominated fields, but women are quoted less often[3]—sometimes not at all—in articles. What's more, the lack of inclusion of leaders of colour is striking and disenfranchising for minority women scientists of colour, particularly as communities of colour are being hit hardest by this epidemic.[4]

This disenfranchisement has effects also on the speed and efficiency of innovative research as well as having some possible implications for the acceptability issue. However, perhaps most importantly women not getting their due makes the goal of gender equity that much more difficult to pursue. Marie Curie did much to enhance the standing of women in society, but the denial of credit to innovative work by women makes gender equity that much harder to achieve.

Furthermore, undercounting of female achievements also tends to discourage women from undertaking higher education and opting for "difficult and challenging" subjects of specialization. This last problem can be particularly severe in many developing countries.

4 Economic consequences of pandemics

Pandemics tend to be hugely disruptive events. They reduce employment and economic activity and cause much poverty and hardship. These recessionary effects can be observed across the world right now, as a result of the global spread of the Covid pandemic. Dealing with this crisis, which is distinct from the medical catastrophe (even though casually connected with it) requires scientific work that goes beyond medical activities. The need for well-informed and humane economic analysis is particularly involved in tackling the economic consequences of pandemics.

Gender economics is a relatively new area of study, but its relevance is particularly strong when the lives of women are especially disrupted through the loss of household income, lack of medical facilities, the need for physical separation (as a part of prevention strategy for the epidemic), and particularly the deprivation of resources and opportunities for child care.

I must point to the special need for concentration on gender economics in the context of pandemics. Even though there is not enough opportunity in this paper to go into the subject in detail—the special issue that is being planned by Alberto Quadrio Curzio for which this paper is being written, will happily have substantial

[3] https://www.theguardian.com/tv-and-radio/2020/may/04/male-experts-dominate-uk-news-shows-during-coronavirus-crisis.

[4] Caroline Buckee et al., "Women in science are battling both Covid-19 and the patriarchy," *Scientific American*, May 15, 2020.

expertize in this field, including the presence of very distinguished economists (such as Prof. Bina Agarwal) with appropriate specialist knowledge. It is important to remember that the needed women scientists may have to be economists and sociologists too—not just biologists and doctors.

5 Society and science

Before finishing this paper, I must briefly touch on a pandemic-related subject in which the scarcity of women scientists, when that is the case, may be particularly strongly felt. Even though I do not expect that women in general—and women scientists in particular—are invariably more prone to bring in welfare-related considerations in social policy making than men are likely to do, there are some reasons to think that such a connection may, at least on some occasions, play a significant role. For example, "affordable health care" is a big electoral winner in America partly because of the support it gets from women voters (and this seems to apply to other egalitarian proposals as well).

However whether or not there is any gender difference here, we have to ask the question whether welfare-oriented social scientists happen to be influential in national policy making at a time of social crisis (of which a pandemic would be a fitting example).

Social suffering in a distributional crisis has sometimes been observed to contribute to a long-run improvement in distributional parameters through institutional change. There was, for example, a sharp reduction of the incidence of undernourishment in Britain during the difficult years of food shortage for the country as a whole during the Second World War. Because of much lower total availability of food during the War-years, Britain arranged for more equal sharing of food—through rationing at controlled prices—and one result of this particular reform was that the chronically undernourished in Britain were better fed during the War years (despite lower food availability) than they had been ever before. A similar thing happened in the sharing of medical attention. The expanded medical needs made it necessary to arrange for better sharing.

The results of better sharing on nutrition and well-being were astounding. During the war decade of the 1940s, life expectancy at birth in England and Wales went up by 6.5 years for men, compared with a meagre 1.2 years in the preceding decade, and for women it went up by as much as 7 years, far exceeding the modest rise of 1.5 years in the decade before. The positive lessons from pursuing equity and paying greater attention to the disadvantaged during the war years helped in the emergence of what came to be known as the welfare state. Aneurin Bevan, a strong advocate of greater equity during and after the war (he was also in the War Cabinet), inaugurated the first National Health Service hospital in Britain—the Park Hospital in Manchester—in 1948.

Can something similarly satisfactory happen because of the shared experience of tackling the economic crisis today? That will surely depend on how the crisis is dealt with and what concerns come to the fore. Unfortunately, at this time, equity cannot be seen to be a particularly noticeable priority in policies to deal with the

pandemic across the world. For example, while only about 14% of the US population is Black more than half the people dying from the pandemic belong to that category. In Chicago a full 75% of pandemic deaths have been of African Americans who constitute only one third of the resident population. There are other inequities in America, and internal disparities in the toll of the pandemic have been no less in many other countries, such as Brazil or India.

India is a particularly contrary case. The pre-pandemic inequalities were as strong in India as in any country in the world. India has the unfortunate division between reasonably fine medical facilities for the affluent and not even any minimally satisfactory primary health care for the poor. In trying to remedy the brutal asymmetries of the modernized caste system, India could have greatly benefited from equitable pandemic management as an antidote. There is, however, little evidence of any noticeable egalitarian concern in the response to the crisis. Instead, the focus has been on virus control with drastic lock-down (including suddenly stopping all trains and buses) with very little attention paid to labourers who lose their jobs and incomes from the lock-down, or to the many migrant workers—the poorest of the poor—who were kept hundreds of miles away from their homes. Social distancing restrains the spread of the virus (that is not in dispute), but it has to be combined with compensatory economic arrangements for people made destitute by the lock-down.

This is surely a missed opportunity, in contrast for example with what Britain was able to do faced with the prospects of unequal suffering during the Second World War. This is where the presence and effectiveness of a caring professional class could make a big difference. Women scientists need not necessarily have been inclined to play a part in such institutional reform, but they surely can play a big role in the flourishing of benevolent science, as Marie Curie did. It is to the advancement of social cohesiveness to which Alberto Quadrio Curzio is drawing attention.

As I end this paper, my huge admiration for Marie Curie brings me back to her extraordinary life. She died from aplastic anaemia, a kind of leukaemia, caused by her dedicated selfless work with nuclear material for the benefit of others. There was great science in her life, but also fearless dedication. She radically changed the world in which she was born.