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Barbara Hof is a postdoctoral fellow at the University of Lausanne in Switzerland. A historian of computing and physics, she is currently working on a book project that analyzes the role of knowledge sharing in Cold War science diplomacy.

Science for All at CERN

Barbara Hof

In the 1960s CERN initiated a series of popular-science talks for nonacademic staff in the belief that getting them interested in science was key to its becoming a world-leading laboratory.

Almost 60 years ago, CERN began offering lectures to its nonscientific personnel on dinosaurs, science in the Middle Ages, nuclear fusion with lasers, salt mines, gold in the ocean, permafrost, the birth of stars, Mars's surface, plant transpiration, and much more. Those lectures were part of a wide-ranging series titled Science for All, which was aimed not at the outside public but at CERN's technicians, secretaries, laboratory assistants, operators, and craftspeople. Collectively, they made up 84% of the workforce—1842 of 2191 people in 1965 when the program was introduced.[1] Management believed that CERN's physicists would more easily achieve their goals if the behind-the-scenes support staff could be motivated to appreciate science.

CERN is well known today as a prestigious particle-physics laboratory, the world's largest accelerator complex, the birthplace of the World Wide Web (see the article by Bebo White, Physics Today, November 1998, page 30), and a symbol of European integration and international cooperation after World War II.[2] Although it is a prominent model of Big Science and science diplomacy, little has been written about the internal dynamics that contributed to CERN's success. Alongside the scientific collaborations it managed on an ever-increasing scale, CERN also instituted educational programs as it became a world-leading laboratory. Science for All is the most striking manifestation of those efforts, which is why it is worth remembering today.[3]

Introducing staff training

Science for All was only one of several educational programs that CERN started in the 1960s. To understand the reasons for their introduction, it is important to look first at the wider political context and understand how transatlantic knowledge transfer kick-started the development of high-energy physics in Europe after World War II.

In the war's aftermath, physicists in several European countries arrived at the idea of founding an international research laboratory. They realized that if they joined forces, they would have the funds and skills to build a large accelerator similar to those in the US, where great progress was being made in particle physics. A joint laboratory was also seen as a means toward European integration. One of those who proposed such an institution was the French physicist Louis de Broglie in 1949.

The following year, I. I. Rabi, the US delegate to a UNESCO meeting in Florence, Italy, summarized those plans when he presented a formal proposal for the establishment of a European physics center similar to Brookhaven National Laboratory in Long Island, New York, which had been founded in 1947.[4] US officials supported closing the gap in research opportunities between the two continents because scientific collaboration was

CERN staff receive technical training in electronics in 1975. (Courtesy of © CERN, ref. 53-3-75/colorized by PHYSICS TODAY.)

seen as instrumental to helping forge a Western alliance in the emerging Cold War. Precisely because of that potential influence on European affairs, French and Swiss Communists lobbied against the creation of CERN, arguing that the joint scientific project lacked political neutrality.[5]

Those objections proved ineffective: CERN was officially founded in 1954. Transatlantic cooperation provided staff members with some of the necessary knowledge to build the world's then-largest proton synchrotron, which was inaugurated in 1960. Europeans learned about its design from peers in the US, including Hildred Blewett and John Blewett.[6] In its first decade, CERN received additional US help in the form of consultations, colloquia, visits to the construction site, briefings, paid fellowships, and guest stays of CERN's leading physicists at the Berkeley and Brookhaven laboratories. Those informal learning opportunities helped CERN overcome what its founders saw as its knowledge deficit.

But CERN management, led by its director general, the Austrian-born US physicist Victor Weisskopf, soon recognized that the structured training of personnel was fundamental to securing the laboratory's future success. Shortly after Weisskopf's election in 1961, the CERN Staff Association, asked to work closely with management to improve working conditions, provided him with a report on training needs. The report was endorsed in March 1962 by the organization's Scientific Policy Committee,[7] and the laboratory's top authority, the CERN Council, soon approved the introduction of educational programs.[8]

CERN's in-house training was closely tailored to research, which distinguished it from the content offered at other educational institutions. The goal was to provide staff with the specialized knowledge needed for their job tasks. Management believed that workers' skill sets needed to be improved so that they could adapt to rapid advances in research. For the same reason, the Scientific Policy Committee also recommended offering training for graduate students.[7]

Since CERN's founding, its theoretical physicists had held seminars to discuss ideas. That was now expanded and termed academic training. As a counterpart to it, and because technical and programming expertise was in high demand at the accelerators, at detectors, and in the offices, technical training was introduced for engineers, technicians, mechanics, applied physicists, and other staff. Because those structured training programs were well attended during a trial period in fall 1962, CERN formed the Training and Education Section the next year under the leadership of the Belgian physicist Guy Vanderhaeghe.[9]

Why the support staff?

CERN's academic and technical training courses prepared staff for their specific tasks. Trainees gained experience in the Fortran programming language, discussed theoretical considerations and experimental findings, improved their skills in mathematics, or learned more about new accelerator uses and designs. In addition, CERN began offering graduate training to doctoral students of member states. At a time when instruction in particle physics was not yet part of the standard physics curriculum at many universities, CERN's graduate training helped participants gain familiarity with the basics of the field and current trends.

CERN management also hoped to foster a broader and deeper understanding of physics, which led the organization in 1962 to introduce general lectures "for the whole of the staff."[10] Those talks focused on the basics of neutrino physics, a highly topical subfield at the time. But they were discontinued after a year.

The organization decided to try again in 1965. Gearing the lectures toward the support staff, most of whom came from nearby French-speaking communities, CERN decided to hire a permanent instructor, Rafel Carreras, to lead the organization's in-house general education offerings. Carreras, seen at the blackboard in the opening image, had studied physics and biology and had a keen interest in explaining science to laypeople. And he had experience lecturing in science at two Swiss universités populaires (open universities), which were specifically aimed at giving learning opportunities to adults who did not have the formal qualifications required to study at a university.

Carreras ended up teaching at CERN for more than 30 years.[11] During his first decade at the organization, he offered two general education programs. The first, Understanding CERN, familiarized new members of the laboratory's support staff with its overall scientific mission in the belief that

A theory seminar at CERN in 1962. (Courtesy of © CERN, ref. 5314/colorized by PHYSICS TODAY.)

informed personnel would collaborate better with the scientists. The program consisted of lessons in the organization's history, its accelerators and detectors, the production and use of particles, and the nature and classification of particles. The Education and Training Section believed that giving employees an overview of CERN's activities would help increase efficiency in the workplace.

Aiming to motivate

The second general lecture series that Carreras began offering in 1965 was called Science for All (or Science pour Tous in the original French). That title is reminiscent of Science for the People, a late-1960s movement of concerned scientists in the US who opposed the Vietnam War. Those activists criticized leading US physicists for their contribution to weapons development and military strategies and demanded radical change in the academic system.[12]

CERN's Science for All was the opposite of Science for the People: It was not about overcoming the hierarchy and division of labor in the laboratory, even if the communication of scientific material to nonacademics arguably partially embodied liberal ideals of giving access to knowledge. Carreras held antidiscriminatory views and Vanderhaeghe was an advocate of trade unionism, which certainly influenced the educational programs at CERN. To what extent the nonacademic personnel appreciated Science for All cannot be reconstructed from the archival holdings. But it is clear that CERN management saw it as a tool to help secure a positive reputation for the laboratory among its nonscientific staff.

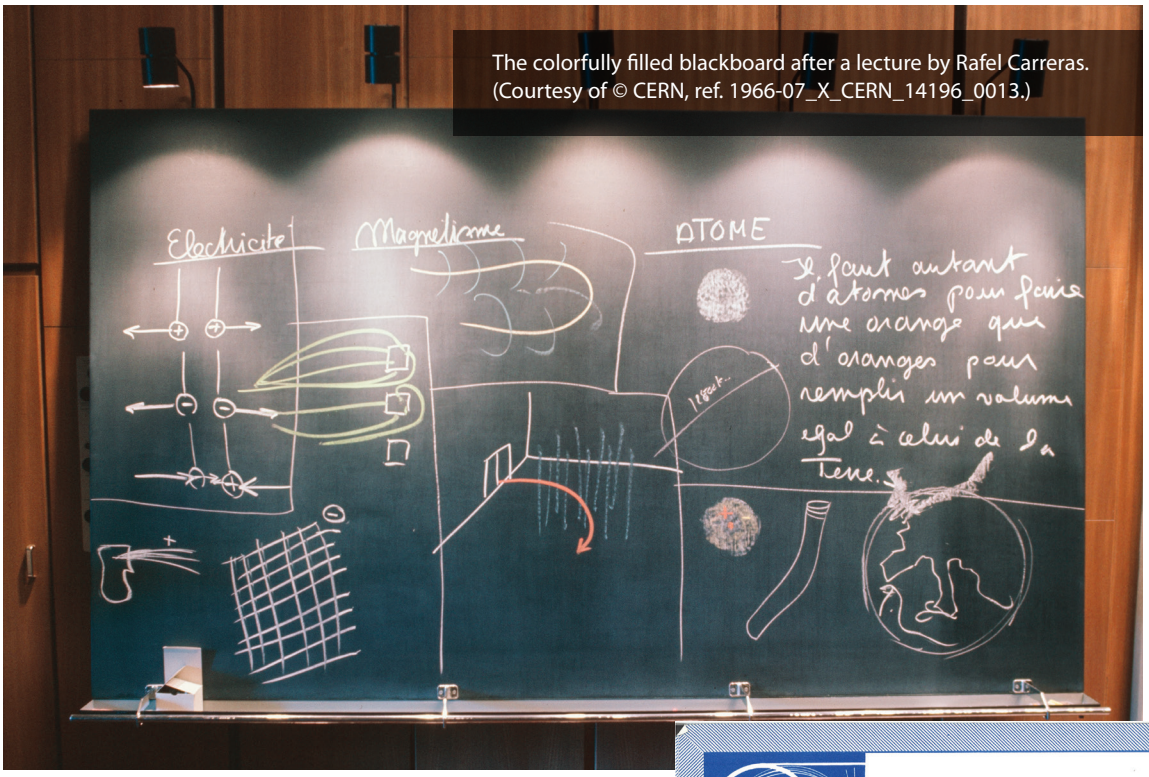
At the time when Science for All was introduced, CERN was in the midst of an organizational reform aimed at helping it cope with the growing number of research projects and increasing demands from visiting physicists who sought to use the accelerator complex for their own research purposes.[13] Workflows had to be well organized. As a result, CERN introduced a management training program to help its senior scientists improve their communication and motivational skills.

Science for All, on the other hand, was designed not to meet day-to-day demands but to inspire staff members about science. CERN did not introduce the series to help it catch up with US laboratories, to maintain its central position in the dissemination of knowledge throughout Europe, or as a way to pass on its core mission. The lecture series was simply intended to get nonscientists interested in science and encourage them to be proud that they worked at CERN.[14]

Carreras was given the freedom to design Science for All as a motivational learning program open to all staff. To do that, he presented scientific findings and discussed them with participants in French, the language spoken by the local population. The weekly program was inaugurated in December 1965 with a lecture on the use of laser beams on living cells. The free lectures, held outside official working hours, were announced in the *CERN Bulletin*, a newsletter for the CERN community. In addition to giving talks, Carreras ran sessions during which the audience was invited to ask questions. The CERN amphitheater where lectures were held was usually well filled, with at least 50 and sometimes as many as 400 participants in attendance.

Each Science for All lecture was about 30 minutes long, and Carreras used the chalkboard or overhead projector to

One of Rafel Carreras's first lectures at CERN in 1966. (Courtesy of © CERN, ref. 136-12-66/ colorized by PHYSICS TODAY.)



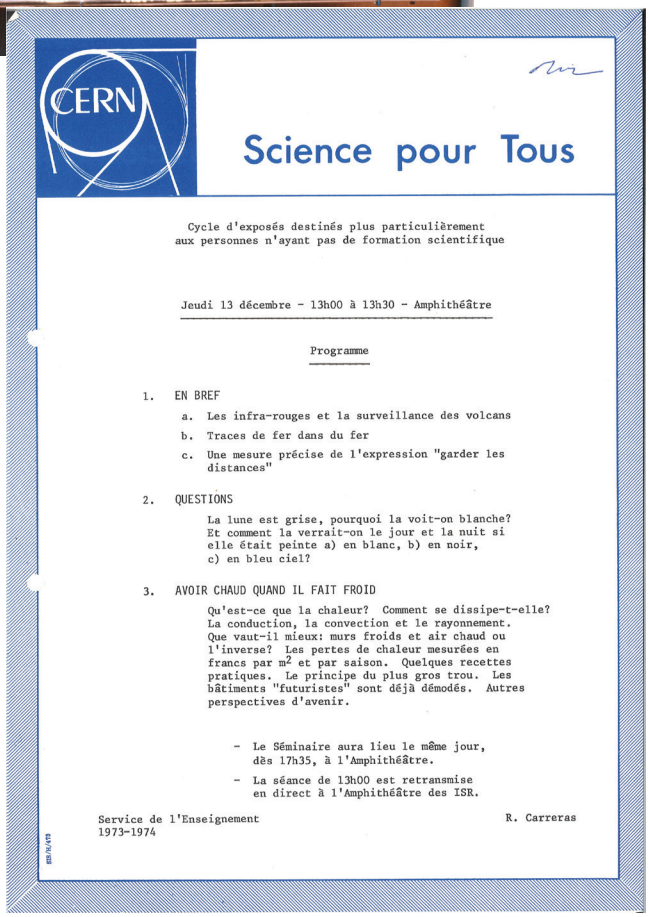
The colorfully filled blackboard after a lecture by Rafel Carreras. (Courtesy of © CERN, ref. 1966-07_X_CERN_14196_0013.)

provide visual content. He typically covered trends and new developments from the world of science, but his lectures also occasionally summarized news that he felt was of general interest, such as the Apollo missions. Lectures explored, for example, why CERN was so big, the invention of the microscope, the state of science 50 years ago, volcanoes, echoes, nuclear explosions, particle collisions, and how the end of the US Atomic Energy Commission in 1975 affected high-energy physics. Carreras chose the topics himself or by popular demand. He also based some lectures on popular-science books such as Weisskopf's *Knowledge and Wonder: The Natural World as Man Knows It*.[15]

Science for All was not meant to inspire nonacademically trained staff to study for a university degree but to awaken their general interest in science. Because the lectures popularized scientific ideas, representatives of CERN's Training and Education Section noted in 1972 that some of them might be of interest to a wider audience and thus fell within the realm of public information. Although the activities of CERN's Public Information Office, which communicated decisions and research results to the general public, were never merged with Science for All, management decided to open Carreras's lectures to nonemployees as well.[16]

The other side of Big Science

Science for All is a reminder that Big Science encompasses more than the science itself: In CERN's case, it also involved cultivating enthusiasm for science among the nonacademic staff members to better integrate them into the organization's workflow. The educational program was intended to motivate employees and spread a positive image of CERN among its support staff, which largely came from the surrounding region. Its introduction was more strategic than idealistic, even if it



CERN

Science pour Tous

Cycle d'exposés destinés plus particulièrement
aux personnes n'ayant pas de formation scientifique

Jeudi 13 décembre - 13h00 à 13h30 - Amphithéâtre

Programme

1. EN BREF
   a. Les infra-rouges et la surveillance des volcans
   b. Traces de fer dans du fer
   c. Une mesure précise de l'expression "garder les distances"
2. QUESTIONS
   La lune est grise, pourquoi la voit-on blanche? Et comment la verrait-on le jour et la nuit si elle était peinte a) en blanc, b) en noir, c) en bleu ciel?
3. AVOIR CHAUD QUAND IL FAIT FROID
   Qu'est-ce que la chaleur? Comment se dissipe-t-elle? La conduction, la convection et le rayonnement. Que vaut-il mieux: murs froids et air chaud ou l'inverse? Les pertes de chaleur mesurées en francs par m^2 et par saison. Quelques recettes pratiques. Le principe du plus gros trou. Les bâtiments "futuristes" sont déjà démodés. Autres perspectives d'avenir.

- Le Séminaire aura lieu le même jour, dès 17h35, à l'Amphithéâtre.
- La séance de 13h00 est retransmise en direct à l'Amphithéâtre des ISR.

Service de l'Enseignement
1973-1974

R. Carreras

A TYPICAL ANNOUNCEMENT for a Science for All lecture. (Courtesy of the Archives of William Owen Lock, 1927–2010, ref. CERN-ARCH-WOL-160, CERN Archives.)

resonated with contemporary notions of equality. Nevertheless, Science for All represented a universalistic approach to knowledge—namely, the ideal that science should reach everyone. As Carreras stated in a lecture on his retirement in 1997, his talks had provided staff with knowledge that enabled them to talk about anything related to science and about problems at the intersection of science and society.[17]

Since the introduction of the first structured training programs in 1962, CERN has expanded its learning opportunities for graduate students, postdoctoral fellows, visiting scientists, and research associates. It continues to invest in employee orientation and the professional development of support staff. While Science for All was always a somewhat modest effort, it was also a pioneering experiment in science communication. It was an initiative to get people excited about science and a step toward building the global audience that CERN enjoys today.

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