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COMUNICARE FISICA ALL'AMERICANA

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ABSTRACT

I survey motivations for education and outreach initiatives in the American context and explore the value of communicating physics for physicists and for the wider society. I describe the roles of large institutions, professional organizations, and funding agencies and cite some individual actions, local activities, and coordinated national programs. I note the emergence of transnational enterprises—not only to carry out research, but to communicate physics. A brief appendix collects some useful internet resources.

1 Introductions

It is my great pleasure to join Italian colleagues for this ambitious workshop on communicating physics. In my main career as a theoretical physicist, my

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research has addressed many topics in particle physics. My close engagement with experiment has made the Fermi National Accelerator Laboratory a stimulating scientific home for many years. Beyond my personal activities to bring the ideas and aspirations of particle physics to a broad audience, I have held a number of positions in which I have been able to encourage—and take pleasure in—the outreach and education efforts of many of my colleagues. I have served as Head of the Fermilab Theory Group, as Deputy Director of the Superconducting Super Collider Central Design Group, and as Chair of the American Physical Society's Division of Particles and Fields. In the last capacity, I oversaw the planning and execution of *Snowmass 2001:* a summer study on the future of particle physics (see snowmass2001.org). I am also a member of the board of trustees of the Illinois Mathematics and Science Academy, a state-supported residential high school.

Fermilab is a U.S. Department of Energy national laboratory for particle physics, operated by a consortium of 90 research universities in the United States, Canada, Italy, and Japan. The laboratory and its research community are highly international; our lab has much in common with CERN. Fermilab has some two thousand employees, an annual budget of $300M, and welcomes 2250 experimental "users" from around the world. Our principal research instrument is the Tevatron, a superconducting proton synchrotron 2π kilometers in circumference that accelerates protons and antiprotons to nearly 1 TeV. When operated as a proton-antiproton collider, the Tevatron is the world's most powerful microscope, giving us access to *nanonanophysics* on a scale a billion times smaller than an atom.

Many of you have visited my country, or gained an impression of it from Puccini's opera, *La Fanciulla del West,* or from the cult classic film, *The Blues Brothers.* Nevertheless, a few remarks about the country's character may provide useful context for today's exploration.

The United States is large in both land area and population, and much of its area is lightly settled. It is a young nation, at least in its psyche, and it is the wealthiest country in the history of the planet. The U.S. was founded as a nation of immigrants, and the flux of people from diverse origins to our shores continues today. A great degree of social mobility is perhaps correlated with a restrained esteem for authorities (including professors). At the same time, unease with the pace of change leads many to a powerful reliance on Authority.

The U.S. is a deeply non-Napoleonic society, characterized by much local autonomy, notably in the responsibility for schools. Our university system is highly heterogeneous. The national government assumes responsibility only for a few military academies, and our most celebrated universities are largely private institutions. In America's heartland, the state universities serve as the leading cultural institutions. Though academic science is quite young in America, research has traditionally been centered in universities—research and teaching go hand in hand—and that has led to a superb standard of postgraduate education.

In contrast to the European standard, we do not have dominant national newspapers. Our vast radio and television empires, which seem increasingly preoccupied with gossip and celebrity trials, evince little interest in science. National Public Radio, especially in its local programming, is receptive to science and culture. All of these factors—beginning with the vastness of the country—enhance the importance of local outreach and education efforts.

2 Incentives for Education & Outreach Efforts

Some of the motivations I would cite for physics communication are similar to those evoked by earlier speakers. First comes the teaching imperative: the desire not only to pass on information about the minute particulars of current research, but also to cultivate an understanding of the scientific worldview, with its rejection of Authority, reliance on experiment, and celebration of doubt. Next comes the propaganda function, which I understand here in a positive light: *propaganda fide* for our attachment to reason, observation, and controlled experiment; the development of what social scientists call "diffuse good will" toward the scientific enterprise; and an attempt to influence behavior and gain acceptance and support for our undertakings.

Since we scientists devote our lives to exploration, I see outreach and education as a mode of exploring the world—an opportunity to learn from and about others. Some of my colleagues emphasize the value of "inreach"—to see ourselves as others see us! Previous speakers have spoken of engaged learning; we might well aspire to *engaged teaching.* Participation in outreach programs can open our own students to the wider world. Our communications efforts can also help to change the face of physics—to attract women in greater numbers and to show minority and new immigrant groups the appeal of careers in and around science. Finally, outreach and education programs are good for physicists: the joy that comes from sharing our numinous adventure with others is marvelous psychotherapy!

3 U.S. Organizations and Institutions

The American Physical Society (www.aps.org), the principal professional organization for academic and industrial physicists in the United States, offers many education and outreach programs (www.aps.org/educ/). Its *Physics Central* web site (physicscentral.org) aims to communicate the excitement and importance of physics to everyone. *Physical Review Focus* (focus.aps.org) stories explain selected physics research published in the APS journals *Physical Review* and *Physical Review Letters.* Several of the Divisions of the APS maintain vigorous outreach and education programs, and the Forum on Education (www.aps.org/units/fed/) offers a meeting place for members interested in education.

The American Association of Physics Teachers (www.aapt.org), with 11 000 members around the world, aspires to be the leading organization for physics education. It publishes *The Physics Teacher* and the *American Journal of Physics,* and strives to provide the most current resources and up-to-date research needed to enhance a physics educator's professional development.

The American Institute of Physics, a federation of ten Member Societies representing the spectrum of physical sciences, supports a number of educational efforts, described at www.aip.org/education/. The electronic newsletter *Physics News Update* (www.aip.org/physnews/update/) is a digest of physics news items arising from physics meetings and journals, newspapers and magazines, and other news sources. The AIP also maintains the *Physics News Graphics* image archive (www.aip.org/png/).

The American Association for the Advancement of Science (www.aaas.org) is the largest scientific organization in the United States. AAAS sponsors an annual meeting—in which physics plays a minor, but growing, part—that is a major event for science writers from much of the world. It also animates a great range of education programs and activities to promote public awareness of science and its role in public policy (www.aaas.org/programs/education/).

The Department of Energy's Office of Science (www.science.doe.gov) is the largest supporter of basic research in the physical sciences in the United

States. It is also the main patron of large research instruments for high-energy physics, nuclear physics, and fusion energy sciences. The Office of Science sponsors a range of education initiatives through its Workforce Development for Teachers and Scientists program (www.scied.science.doe.gov/scied/sci_ed.htm). The Office of High Energy Physics points with pride to educational and outreach efforts of its national laboratories and university-based research groups but does not set specific expectations or requirements for research contractors. The DOE and NSF jointly sponsor the *QuarkNet* program described in §4.4.

The National Science Foundation (www.nsf.gov), which mainly funds individual investigators, is the other principal source of support for basic research in physics. Support for science and engineering education, from pre-Kindergarten through graduate school and beyond, is essential to NSF's mission. In addition to judging the intellectual merit of scientific proposals to the NSF, reviewers are asked to take into account the "broader impacts" of the proposed research program. Specifically, *How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups?* Last year alone, NSF grantees in particle physics reached more than 100 000 school-age children. NSF directly funds research into effective educational practice, and supports research participation for students and teachers.

The National Aeronautics and Space Administration (www.nasa.gov) has an enviable record in engaging the public imagination in the value of exploration and in the astronomical sciences. NASA requires an extensive outreach and education effort for each of the missions it supports.

All of the major particle physics laboratories have extensive public affairs and education offices. Many in the *Comunicare Fisica* audience will know Judy Jackson of Fermilab (www.fnal.gov) and Neil Calder of the Stanford Linear Accelerator Center (www.slac.stanford.edu), and the magazine symmetry (www.symmetrymag.org) recently launched as a joint venture of the two institutions. Both labs have lively programs for science writing interns. Together with other particle physics laboratories around the world, U.S. institutions have launched interactions.org, a central resource for communicators of particle physics. To celebrate the World Year of Physics, interactions has organized *Quantum Diaries* (interactions.org/quantumdiaries), a web site that follows physicists from around the world through their blogs, photos, and videos.

The International Linear Collider (linearcollider.org), which many of us see as the next great accelerator project after the Large Hadron Collider at CERN, is organized as an international design effort, with an international communications team.

The Kavli Institute for Theoretical Physics (www.itp.ucsb.edu), on the Santa Barbara campus of the University of California, is funded by the National Science Foundation and the University of California. The KITP program of workshops encompasses research in theoretical physics very broadly understood. The Kavli Institute has created a journalist in residence program,[1] and also has an artist in residence.

The Particle Data Group (pdg.lbl.gov), an international collaboration that reviews particle physics and related areas of astrophysics, compiles and analyzes data on particle properties. From its U.S. center at Lawrence Berkeley National Laboratory, the PDG produces and distributes a wealth of educational materials, including the famous standard model wall chart described in §4.3.

The Division of Particles and Fields (www.aps.org/units/dpf/) and Division of Physics of Beams (www.aps.org/units/dpb/) of the American Physical Society, like many of their counterparts in other subfields, support a range of ongoing and special programs in education and outreach. Increasingly, individual experiments are making significant efforts to bring intelligible accounts of their research to public notice.

4 Examples from Particle Physics in the United States

Now I would like to briefly describe a number of education and outreach initiatives carried out by American particle physicists. I have chosen these examples out of my own experiences to illustrate the lessons I will draw in §5, including significant unplanned successes. See the Appendix for additional resources.

4.1 Saturday Morning Physics at Fermilab

When Leon Lederman became Director of Fermilab in 1979, he created the Saturday Morning Physics program (www-ppd.fnal.gov/smp-w/) for high school

[1] To my knowledge, no physics institution in the U.S. offers an experience comparable to the Woods Hole Oceanographic Institution's Ocean Science Journalism Fellowship (www.whoi.edu/home/news/media_jfellowship.html).

students curious about science. For more than twenty-five years, we have welcomed students—and some of their teachers—to the lab on Saturday mornings for ten-week series of lectures (two hours) and in-depth tours of many activities at the laboratory. The lab runs three sessions of SMP each year, with as many as 120 students in each "class." By now, more than six thousand students have been exposed to the ideas of particle physics, the wonders of exotic technologies, and the spirit of scientific inquiry.

We made an important discovery during the first year of Saturday Morning Physics: a number of high school science teachers accompanied their students, and devoted ten consecutive Saturday mornings to learning about particle physics. Though they didn't all have deep preparation to teach physics, they all had sharp intelligence, inquisitive minds, and high enthusiasm. They all wanted to become better teachers; our lab could provide information and encouragement and—perhaps most important—the opportunity for them to meet and support each other. I believe that our accidental discovery of these teachers launched the initiative that blossomed, under the inspired guidance of Marge Bardeen and Stanka Jovanovic, into the lab's Education Office (www-ed.fnal.gov) and Leon M. Lederman Science Education Center.

4.2 Physics Vans

A number of university physics departments organize physics road shows for schools, shopping centers, and community events. These feature demonstrations, often performed theatrically with an amusing twist, by physics undergraduates and graduate students, and hands-on experiments for audience members. Physics vans spark curiosity and put a human face on physics. They are also great fun for the student performers!

4.3 Standard model wall chart

One of the icons of physics classrooms is the table of particles and interactions that grew out of a Conference on Teaching Modern Physics held at Fermilab in 1986. [1] The celebrated chart (see Figure 1) of fundamental particles and interactions created by the Contemporary Physics Education Project represents the enthusiastic work of many teachers. Available as wall chart, poster, and place mat, this representation of our "standard model" has had a global reach, with more than 200 000 distributed. It has helped move particle physics into the

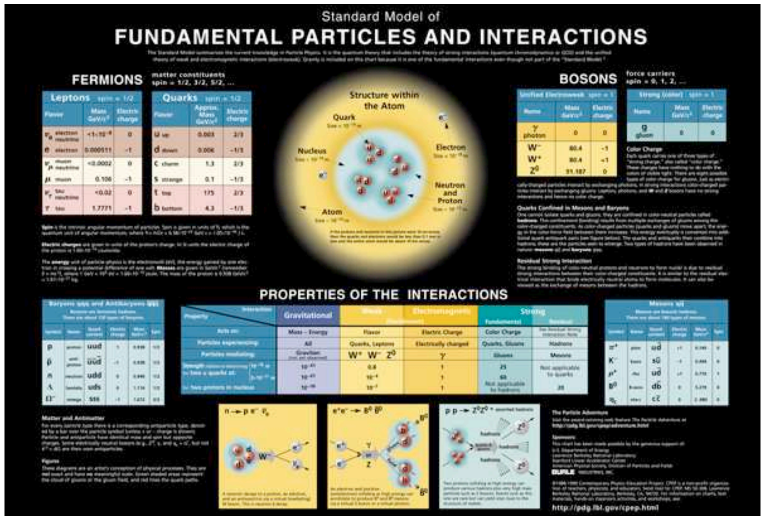

Figure 1: Contemporary Physics Education Project standard-model wall chart.

classroom, and it presents many essential notions of our current understanding. The wall chart project also stimulated *The Particle Adventure,* an interactive web site.

4.4 *QuarkNet*

QuarkNet is a remarkable immersive research experience for high school teachers and their students that is based on lively ongoing partnerships with experimental research groups.[2] Currently fifty-three *QuarkNet* centers operate in twenty-five states and Puerto Rico. They touch 100 000 students per year, and five hundred teachers and one hundred students are research partners with 150 physicist mentors. One of the goals is to engage teachers and students in real time with data from the Large Hadron Collider at CERN. For now, QuarkNet centers involve twelve major experiments and the computing GRID.

[2] The program was established in 1998 by Michael Barnett (Lawrence Berkeley National Lab), Marjorie Bardeen (Fermilab), Keith Baker (Hampton University), and Randy Ruchti (Notre Dame), with initial funding from the National Science Foundation and continuing support from NSF and DOE.

A key tenet of the *QuarkNet* paradigm is that the teachers and students should gain experience in assembling and commissioning real detectors. A favorite example is the construction of cosmic-ray detectors that consist of several paddles of plastic scintillator, photomultiplier tubes, and the associated trigger system. School groups are deploying these simple detectors at schools around the country in the *QuarkNet* Cosmic-Ray Detector Array. Students are learning to use the GRID to handle calculations involving large amounts of data. (I have the impression that the professionals are learning how to make the GRID a robust tool, in the process.)

4.5 Web lecture archives—unplanned outreach!

In the summer of 1999, computer scientist Chuck Severance and physicist Steve Goldfarb, then a member of the L3 collaboration at CERN's Large Electron-Positron Collider, tested a web lecture archive of lectures for summer students. I had the good fortune to be their first experimental animal. Severance's Sync–o–matic software framework [2] is simple and functional. It synchronizes a video stream with good-resolution images of the speaker's slides, all displayed in a web browser. A recent example from Fermilab's web lecture archive is shown in Figure 2.

When I showed the system to my friends in Fermilab's Visual Media Services, they were impressed with the low resource cost (including modest bandwidth and storage requirements) and ease of use, and were quick to see the potential in a streaming video archive. Today at Fermilab, the streaming video archive boasts 1334 entries, including colloquia, conference talks, academic training lectures, and memorable events.[3] We hoped that the archive might prove valuable for Fermilab's staff and users, as indeed it has, but didn't imagine that it would become part of the lab's public face—and the field's. In fact, many viewers from outside our community land at the video archive thanks to search engines, not by drilling down from the Fermilab home page.

[3] Archives of similar richness are maintained at CERN, SLAC, and the Kavli Institute for Theoretical Physics (see the Appendix for links). The KITP is experimenting with the new medium of enhanced podcasts.

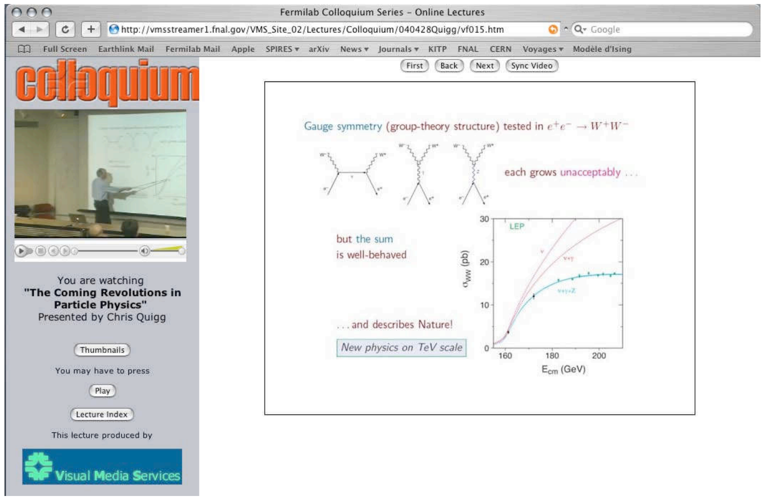

Figure 2: Appearance (in a browser) of a lecture from the Fermilab web archive.

4.6 Engaging Hispanic students

While living at Fermilab as a CDF postdoc, Aaron Dominguez (now at the University of Nebraska) developed an educational project in Aurora, Illinois, to improve the future and stability of the Hispanic community by supporting the educational and social accomplishments of its young people. Bilingual English/Spanish Tutors (BEST) pairs high-achieving high school student mentors with low-income elementary school children. The BEST tutors help their younger peers with homework, reading, and math after school twice a week. The tutors also gain a critical sense of responsibility for the successful education of their own Latino community. Aaron's program has enrolled over 60 students and 35 bilingual high school mentors; the BEST model has been replicated in the neighboring community of Batavia.

4.7 Tevatron postcards

In 1997, I received an invitation to give the first Carl Sagan Memorial Lecture in the series, *Cosmos Revisited,* at the Smithsonian Institution in Washington. I wanted to give members of the audience specimens that would stimulate them to continue the conversation begun by my lecture, "The Particle Cosmos." With Judy Jackson, we conceived an edition of eight postcards depicting significant events—the outcome of proton-antiproton collisions—from the CDF and DØ experiments.

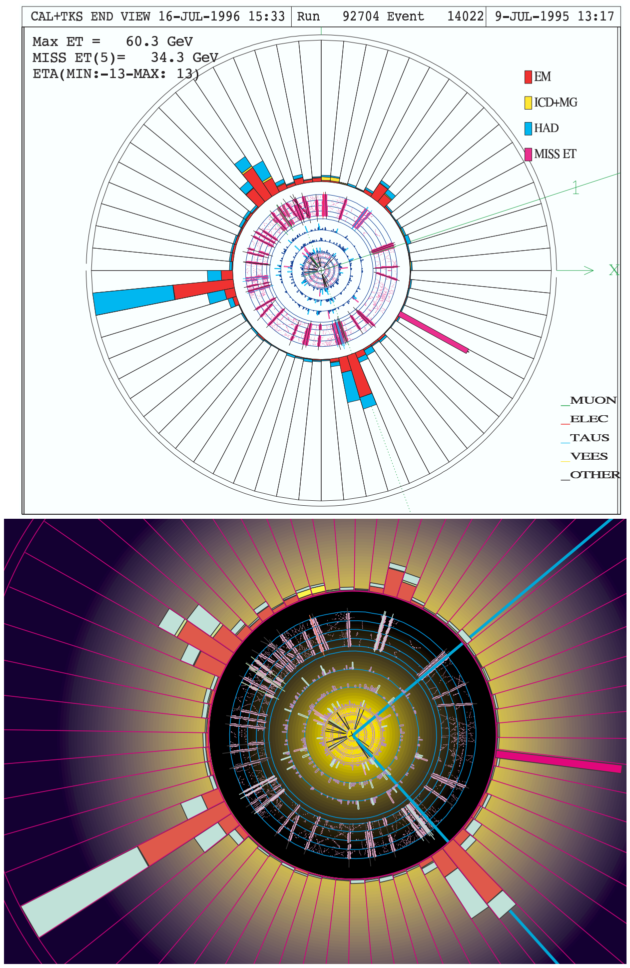

Figure 3: A pair of top quarks reconstructed in the DØ experiment at Fermilab. This end view shows the final decay products: two muons (turquoise), a neutrino (pink), and four jets of particles.

We began by asking the experimental groups to submit authentic event displays. An example is shown in the top panel of Figure 3. This display of a top-quark event from the DØ experiment illustrates an important reality: Experimenters are deeply attached to their detectors, so the fixed detector elements are represented by strong, assertive lines, whereas the ephemeral tracks that bear witness to noteworthy one-time occurrences are indistinct. The light green traces (one solid, one dotted) representing muons—crucial markers in the top-antitop event—are nearly invisible.

Graphic designer Bruce Kerr (www.kerrcom.com) preserved the authenticity of the event displays by discreetly editing the event display to emphasize the elements that signal top-pair production. Except for the background sunburst that contributes visual interest and serves as a metaphor for the conversion of energy into new forms of matter, every element of the postcard shown in the bottom panel of Figure 3 is present in the original PostScript file. And every element in the original event display is preserved in the final image. Such fidelity is important;[4] the image is instantly readable to physicists, including its creators in DØ, and intelligible—with just a bit of explanation—to laypersons. We wrote captions that would explain and initiate conversation. The postcard images (lutece.fnal.gov/Postcards) have become true icons of particle physics, with an impact far beyond their original purpose.

4.8 Snowmass 2001

The Division of Particles and Fields and the Division of Physics of Beams of the American Physical Society organized a three-week summer study on the future of particle physics in Snowmass, Colorado, in July 2001. More than 1200 physicists participated—many young, many from outside the United States—in a very broad examination of where our field should be heading. Early on, we decided to make outreach and education an essential part of the Snowmass 2001 experience. We wanted to share our love for science with the interesting mix of people in Aspen and Snowmass, and to encourage our colleagues to see each other in action. We also believed that the public interaction would reinforce the optimism and enthusiasm that participants brought to Snowmass.

Theoretical physicist Elizabeth Simmons, who chaired the outreach and education effort, has described the extraordinary results in *Physics Today.* [3)]

[4] . . . but not universal in scientific illustration.

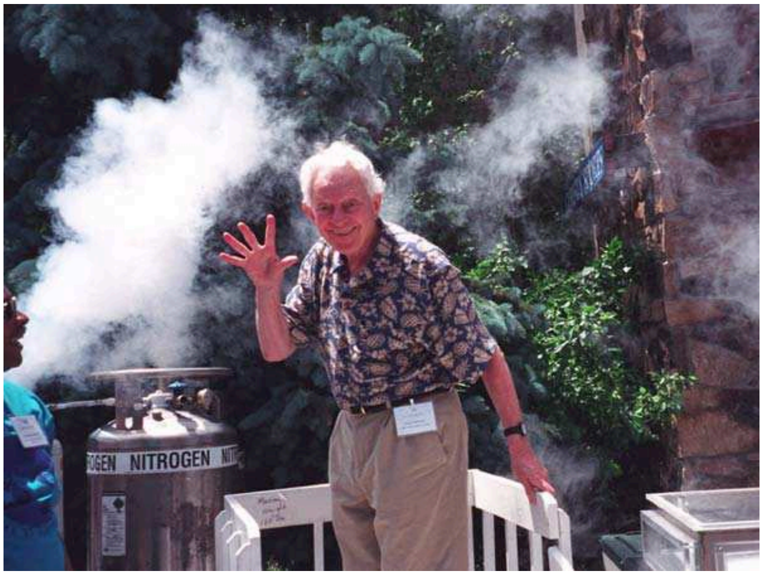

Figure 4: Leon Lederman levitated by the Meissner effect at Snowmass 2001. (Photo credit: Elizabeth H. Simmons, Michigan State University)

The Snowmass 2001 program (snowmass2001.org/outreach/education2.html) included workshops for teachers and students, public lectures, a science book fair, science theater, open-air talks, astronomy activities, conversations with children, outreach workshops, and a balloon ascension to recreate Victor Hess's discovery of cosmic rays. The centerpiece was a huge weekend science fair on the Snowmass Village Mall that attracted some 1500 members of the general public. Among the weekend's hits was a superconducting apparatus capable of levitating an entire human (see Figure 4) from the Texas Center for Superconductivity and Advanced Materials (www.tcsam.uh.edu/education_outreach).

Comunicare Fisica participants will find special interest in the communications workshops (www.fnal.gov/pub/snowmass/workshops/workshop.html) organized at Snowmass 2001.

In connection with the summer study, the DPF commissioned an illustrated thematic survey of our vision of particle physics and its future in the most ambitious intellectual terms. Within this broad vision, the document was to identify the questions we want to address over the next two decades. Like the summer study itself, the thematic survey aimed to help our community recognize and articulate what particle physics is and aspires to be, guided by the scientific imperatives. *Quarks Unbound* was a smashing success, for three principal reasons. First, we were careful to think through what we wanted to accomplish and to identify the audiences we wanted to reach. Second, we entrusted the project to a small team—not a large and representative committee—that included a science writer, a graphic designer, and a few physicists. [We did not want the sort of bland "offends no one, delights no one" product that large committees are adept at producing!] Third, we distributed *Quarks Unbound* widely and enthusiastically to groups and individuals. A private donor financed a second printing, so that the number of copies distributed worldwide now exceeds 60 000.

5 Some lessons

I am continually impressed by the passion, curiosity, and faith in the value of exploration evidenced by those who attend our outreach and education programs. It may be true, as several speakers have opined, that the general population is ignorant and indifferent about science, but my experience is that we do find a receptive and engaged audience. Accordingly, the first lesson is: Respect (do not underestimate) the audience.

Leadership from established scientists and Heroes of the Field provides important validation for the efforts of others. The effectiveness of leading by example is well-established. Respected senior physicists can also discourage the misperception that engaging with the public is unworthy of serious scientists. They also have value as fundraisers, from both public and private sources.

While leaders are important, it may be even more important for the leaders to let go: to grant autonomy and resources to small groups and trust them to do wonderful things. Nothing is more stifling to creativity and innovation than repeated reviews by committees constructed to represent an average. The field is better served by original—even quirky—efforts that explore a whole range of approaches than by efforts programmed to hit the mean each time. Both those in authority and those who execute should find pleasure in experimenting and taking risks!

A familiar conceit is that "Physicists can do anything." I like to tell my colleagues that the complete slogan concludes "…badly," to remind them of the rewards of collaborating with professionals who know their fields as well as we physicists know physics. Working with gifted writers, editors, designers, artists, and educators can be immensely satisfying and can lead you to do things you didn't know were possible.

Let me underline again the importance of local activities. These include organizing public lectures and symposia at the universities and labs, engaging with cultural institutions and creative people within the community, and developing relationships with local radio stations and newspapers. A record of success on the local scene may even enable effective national efforts.

One committed person can do a lot—and an individual can achieve even more with encouragement and support from colleagues. But it is also delightful to learn from others and to draw inspiration from their efforts. The *QuarkNet* model has succeeded so well because it has elements of individuality, collaboration, coordination, and the bond that grows from being part of a large and ambitious enterprise.

Always ask, Why are we doing this? Who is the audience? What are our goals? What will success mean? Be prepared to finish the task: if you prepare a new brochure about your experiment or your subject and are passive or hesitant about distributing it, you have limited your effectiveness. If following through seems like too much effort, you should notice that before you start. Expect to discover new people (not all PhD physicists). Your role may be catalytic. Leaders succeed when others become the stars. Expect also to discover new ideas, and remember that a new outreach triumph may occur when you least expect it.

6 Concluding remarks

Experiments at the Large Hadron Collider break new ground in scale and internationalism, counting collaborators in the thousands. The outreach efforts of the ATLAS (34 countries) and CMS (31 countries) collaborations are truly transnational, and marvelously dynamic. The ATLAS experiment movie (atlasexperiment.org/movie/), for example, is available in ten languages and has won awards in five countries.

The impressive reach of ATLAS and CMS, depicted by the colored spaces in Figure 5, is a source of immense satisfaction and pleasure to particle physi-

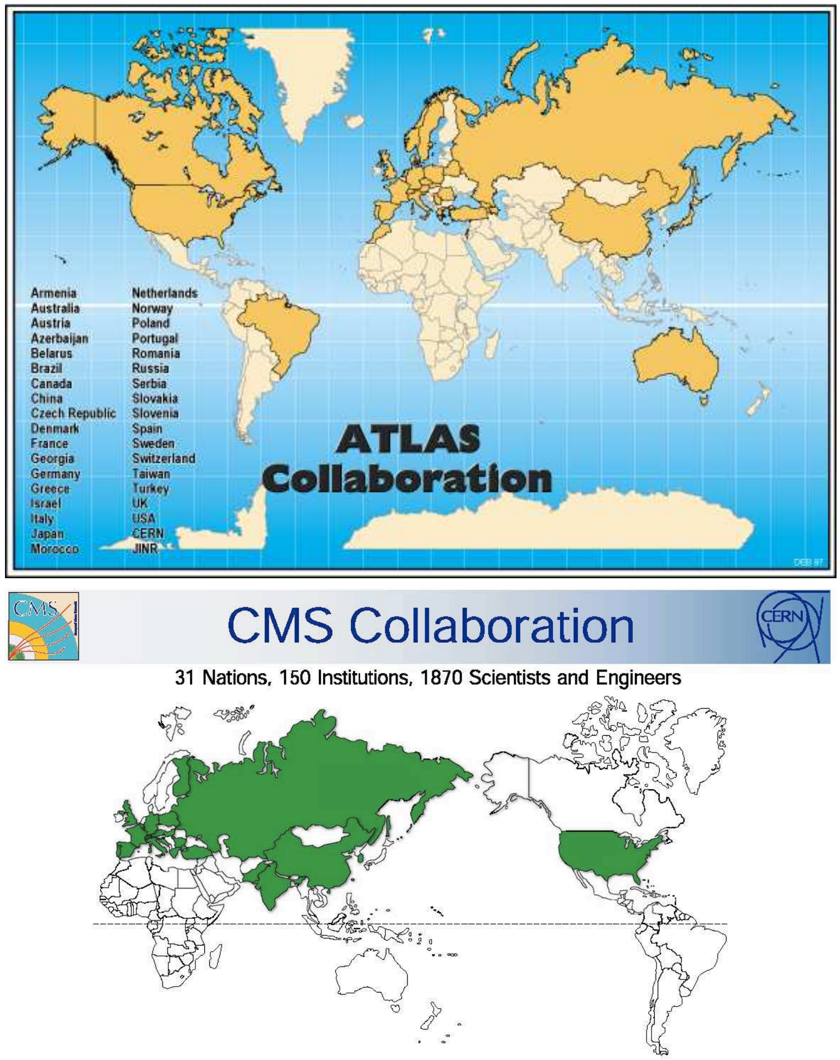

Figure 5: Global reach of the ATLAS and CMS collaborations at the LHC.

cists. For me, and for many of my colleagues, the opportunity to meet and join in common cause with people from many nations is one of the great joys of our research. But there are many blank spots on the LHC maps of the world, and we should take those open spaces as a challenge. I believe that we should aspire to engage the whole world in the values and the rewards of science. Our goal should truly be physics without boundaries.

Science is more than solving the next great puzzle of particle physics; it is a set of values for contemplating the world. I draw great hope from the concluding lines of Anthony Lewis's millennial essay in the New York *Times* of December 31, 1999. You will recognize the tradition we owe to Galileo:

> [T]here has been one transforming change over this thousand years. It is the adoption of the scientific method: the commitment to experiment, to test every hypothesis. But it is broader than science. It is the open mind, the willingness in all aspects of life to consider possibilities other than the received truth. It is openness to reason.

When we are at our best—when we are truest to these ideals—we do our best science, and we give our greatest gift to society.

7 Acknowledgements

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References

1. *Quarks, Quasars, and Quandaries,* edited by G. Aubrecht (American Association of Physics Teachers, College Park, MD, 1987).

2. Charles Severance Sync-O-Matic 2000, a tool for making RealMedia®-based web lectures (www.syncomat.com). See also the web lecture archive project (www.wlap.org).

3. Elizabeth H. Simmons, "How to Popularize Physics," Phys. Today **58,** (1) 42 (January 2005).

Appendix: Some education and outreach resources

High-Energy Physics Outreach	www-ed.fnal.gov/hep/
Fermilab's *Saturday Morning Physics*	www-ppd.fnal.gov/smp-w/
Argonne National Lab	www.anl.gov/Careers/Education/
Berkeley Lab	csee.lbl.gov/
Brookhaven National Lab	www.bnl.gov/scied/
Cornell Lab for Elementary Particle Physics	www.lns.cornell.edu/public/outreach/
Kavli Institute for Cosmological Physics	cfcp.uchicago.edu/education/
Illinois Physics Van	van.hep.uiuc.edu
Maryland Physics is Phun	www.physics.umd.edu/PhysPhun/
Michigan State Science Theatre	www.sciencetheatre.org
Little Shop of Physics	littleshop.physics.colostate.edu
UCSB Physics Circus	www.physics.ucsb.edu/~circus/
CPEP	www.cpepweb.org
The Particle Adventure	particleadventure.org
QuarkNet	quarknet.fnal.gov
Understanding the Universe	www-ed.fnal.gov/uueo/
QuarkNet Grid	quarknet.fnal.gov/grid
Mariachi	www.phy.bnl.gov/~takai/MariachiWeb/
CHEPREO	www.chepreo.org
NALTA	csr.phys.ualberta.ca/nalta
CROP	cse.unl.edu/~gsnow/crop/crop.html
Web Lecture Archives	www-visualmedia.fnal.gov webcast.cern.ch/Projects/WebLectureArchive/ www-project.slac.stanford.edu/streaming-media/ www.itp.ucsb.edu/talks/
Tevatron Postcards	lutece.fnal.gov/Postcards
Quarks Unbound	www.aps.org/units/dpf/quarks_unbound/
LIGO	www.ligo-la.caltech.edu/public.htm www.ligo-wa.caltech.edu www.einsteinathome.org
LHC-CMS	uscms.fnal.gov cmsinfo.cern.ch/Welcome.html
LHC-ATLAS	atlasexperiment.org
Research experiences	www.nsf.gov/crssprgm/reu/index.jsp
World Year of Physics	www.physics2005.org

The page particleadventure.org/particleadventure/other/othersites.html contains a very extensive list of internet resources.