Did you know that polio has been virtually eradicated in the Western Hemisphere?

The Wizard of Public Health

By Melissa Hendricks

IN THE EARLY 1950S, POLIO HIT ROCHESTER, HARD. Paralyzed people filled hospital wards to overflowing—20, 30, 40 iron lungs per room. Patients, mostly babies and children, lay encased in the coffin-like metal cylinders, only their heads poking out; pumps raised and lowered the pressure within, forcing frozen lungs to breathe. Nurses were scarce, so hospitals brought in medical students from the University of Rochester.

One of them was Donald Ainslie Henderson, who recently stepped down as dean of The Johns Hopkins School of Hygiene and Public Health. Then, though, he was a gangly youth in a short white jacket. "The iron lungs breathed for them," recalls Henderson today, but "the secretions would accumulate. Even on the iron lung, the patient could asphyxiate if somebody wasn't closely attending. It was a very vivid, depressing experience."

Part of the reason is D.A. Henderson—who had already directed the program that made smallpox vanish. Having stepped down as dean of Public Health at Hopkins, he now moves on to advise the White House.

Polio was "all around," he says, feared in much the way that AIDS is feared today. "Except that in a way it was worse, because polio affected everyone, young, old—even the president [Franklin D. Roosevelt]—and there was nothing you could do to protect yourself. Nothing. Every summer polio came and everyone had tremendous apprehension. They would close down swimming pools and moving picture theaters and try to assure that children wouldn't get together so they wouldn't transmit the virus. But how much *really* could we do? Children are going to play together, and in the autumn they go to school. When cases did occur many were left paralyzed, and in many classrooms children were in wheelchairs and had crutches. So there was a constant reminder that polio was around. It was very, very much feared." In 1952, the dread disease struck 57,879 people in the United States, claiming 3,145 lives and leaving 21,269 with some degree of paralysis.

In 1990, polio infected only 10 people in the entire

While running the world's smallpox eradication program, D.A. Henderson visited vaccination sites throughout the world, including this one near Addis Ababa, Ethiopia.

COURTESY ELIZABETH FEE

Western Hemisphere, following several years of dramatic decline. In 1989, 131 people got the disease. The year before, 319. Soon, in fact, polio will be eradicated in the Western Hemisphere. Almost 40 years after Henderson treated his first polio patients—and thanks in part to his later efforts—American parents and children no longer live in fear of poliomyelitis. Many do not even know its name.

DONALD A. HENDERSON IS now chairman of the Pan American Health Organization's (PAHO's) Technical Advisory Group on Immunization. In this work, Henderson has counseled the leaders of polio eradication in this part of the world on a daily basis. He will be continuing to advise PAHO and the World Health Organization (WHO) as public health officials expand the polio campaign to the rest of the globe.

Henderson has that kind of authority because it was he who directed the WHO campaign from 1966 to 1977 to eradicate smallpox—the first disease to be wiped out, worldwide. Because of this achievement he has won almost every kudo in the world of public health, including the Charles S. Dana Foundation Award, the National Medal of Science, and nominations for the Nobel Prize. You don't hear about the awards from Henderson, though, nor much about himself. He is a tall man with an obstreperous cowlick and a relaxed, informal manner, known for understatement. He has no need to brag; there is authority in his manner, an unmistakable aura of confidence.

In 1977, just a few months before WHO officially certified smallpox eradicated, Henderson began his tenure as dean of the Johns Hopkins School of Hygiene and Public Health. In that job, he was able to expand the Hopkins program, strengthening it especially in international and environmental areas. Henderson regarded the job as Teddy Roosevelt did the presidency: a "bully pulpit" from which to expound his views.

Henderson's credo is the public health belief that prevention is better and cheaper than cure. If he needed proof, he got it in his work for WHO, when he traveled extensively in developing nations. "In country after country," he says, "I'd find whole wards full of children with poliomyelitis, tetanus, measles, whooping cough. We have excellent vaccines for these diseases. I wonld inquire of the staff and of the ministry of health, 'Why all these cases? Are you vaccinating?' The answer, uniformly, was 'Well, no. We don't have the money for the vaccines. We don't have time to do that.' In fact, the countries were spending a lot of money in foreign exchange to procure drugs to *cure* disease. If they had bonght the vaccines, they wouldn't need to buy so many drugs. Curative care is essential, but to totally ignore the preventive side is foolishness. *The* single most cost-effective tool we have

CHARLES FREEMAN

Henderson regarded the Hopkins deanship as a "bully pulpit" from which to expound the public health credo: prevention, vaccines, vaccines, and prevention.

Only about one out of 50 to 100 polio victims show symptoms, which makes it hard to find every case and break the chain of transmission.

Diseases, the Technical Advisory Group on Immunization, and the Department of Health and Human Services' National Vaccine Advisory Committee. More obscure organizations swelled the list: U.S. Department of State Advisory Committee on Oceans, Environmental and Scientific Affairs, and the Scientific Advisory Panel for the United Fresh Fruit and Vegetable Association.

ONE ORGANIZATION SEEKING Henderson's guidance was the Pan American Health Organization (PAHO), where Ciro de Quadros had become the regional advisor for the Expanded Program on Immunization (EPI). He and his colleagues were trying to reduce polio, measles, tetanus, and other childhood killers in the Americas, especially Latin America. They were very successful. For one disease in particular, de Quadros had wonderful news.

In his cramped Washington office, de Quadros points to a graph showing polio cases reported during four-week periods in Brazil, from 1975 on. (See graph on page 22.) The line fluctuates around 250 cases per month until 1980, when it plummets to near zero. What happened? In 1980, EPI began intensive "vaccination days." Perhaps, thought de Quadros, PAHO and local health officials might be able to make the polio curve fall to zero for every country in the Americas.

In 1983, de Quadros telephoned Henderson to tell him the good news. Eradication looked possible, he thought. Would Henderson favor launching a polio eradication program, similar to the one used for smallpox? "We needed to have the support of the main public figures in public health," says de Quadros. "Dr. Henderson was the leader in smallpox eradication. It would be very difficult to eradicate another disease if Dr. Henderson would not support that effort, given his technical knowledge and his leadership in the field. He has a lot of weight with countries."

Henderson was not obliging. "He said 'no way,' " de Quadros recalls.

"I was very skeptical," Henderson concedes. At a meeting of the deans of U.S. schools of public health last spring, Henderson discussed one reason he hesitated. "The best thing we could do is eradicate the word 'eradication,' " Henderson told the deans. " 'Eradication' is a two-edged sword." Henderson reminded his listeners of the much-ballyhooed 1960s effort to "eradicate" malaria. The project spent a lot of money and made a lot of promises but failed to eradicate malaria or to come up with a successful vaccine. Offering false hope, say Henderson and many of his colleagues, makes public health initiatives look ineffective, at best. "We may be playing with fire if we can't achieve our commitments."

ROTARY INTERNATIONAL

In developing countries, most children receive the oral form of the polio vaccine.

Henderson saw that eradicating polio would be even harder than eradicating smallpox had been. The symptoms of smallpox are evident—a characteristic rash on the face, arms, and legs. "With polio," Henderson sighs, "only about one out of 50 to 100 shows symptoms." The majority of those infected experience only mild, coldlike symptoms or no symptoms at all. So most polio cases went undetected, even while the patients spread the disease to their family and acquaintances.

To complicate matters further, several illnesses, including Guillain-Barré syndrome, cause paralysis that looks like polio, although the patient is not infected with the polio virus at all. The only way to confirm that a patient has polio is by analyzing stool samples, looking for virus in the stool that is shed while the person is infected. "So an enormous network of labs is necessary," says Henderson.

In addition, administering polio vaccine is more time-consuming and less reliable than immunizing against smallpox. Vaccinating a person against smallpox requires only one shot, but polio vaccine must be followed by three boosters. And while the vaccinia virus making up smallpox vaccine is relatively hardy, and therefore portable, the polio virus is fragile. Quickly killed by the heat and humidity found in many developing countries, it must be constantly refrigerated. Other factors common in developing nations appear to compromise polio vaccine, including malnutrition and certain intestinal viruses.

Despite Henderson's initial doubts, he eventually changed his mind about polio eradication. "I think the graph convinced him," says de Quadros, referring to his chart showing how cases had dramatically decreased in Brazil. "By 1985, D.A. told me he was going to learn Spanish." The same year, PAHO announced its goal of stopping transmission of polio by the end of 1990, and Henderson had signed on as chairman of the Technical Advisory Group.

Once Henderson pledged his support to de Quadros, he and the other members

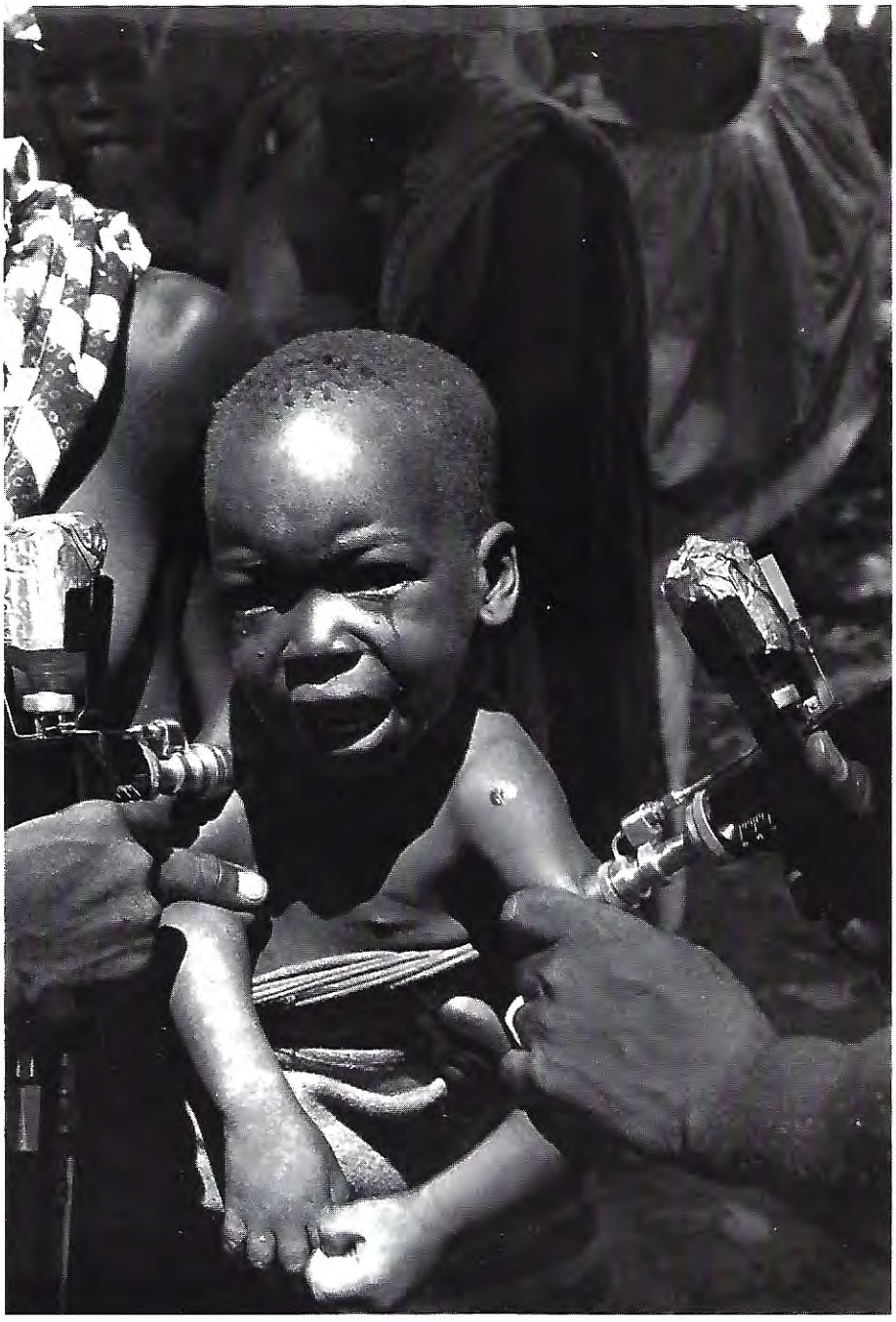
Nana Henderson. The world stopped for a while. "At first I thought I had culture shock," she says. "D.A. and I talked to each other about this 'melancholy.' We realized it was *the program* we missed."

The Hendersons did not bemoan their loss for long. Nana Henderson began working for several nonprofit organizations, rising to state leadership. And when WHO declared smallpox eradicated, on October 26, 1977, D.A. Henderson became a celebrity. "People were in awe of him," says his former administrative assistant, Christine White. "He was interviewed a lot. He was on the 'Today' show, and what's the name of that show, 'To Tell the Truth'? But D.A. is such a down-to-earth person. You soon forget he's bigger than life," says White (who is now director of alumni affairs for the School of Public Health).

As dean, Henderson worked as doggedly as he had in Geneva, becoming invested in every pocket of the school's activities, from faculty to students to staff. To strengthen an institution Henderson believed to be one of the (if not *the*) world's preeminent schools of public health, Henderson began to build bridges connecting disparate parts of the school, between students and faculty, and between various academic departments. Among other things, he established the Institute for International Programs (now directed by Henry Mosely), an interdepartmental office handling education, research, and service concerned with international health.

"The school experienced an incredible expansion of the international health effort under D.A.," says Edyth Schoenrich, long-time associate dean for academic affairs. "He helped to overcome the inertia of any academic institution by his conviction that it is the nature of public health problems that many different disciplines have to work together. D.A. tried to foster collaboration and cooperation in teaching and in service, across departmental lines."

Henderson guided the school through tough financial times in the '70s and '80s. He helped establish International House, a residence where foreign students—about half the enrollment—could easily find good housing. He instituted student/dean forums, open discussions where students could voice their questions and complaints directly. From 1977, when Henderson took over as dean, until 1990, when he resigned, the student body increased from 760 to 1,393, the faculty from 215 to 340.



WORLD HEALTH ORGANIZATION

In 1967, this child was given both smallpox and measles vaccines by means of the new jet injector. The device allowed workers to vaccinate as many as 1,000 persons per hour.

The dean's zealousness alienated some. "He's more of a workaholic than anyone I know," says White. "He is quick to judge." She adds, loyally, "Most of the time he is right." Others say Henderson sometimes tries to control projects rather than to delegate responsibility. But many who worked closely with him say those critics misunderstand Henderson. "He gave 150 percent of himself and expected perfection in others," says White.

In his East Baltimore office, Henderson was courted by international agencies wanting his advice. Adding to his already full schedule as dean, he accepted many of their offers, becoming a sort of roving statesman for immunization: member of the WHO Expert Advisory Panel on Virus

"Henderson understands that the most important thing in any enterprise is the people," says another epidemiologist.

eradication project worldwide for WHO. In 1966 the Hendersons and their three children headed for WHO headquarters in Geneva, Switzerland, which served as home while D.A. Henderson directed the smallpox program.

Total eradication of a disease had never been done, and though a good vaccine made it theoretically possible, the task looked worse than daunting: The world held more than 3 billion people. Did they *all* need to be vaccinated? By any standards, the logistics were formidable. In addition, countries where smallpox was rampant were poor and short on vaccine and vaccinators. Many people needing vaccine lived deep in the jungle or in other remote areas requiring a week's difficult travel. WHO's budget was tight, providing Henderson with a staff in Geneva of only five professionals. And health officials in some countries objected to an outside organization setting up a program.

Henderson took on the challenge with fervor and two new ideas. First, he and his colleagues at WHO decided to rely on local people to vaccinate and help manage the program; that would be far more efficient and cost-effective than sending in teams of physicians, and it would upgrade each country's own public health capacity.

Second, this new program would not focus on the numbers of people vaccinated, the traditional standard. Instead, the managers would record the number of cases of smallpox, aiming for a goal of zero. Accordingly, mass vaccination sites were set up only where smallpox was epidemic. Later, the team set up careful surveillance (this is where the local workers made the campaign possible). Once a case was found, the workers would vaccinate all contacts of the infected person. Then when each country got down to a very few cases of smallpox each year, the program would offer big awards, like half a year's earnings, to anyone who first reported a case. The idea was to break the chain of transmission, killing the smallpox virus by depriving it of every human host. As simple and commonsensical as this approach sounds today, it was radical at the time.

Henderson became immersed in the work. Traveling throughout Asia, Latin America, and Africa, he made it his job to know what every person in the program was doing. Everywhere he went, he spoke to all the people involved in eradicating smallpox, from ministers of health to local village health workers. "Dr. Henderson understands that the most important thing in any enterprise is the people," says epidemiologist Ciro de Quadros, who helped lead the smallpox eradication program in Ethiopia. "If people understand what they're doing, they will be more enthusiastic about the project. He gives the same attention to a Nobel Prize winner as to a vaccinator in the field. I saw him in a remote area of Ethiopia talking for hours to a vaccinator to see how that person was working, talking as he would, I suppose, to a professor at Johns Hopkins."

Every six weeks or so, Henderson returned from his world travels to his family in Geneva. Nana Henderson and the children became caught up in the smallpox program as well. "We had all sorts of people involved in the project stopping by for dinner," she recalls. "Peace Corps volunteers, diplomats." During their 11 years in Geneva, Mrs. Henderson and the children followed the program step-by-step as one country after another declared smallpox eliminated (meaning there had been no case in two years). "When the kids were gone," recalls Mrs. Henderson, "they'd call up and the first question would be 'What's the latest in Ethiopia?' " Their eldest son, David, even worked as a vaccinator for two summers in Ethiopia. (David did not continue in the public health field, though. He is now a sculptor and, with his brother Douglas, plays in the rock band Spongehead. After beginning a career as a fashion designer, the Hendersons' daughter, Leigh, is now working toward her doctorate in epidemiology at the Hopkins School of Public Health.)

IN 1977, THE HENDERSONS RETURNED to the United States. Smallpox was all but officially eradicated, and D.A. Henderson was starting a new role, dean of the School of Hygiene and Public Health at Johns Hopkins.

Returning to the States was like stepping off an amusement park ride, says

A Sample Problem for Polio Advisors

The Technical Advisory Group on Immunization, chaired by D.A. Henderson, struggles with a variety of questions concerning polio eradication, from how to transport vaccine 500 miles across a desert to how best to locate people in need of vaccination. A few years ago, for example, the group grappled with a perplexing problem concerning the formula of the oral polio vaccine.

Most children in developing countries and many children in the United States receive oral polio vaccine, also called the live, attenuated, or Sabin polio vaccine. (Another form, the Salk vaccine, is injected.) The oral polio vaccine actually contains three different strains of polio virus: types I, II, and III. For some reason, people are less likely to develop antibodies against (and, therefore, immunity to) types I and III. So vaccine manufacturers produced the vaccine with types I, II, and III in the ration 10:1:3.

Then, in the mid '80s, there was an outbreak of type III polio in Brazil, despite an immunization program that reached 18 million out of 19 million youngsters under age 5 on one vaccination day. Something strange was happening. The Technical Advisory Group examined the evidence and asked researchers to measure antibody levels of people after they had been vaccinated. The tests showed that, in general, people receiving vaccine were barely producing antibodies against the type III virus. Without knowing the cause, Henderson's group recommended increasing the amount of type III virus. The vaccine formula was changed, to a 10:1:6 ratio—and it worked, for Brazil.

The optimum formula for polio vaccine is still not clear, and the answer may vary from country to country. Research by Vanderbilt University pediatrician Peter Wright and others may lead to an improved vaccine. One study is being conducted on 2,000 children in The Gambia and Brazil. "The differences weren't appreciated before," says Wright. "Now we recognize them."

in medicine is vaccination. It's a very powerful tool, preferable to trying to patch up a problem with antibiotics." As evidence, he points to smallpox: the $96 million spent to eradicate smallpox has been recovered once every 30 days ever since, in care not needed.

Last year, Henderson resigned as dean at Hopkins (ophthalmologist Alfred Sommer is the new dean of Public Health), but he is not retiring. Still professor of epidemiology and international health, he is taking a leave of absence to go to an even more hully pulpit, the White House. In December, President Bush nominated him as associate director of life sciences in the President's Office of Science and Technology Policy. Congress is expected to approve the nomination in February. Meanwhile, he has been a part-time advisor.

HENDERSON BEGAN HIS CAREER in public health in 1955, working for the federal Centers for Disease Control (CDC) as assistant chief of the Epidemic Intelligence Service. He intended the position to be short-term; he was really just working off his military deferment. But epidemiology turned out to be his niche. "It was really serendipitous he was recruited," says his wife, Nana. "It just clicked." Within a month, Henderson was chief of the Epidemic Intelligence Service.

Henderson's mentor was Alex Langmuir, one of CDC's leading epidemiologists (he began the Epidemic Intelligence Services) and a former Hopkins professor. From Langmuir, Henderson quickly learned the basics of figuring out why epidemics occur and how to stop them. "We were a group of 'disease detectives,' " says Henderson. On call around the clock, the epidemiologists were expected to have a team on site within 24 hours of any epidemic. At first the field epidemiologists worked within the United States, but soon they expanded into the international arena. "We recognized disease has no boundaries," he explains.

Once, as greenhorn chief, Henderson got a call from the State Department. It seemed that 200 cases of botulism had sprung up, associated with a single restaurant. People were dying. A mob had burned the restaurant.

"So I flew down with all the U.S. supply of botulinum anti-toxin. The Argentines were expecting the Big Expert from out-of-town. But I didn't know much about botulism. I'd had a lecture on botulism of probably five to 10 minutes in med school. So I grabbed a bunch of reprints on the illness from my drawers and read them on the plane. I was scared to death."

After examining the evidence, Henderson concluded that only about a dozen cases were true botulism. The culprit: canned pimientos. Henderson and his staff confiscated the remaining pimientos and returned to the U.S. with the anti-toxin. "Everyone was greatly relieved," he says.

Thus began Henderson's globetrotting, hard-working career. Eventually, his drive and endurance would earn him a reputation as what one associate terms the "John Wayne of international health," a tough guy who takes on diseases afflicting millions.

He left CDC to complete his residency in medicine and pathology, as well as a Hopkins Master of Public Health in 1960, then returned to CDC in 1960. His last position there was a brief stint as chief of the U.S. smallpox eradication program, a job that soon led to directing the smallpox

JAMES K. LIGHTNER

In 1977, Henderson replaced John C. Hume, left, as dean of the School of Public Health.

ROTARY INTERNATIONAL

Outside the Western Hemisphere, polio still cripples thousands of children each year.

ROTARY INTERNATIONAL

The war on polio: During a vaccination day in Mexico, volunteers from Rotary International go door-to-door, informing mothers where to take their children to be immunized.

of the advisory group began evaluating PAHO's progress and advising the organization on tactics for ridding countries of the last threats of disease. Unlike his intimate involvement in the smallpox program, for the polio undertaking Henderson works as a knowledgeable, dispassionate advisor and statesman. He talks on the phone to leaders of the program daily, and he meets with members of the advisory group every few months.

Henderson brought to the polio program several lessons, which he prefers to call "themes," from the smallpox eradication campaign. "We didn't have a lot of money for that program," he says. "The total amount of international support over 12 years was $96 million, which is $8 million a year on average. That includes all contributions of vaccine, people's time, Peace Corps volunteers." Succeeding in eradicating smallpox even under such a low budget taught Henderson, he says, "that a great deal can be done in prevention if we apply the tools we have available intelligently."

To Henderson, that meant relying not only on doctors but on local residents as much as possible. Using local resources not only saved money, but also reached many more unvaccinated people. "We realized," he says, "we couldn't vaccinate a lot by having mothers bring their children to a health center or clinic. Children are difficult to carry. They didn't show up in great numbers beyond a mile from the health center. And people in developing countries do not think differently from many people here: If a child is well, do I bring him in to get vaccinated? What we did was to take the vaccine into the villages, where we enlisted the support of schoolteachers, religious leaders, village leaders, and others in the community to bring the children to collecting points." Using that method, local smallpox workers ended up reaching about 90 percent of the children.

"We also learned it was important to record cases of smallpox as quickly as possible, and to analyze data. National reporting systems that existed were so poor that we were getting few reports, and the ones we had were uninterpretable. So we helped the countries set up reporting systems. That permitted us to focus our resources on the areas with the biggest problems. This sort of thing is very unusual in the health field.

"Secondly, we used as our primary indicator of progress and success the number of cases of smallpox, *not* the number vaccinated." Soon after smallpox had been eradicated, Henderson summed up the strategy: "Find the case, quarantine the case, vaccinate the neighbors."

THE POLIO PROGRAM HAS adopted several of these strategies, especially the idea of surveillance and containment. It, too, uses community leaders to report cases of disease. "Every moment, we need to know how many cases of polio there are," says de Quadros. "We collect stool specimens from all victims of flaccid paralysis, and send the specimens to the labs to make sure the paralysis is polio." He points to a map of Guatemala, with pink circles representing hospitals and green circles health clinics. "We chose the clinics, hospitals, and health centers that are most likely to receive patients with paralysis," he explains. "We covered the whole country with 250 reporting units. Every week they call by telephone or they send a telegram and say we did not have a case or we did have a case." Now that the major areas of outbreak are covered, he says, if a unit reports a case, an epidemiologist goes to the location, gets a stool specimen, and makes sure that everybody in contact with the infected person is vaccinated.

Strict surveillance showed de Quadros and Henderson that most cases of polio in Latin America did not occur in the remote areas, but in the miles of shanties without plumbing, the *favelas* that have grown up around the cities. "We found that going house-to-house in those areas, we had much better coverage." Even if the workers did not reach every person, they made progress if they reached every few houses, since a person recently immunized for polio can transmit the vaccine's virus, which may serve to immunize a neighbor. The vaccinators made return sweeps to administer the boosters.

To get the very last cases of polio, de Quadros and his colleagues adopted other

Twice a year in El Salvador, civil war comes to a halt so that children and adults can come to vaccination centers.

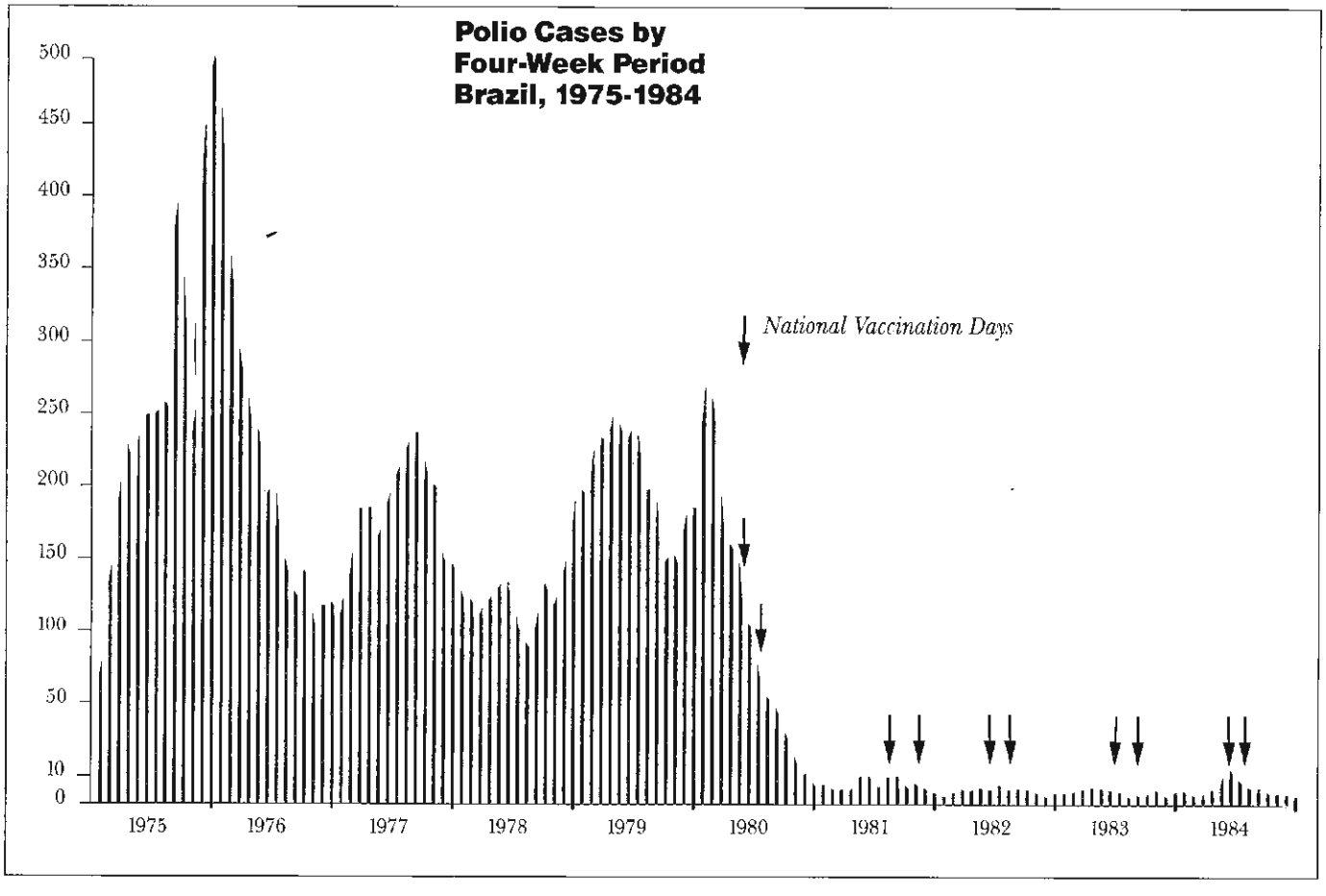
tactics used in the smallpox campaign. They offered $100 rewards to persons reporting a case of paralysis, and they inaugurated national vaccination days. "Usually about one month before the day, the country puts up ads in newspapers, radio, television informing the public about the event," explains de Quadros. (In his office, a famous Brazilian actress beckons from a poster on the wall, announcing one of these national days.) Vaccination days have been extraordinarily successful, despite political unrest. In El Salvador, for example, PAHO arranged for "days of tranquillity." Twice a year since 1985, civil war comes to a halt, while children and adults come to vaccination centers to receive immunizations for polio and other diseases. "It works," says de Quadros.

In his office, Henderson says delightedly, "It's getting very hard to find the virus. During the last 12 months [May 1989–May 1990] there have been just 12 isolates of the virus in all the Western Hemisphere—nine from one localized area in Mexico, the other three from Andean countries. So everybody is quite excited. We're easily a year in advance of where we thought we would be." He smiles contentedly.

Next, WHO has set the year 2000 as a goal for global polio eradication—though this date is considered optimistic. "I think we have real concerns we can achieve eradication by the year 2000," cautions Henderson. He doubts that current vaccines are good enough.

With Hopkins immunologist Gordon Ada, Henderson has written what he titled a "Manhattan-Type" proposal for improving polio vaccine. The plan calls for research to develop polio vaccines that are not only stable in high heat, but also can be given in only one dose. The proposal also calls for better diagnostic tests in order to verify that polio has been eradicated from an area. One problem has been that the virus in the vaccine is nearly identical to the virus that causes polio. Doctors now test stool samples for the virus, but their tests cannot tell the active polio virus of an infected person from virus shed by a person recently immunized. A diagnostic test distinguishing between the two would allow health officials to test specimens from sewers, to determine whether polio is present in the area. (Whether or not much of this research on polio vaccines takes place depends, of course, on funding.)

IN RELATED WORK, HENDERSON and some of his colleagues are discussing a sort of master vaccine for children, a single dose to be given soon after birth, that will protect against the major childhood diseases—diphtheria, polio, tetanus, measles, and others. Genetic engineering and other technical advances make vaccines against new diseases and improved vaccines



CHARLES FREEMAN

Now Henderson and his colleagues are discussing a "master vaccine" to protect against all the major childhood diseases, worldwide.

against polio and other diseases very possible, attests Henderson. "This is a pivotal time in vaccine development," he says. Thus, the time seemed right to launch the Children's Vaccine Initiative. In September 1990, Henderson and other prominent public health leaders met in New York during the Child Health Summit to discuss the childhood vaccine, also called a super vaccine.

As one outcome of the meeting last fall, the United Nations decided to launch the development of the childhood vaccine. Planning of goals, strategies, and funding sources is just beginning, and Hopkins professor of international health Philip Russell has been asked to chair the international consultative group to the Children's Vaccine Initiative.

"We agreed that a children's vaccine would be a wonderful idea," Henderson says, "but technically it will be difficult. A lot of steps will have to precede this eventual nirvana." He does not wish to bold out false hope.

Still, at least two different research frontiers look promising. One uses the vaccinia virus, the same virus used in the smallpox vaccine. Researchers would chop out portions of vaccinia, a relatively large virus, and insert antigens against other diseases. "You could put maybe eight to 10 antigens into it, effective against eight to 10 diseases. This is not a very difficult virus to grow, and many developing countries can grow it." Vaccinia is also extremely hardy.

Sustained release preparations are another possibility. These small capsules would contain vaccine, which would be released gradually over a specified amount of time. The microcapsules might be given by mouth, a much easier means of delivering vaccine to large numbers of people.

As for any research, this effort will require funding, and a lot of it. The money should come from several private and public sector organizations, says Henderson, who has been courting such groups as Rotary International, once again convincing people to undertake the impossible. "He's an extraordinarily effective pitchman," Ted Trainor of Rotary International's Polio Plus Program told the deans meeting last spring. "D.A. helped sway Rotary to give money for research. This was unlikely for Rotarians, who like to see their donations go toward a specific goal."

"Vaccines are a bit of an orphan in our medical armamentarium," Henderson complains, "because they are not lucrative, as are drugs. They really are everybody's business but nobody's business.

"To test, develop, and bring to market a new vaccine, the cost is estimated to be $100 million." So Henderson says that pharmaceutical companies do not profit by developing vaccines for the diseases most common in developing countries. "They make their money by selling vaccines to industrialized countries. It's very difficult for them to recoup development and testing costs in the Third World."

Liability is another deterrent, since companies do not want to risk massive suits from distributing a vaccine that turns out not to work or to cause harm. "So companies are not terribly motivated to do this research," says Henderson. He would like to see more vaccine research and production take place within the developing nations themselves.

In his new role in the President's Office of Science and Technology Policy, says Henderson, he will continue to push for vaccine research. As far as other projects are concerned, be says he won't really know the full extent of his responsibilities until he starts the job.

The position is somewhat flexible, says his White House predecessor, James Wyngaarden, now foreign secretary at the National Academy of Sciences. "Dr. Henderson will certainly have a role in eradicating polio," says Wyngaarden. And Henderson will also certainly use his new position to push for the childbood vaccine. In terms of other projects, ongoing work includes developing policies on biotechnology, on misconduct and conflict of interest issues, and on legislation concerning research animals.

The White House office, which is responsible for providing advice to the president on issues involving science and technology, and for promoting science, gives Henderson a new and even more visible bully pulpit, from which he can continue to preach some of the same important ideas: prevention, vaccines, vaccines, and prevention.

He also has a message brought home from developing countries. "We tend to make the services we provide to the inner city as inconvenient as we possibly can. We put them in clinics that are dirty, where people wait long periods of time. They're not attractive. They're not beckoning. There's not much done to stimulate the local community to get children to come to them. We provide little in the way of health education in the schools and in churches.

"When I talk about the Third World, you begin to get the sense that maybe there's a message here for the United States as well. How well are we doing with the prevention of AIDS in the schools? How well are we doing in the teenage pregnancy issue? Not terrihly well, thank you. We have more teenage pregnancy in this country than in any industrialized nation. We have the worst infant mortality rates of any industrialized nation. And we spend more money on health. We provide the best curative care in the world to those who are insured and have access, hut we have 35 million people uninsured. This doesn't make sense."

Never a cynic, Henderson believes the health care field may be beginning to he more introspective, asking whether to approach public health from the preventive side, rather than the curative. "We're starting to question the protracted fascination of this country with new devices for diagnosis and treatment," he says. "We're asking, 'Wait a minute, why do we have these diseases? Could we prevent them?'

"It's like having a narrow bridge with no handrails, and fishing out people who are drowning, and bemoaning that we can't treat all these drowning victims. Maybe the answer might be to put a handrail on the bridge."