Physics in 1976—a personal account

The 1976 term of the President of The American Physical Society—"a somewhat opinionated and anecdotal revelation, with reflections on the physicist's image and role in society."

William A. Fowler

It was a great honor to serve as President of The American Physical Society during the Bicentennial year of the United States. In this article I will report briefly on the accomplishments of the APS in 1976 and then move on to a more personal account—my own feelings and impressions of the image of the physicist and his role in the larger society. I hope to do away with a few stereotypes, shatter some myths and, finally, outline the potential for physicists making greater contributions to the solution of societal problems than they have ever done before. I will start with the commemoration of the Bicentennial.

There were many suggestions as to how the APS could participate in the Bicentennial celebration. I was all for having a Fourth of July parade and barbecue with bands, beer, fireworks and lots of oratory, but nothing came of it. It then occurred to me that we might support the publication by the American Institute of Physics of selected papers of great American physicists. Council approved this idea.

Spencer Weart of the Center for History of Physics did a magnificent job in selecting classic papers by Franklin, Henry, Michelson, Rowland, Gibbs, Millikan and Compton, which were then reproduced in facsimile from the original journals. Weart wrote a commentary on each paper and thus we have a readable volume that documents the rise of American physics from colonial days through the early years of the twentieth century. More than six thousand of the membership and others have already purchased the volume and I hope many more of you will do so, not only for yourself but also for libraries in your institutions and local neighborhoods. Buy a copy for your nearest grade school or high school. The prepaid cost is $3.50 to AIP Marketing Services, 335 East 45th Street, New York, N.Y. 10017.

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In a short space, I cannot possibly go into all of the detailed activities of the Society during 1976. Anyhow, I become leary of details when I remember a favorite joke fron the old Lum and Abner radio show.

Abner and Lum met at the village crossroads one day and Abner said, "Lum, did-ya hear that what's-his-name is going to move around here someplace or other with I don't know how many kids in his family?" "Yep, Abner," drawled Lum, "I heerd about it but this is the first time I heerd all the dee-tails." I'd like to avoid being in Abner's position, so let's skip the details and just touch on what I consider some of the highlights of the past year.

Governance and public affairs

In the Fall of 1976 much of what we had been up to in the Society for a number of years finally became strictly legal. The membership approved the new Constitution in September, and Council approved the revised Bylaws in October. The new versions make it possible for the Society to operate with efficiency the public-service programs and member-service projects that have been undertaken over the past several years. The new nomination and election procedures encourage the participation of a larger number of the members in the affairs of the Society. Old Council regulations and inflexible parts of the Constitution have been eliminated or incorporated in the new Bylaws, which have been made easier to amend. We now have governing documents that permit the Society wide-range, democratic action toward its stated objective, the advancement and diffusion of the knowledge of physics.

For this great step forward we are indebted to many people, but first and foremost to Vera Kistiakowsky, who served as chairwoman of the Constitution and Bylaws Committee. To her we are all especially grateful. Her imprint is readily apparent—our governing documents are liberally sprinkled with the words "chairperson" and "vice-chairperson." It is heartening that women are playing a greater and greater role in our Society. Chien-Shiung Wu was our first woman president, and she will have many successors.

Our Society took a grand step forward in the establishment of the Panel on Public Affairs. During 1976 POPA was very active and here again I must be anecdotal, not comprehensive. Before the Presidential election POPA suggested that I write to the candidates asking for their views on three issues of interest to physicists:

- the role of the science advisers to the President,
- national energy needs and the nuclear-power program and
- Federal support for basic and applied science.

The replies from both Ford and Carter were thoughtful and straightforward but revealed a striking difference in nuclear-power policies (see PHYSICS TODAY, October 1976, page 61). Ford wrote, "I believe we must increase the use of both coal and nuclear energy to meet our energy needs in the years ahead." Carter stated, "I believe we must make every effort to minimize our dependence on nuclear energy." These quotes should be read in context for a full understanding of the candidates' policies, but they do illustrate why we believe that our letter helped the

Albert Einstein, an American folk hero. The familiar face of Einstein appears here in the company of Babe Ruth, Jean Harlow and Rudolph Valentino at Pete Smith's Hall of Fame Bar in New York City. In the eyes of the public, Einstein's portrait is the one most often identified with the image of the physicist—it has even appeared on T-shirts. Figure 1

candidates and their staff formulate clearcut policies on issues of great significance, not only to physicists, but also to the whole of the American electorate. That electorate chose Carter.

POPA continued to wrestle with the problem of conditions and circumstances of our colleagues in foreign countries. POPA voted, by a narrow margin I was told, that I visit the Soviet Union as President of the Society to express to Soviet scientist-officials our great concern for the situation of the Refusniks and at the same time to give a talk at the Azbel physics seminar. What soon became clear in discussions with knowledgeable people was that one could not accomplish both of these purposes in one trip if everything was to be done in an above-board manner.

I agonized about the matter for a considerable period of time and finally decided that a visit then would not be in the best interests of the Refusniks or the members of the Azbel seminar. Subsequent developments, including the arrest of members of the seminar and the interruption of mail delivery of APS journals, were a source of chagrin and despair. However, POPA came through again and proposed a strong letter of protest, which I promptly forwarded to Academician A. P. Aleksandrov, president of the Soviet Academy of Sciences. We await a reply. In connection with these issues, *An Affirmation of Freedom of Inquiry and Expression* was prepared by the National Academy of Sciences and has been circulated to all members of the APS for endorsement—almost six thousand members have done so.

Relations with AIP

The American Physical Society has been a member society of the American Institute of Physics since the Institute was founded in 1931. The APS Headquarters are located in the AIP Building in Manhattan. The AIP performs a number of services for the member societies: placement, press relations, manpower and education studies, and so forth. It has a strong Corporate Associates program and operates the Center for History of Physics. Its main activity is publication, including that of PHYSICS TODAY and the *Physical Review*. For some time AIP has carried out its operations in five locations, three in Manhattan and two on Long Island.

A consolidation was necessary, particularly of production activities, if the AIP was to continue to render efficient, competitive services to its member societies. The AIP appointed an Ad Hoc Property Committee to explore possibilities for consolidation and relocation. When the problem came to my attention, I appointed an APS Building Committee and I suggested that efforts be broadened to include consideration of creating a Center for Physics that would accommodate future growth of the AIP and the APS and would also permit an extension primarily of public related activities—exhibits, lectures and so forth. In particular, the facility would provide improved and more spacious accommodations for the Public Relations Division, for the Center for History of Physics and for the APS Headquarters. We have wrestled with the problem for over a year. Alex Harvey of Queens College prepared a study in depth of the concept of a Center for Physics and we are all grateful to him for this study.

An Ad Hoc Committee on Building Plans for the AIP was chosen by Philip Morse, Chairman of the Governing Board, in consultation with me as the President of APS. The Ad Hoc Committee acted promptly and on 3 September 1976 recommended consolidation at two locations, a headquarters in Manhattan and a production facility within reasonable commuting distance and in an area with a favorable labor market. Negotiations are now well along for the purchase of facilities on Long Island, which will permit consolidation of production activities on an efficient timescale.

The problem of the Manhattan headquarters is still with us. The question is one of dollars and cents—what can the physics community afford? I believe that it could afford much more. If nothing else, we must improve and augment the facilities for the Center for History of Physics. By the way, member-dues billing later in the year will permit the option of a voluntary contribution to the Center. I do hope all APS members and others will contribute generously to this worthwhile activity—it graces our profession. Finally, I hope that the future will bring a solution to the headquarters problem both for the AIP and the APS.

Washington and other activities

The Congressional Fellowship Program continues to be an outstanding success. Currently Ronald Bruno (Southern Illinois University) is serving on the staff of the Subcommittee on Energy and Environment of the House Committee on Interior and Insular Affairs, while Granville Smith (Grinnell College) is serving on the staff of the Senate Committee on Commerce. Of the seven former Fellows, five are still with the Congress. We are definitely making a continuing contribution to the involvement of physicists in the legislative branch of our government. By the way, a real bonus from this program

is that the Vice-President Elect serves as the chairman of the selection committee. This is the first real introduction to the working operations of our Society and makes it very clear that the work commitment is not just for one year but for three.

The success of this program has led to the suggestion by Joseph Burton, who became our full-time Treasurer on his retirement from Bell Laboratories, that we award two APS Industrial Postdoctoral Fellowships annually. These Fellowships are for well qualified physicists for work in industries where few PhD physicists have been employed in the past. The stipend and travel expenses will be shared by the participating industrial organization and the APS. It is a great idea and has just been approved by Council.

During her tenure as President, Chien-Shiung Wu worked hard on the reestablishment of the office of science adviser in the White House. She continued to do so during the past year as a member of the Executive Committee of the Committee on Scientific Society Presidents. Her magic powers conquered all and on 12 August 1976 President Gerald Ford appointed H. Guyford Stever, a physicist-engineer, to serve as his science adviser and as head of the new Office of Science and Technology Policy. Ford also appointed two physicists, Charles P. Slichter and Charles H. Townes, to the President's Committee on Science and Technology. In his reply to my letter to the presidential candidates before the election, President Carter stated "The office of science adviser to the President should be upgraded immediately to provide a permanent and high-level relationship between the White House decision-making process and the scientific community." I know he has been a busy person, but I hope he doesn't forget the word "immediately" in his statement.

There is one Society problem that has not been solved. Our hard-working Committee on Professional Concerns has recommended that we endorse the Guidelines for Employment published by the Institute of Electrical and Electronics Engineers, which have been endorsed by numerous engineering and scientific societies including the American Chemical Society. However, there are those who argue that these guidelines are not appropriate without considerable modification for the Society and indeed there are those who feel no need for guidelines in this area. A suggestion has also been made that the Society endorse the 1940 Statement of Principles on Academic Tenure and Freedom of the American Association of University Professors.

The Committee on Professional Concerns has emphasized that guidelines are a secondary issue; the real purpose is to assist individual APS members, or groups of members, with professional problems. There is a unique role the APS can play here that no other organization can. In February Council authorized the Committee on Professional Concerns to conduct a survey of the membership, asking for descriptions of instances in which physicists have encountered career obstacles.

During 1976, Guidelines for APS Studies were established by POPA. The Nuclear Fuel Cycles and Waste Management Study came into full operation under Charles Hebel, as well as the Physics Manpower Project under Milan Fiske. These studies are still underway and you will be hearing more about them in the near future.

Three former presidents of our Society were honored during the past year. Hans Bethe and Chien-Shiung Wu were awarded the Medal of Science and John Bardeen was awarded the Medal of Freedom.

The Society continues to grow and prosper. The membership was 28 579 on 15 December 1976 and will probably reach an all-time high of over 29 000 by 30 June. The market value of the Society's reserve holdings is now well over three-million dollars—a prudent value considering the magnitude of our yearly operating budget of over five-million dollars. Voluntary contributions by Society members were over $100 000 last year, and that happy note ends this part of my account.

Carl Anderson receives the 1936 Nobel Prize in Physics. This shy young man in formal dress, still an assistant professor at Caltech, spent long hours building by hand the equipment that led to the discovery of the positron. Figure 2

The image of the physicist

Let me now turn to some reflections on a matter that has been on my mind for some time. It is difficult for me to express the problem precisely, but for many years I have felt that we physicists present a false image to the layman. This is true of all scientists except perhaps the geologists, and I do not think it is true of engineers.

As an illustration, ask the man on the street to name a physicist. The great majority of those who answer will say Albert Einstein. Einstein is an American folk hero. This is nowhere more clearly shown than in Pete Smith's Hall of Fame Bar in New York City's Pennsylvania Station. The pictures in this particular Hall of Fame are mostly of athletes and movie stars but there, in figure 1, alongside Babe Ruth and Rudolph Valentino and Jean Harlow, is our own Albert Einstein. I must confess it took a lot of research to find this picture.

Now I am not complaining about a folk-hero role for Einstein. He was an extraordinary man but he was unique. True, we have our Feynman and Gell-Mann and Weinberg today, but Einstein is not representative of the rank-and-file physicist—he is indeed unique.

Turn to another illustration—the Nobel Prize. Some of the public think that all of us in physics (and also in a number of other fields) take part every year in a great international lottery and one or two or even three of us somewhere in the world hit the jackpot and win the Nobel Prize. We are then privileged to hobnob with kings, queens, princes and princesses as the photo (figure 2) of Carl Anderson receiving his 1936 Prize from King Gustav V illustrates. It is my guess

that the King is saying, "Do you play tennis, young man?" Carl is certainly noncommital. He was only an assistant professor at the time and did not become a full professor for three more years after receiving the prize.

This exaggerated public conception is all wrong. The Nobel Prizes are undoubtedly the highest and most prized awards in the fields to which they apply. They are awarded for a major discovery, but they usually come after many years of work, at times lots of fun but frequently, for long periods, dull and arduous. I know that Carl Anderson built much of his equipment, with which he discovered the positron, with his own hands.

Group endeavors

As the hero-worshippers fail to appreciate, there is another point. In the Bicentennial year everyone was pleased that Americans swept the scientific Nobel Prizes, as well as those in economics and literature. Best of all, we American physicists are very happy that Burton Richter and Samuel Ting won the prize in physics for the discovery of the J/psi particle. But, as both Richter and Ting have emphasized, the discovery came as the result of large group efforts—one group at SLAC and another group at Brookhaven National Laboratory. Physicists work more and more in teams, yet the layman does not recognize this fact. In athletics, for example, the layman is well aware of the importance of team work. This team work is not only essential to many advances at the frontiers of the physical sciences, but also essential to many applications of physics to technological and societal problems. We must find some way to portray the physicist as team worker—not necessarily the lone individual working in "splendid isolation," as far too many laymen believe to be the case.

Robert A. Millikan is another scientist folk-hero. But the Millikan I knew as a graduate student and young faculty member is not the Millikan known to the public. First of all, he was the highly successful fund raiser who transformed Throop College of Technology in Pasadena into the California Institute of Technology. In a 1931 photo taken at the Ambassador Hotel, Millikan is seen showing off Einstein to the Los Angeles Chamber of Commerce (figure 3a). Another photo in figure 3b, is of Millikan in 1931 with Charlie Lauritsen, who supervised my doctoral research and preceded me as President of our Society by exactly 25 years in 1951; Millikan himself was President in 1916 and 1917.

They are posing, and I use the word advisedly before Lauritsen's first million-volt x-ray tube that was used for studies of the Compton effect and for cancer therapy. The apparatus was transformed into an ion accelerator in 1932 when John D. Cockcroft and E. T. S.

Robert A. Millikan is another scientist folk hero. This series shows the popular image of Millikan, but it also reveals other, more realistic aspects of physicists. Millikan was an active fund raiser for Caltech; for example, he shows off Einstein at the Los Angeles Chamber of Commerce annual banquet in 1931 (a). He struck a different pose (b) in 1928 with Charles Lauritsen and the first million-volt x-ray tube; Millikan's halo might lend credence to the hero-worshippers' beliefs, after all. A 1920's photo taken in the machine shop at Caltech (c), once again portrays him dressed up for an occasion. The photographer must have hurried them though, because on either side of Julius Pearson (the shop superintendent, who is also dressed up), there is Millikan with his tie askew and Ike Bowen with unshined shoes. Finally, a shot of Millikan at work—gone are the suit and pose from this 1924 photo (d) of Millikan carrying a 50-pound lead shield for a cosmic-ray counter up Mt Whitney. Figure 3

Walton found they could disrupt the nucleus using protons accelerated to modest energies. I love this shot because it shows Millikan with a halo—maybe the hero-worshippers are right after all.

My favorite photograph of physicists all dressed up for their picture shows Millikan and Ike Bowen, who was to become Director of the Hale Observatories, along with Julius Pearson, who came with Millikan from Chicago to head the physics machine shop at Caltech. Figure 3c shows them looking at some pieces of equipment produced in the shop, but what I like best of all is that Millikan and Bowen are wearing jackets and ties, and so is Pearson. There is one realistic touch—Bowen had not bothered to shine his shoes. I know it was an earlier, different time than now, but we physicists still pose for pictures and even object to candid camera shots.

I did manage to find a photograph (figure 3d) of Millikan in his role as an active cosmic-ray observer. In 1924, when he was 56, he carried the lead shield for a cosmic-ray counter up Mt Whitney. That shield must weigh a good 50 pounds.

I'm not complaining about Millikan as a fund-raiser; heaven knows he dug up my salary and most of the other faculty salaries before the war. Even so, it is a shame that we have so few pictures from the Caltech archives and elsewhere that show Millikan in action as an experimental physicist.

Physical work

Experimental physicists are involved in many activities in which they use their hands—operating a lathe, a fork lift or a crane, soldering, wiring, vacuum plumbing—you name it. I wrote to Luis Alvarez for illustrative pictures from the early days of Ernest O. Lawrence's Radiation Laboratory in Berkeley. He replied: "In response to your letter, I've gone through all of the photographs that Don Cooksey took from the time that Ernest started building cyclotrons up until about 1945. The main impression I get from all these pictures, aside from deep nostalgia, is that we were all hypocrites—we spent most of our time looking like garage mechanics, yet whenever it came time to have our pictures taken, we cleaned ourselves up, put on a tie, and looked as though we had never before seen the apparatus with which we were photographed."

Typical of the situation is this photo of Lawrence (figure 4) at the controls of the mass spectrometer constructed out of the 37-inch cyclotron in 1941. From that small beginning came the calutrons at Oak Ridge National Laboratory, which produced most of the material for the uranium weapon. True, Lawrence has taken off his jacket, but this picture is clearly posed and doesn't show the physical labor performed with their hands by Lawrence and his colleagues in bringing the cyclotron into the world.

Ernest O. Lawrence sits at the controls of the mass spectrometer, which was constructed out of the 37-inch cyclotron in 1941. Without a jacket, this would appear an "at-work" shot, yet, according to Luis Alvarez, "we spent most of our time looking like garage mechanics." Figure 4

Luis did find one gem that shows an earnest young graduate student at Berkeley, in 1940, torch-cutting bevels on the steel plate that was to become part of the magnetic structure of the 184-inch cyclotron. That is no pose in figure 5. In fact, the goggles make our hero anonymous, but he is none other than Bob Wilson, director of the Fermi National Accelerator Laboratory. Time passes but physicists are still at it. The cover photo of this issue of PHYSICS TODAY shows Bob Adair from Yale University doing some welding on apparatus to be used in an experiment currently underway to Brookhaven to study the direct production of single and multiple muons.

Think for a moment about the contrast between these photographs and the usual cartoon in the *New Yorker* showing a physicist in a nice white lab coat standing before an electronic marvel lit up like a Christmas tree or of several physicists arguing before a blackboard covered with nonsense equations. We do not have to go to the *New Yorker;* figure 6 shows one that appeared in *American Scientist,* a fine scientific journal.

We can all enjoy a good joke even at our own expense but I don't think this cartoon is funny. Many of the *New Yorker* cartoons are not all that funny. However, we can forgive the *New Yorker* for anything because it published the wonderful profile of I. I. Rabi by Jeremy Bernstein. That profile projected the true image of a very great physicist to the reader.

Another gem involves Pief Panofsky, Director of SLAC and past President of our Society once removed. While Pief was a student at Caltech under Jesse DuMond, he had a job at the lathe that required a very fine cut and took a long time on each traverse. Pief was not one to waste any time, so he is playing chess with Don Wheeler, now at Lehigh University, while the lathe performs in the background (figure 7).

The physicist not only has much in common with the artisan, technician and craftsman, but also with the artist—this shot in figure 8a of Bob Wilson shows him putting the finishing touches on the sculpture he created for the Institute of Advanced Study.

Speaking of physicists in the world of art, Dick Feynman is an accomplished artist—his sketches rival his diagrams. In figure 8b he is hard at work in the

Another rare shot of a physicist at work is this graduate student at the University of California, Berkeley in 1940, who is torch-cutting bevels on a portion of the 184-inch cyclotron magnetic structure. The subject is Robert Wilson, now the director of Fermilab. Figure 5

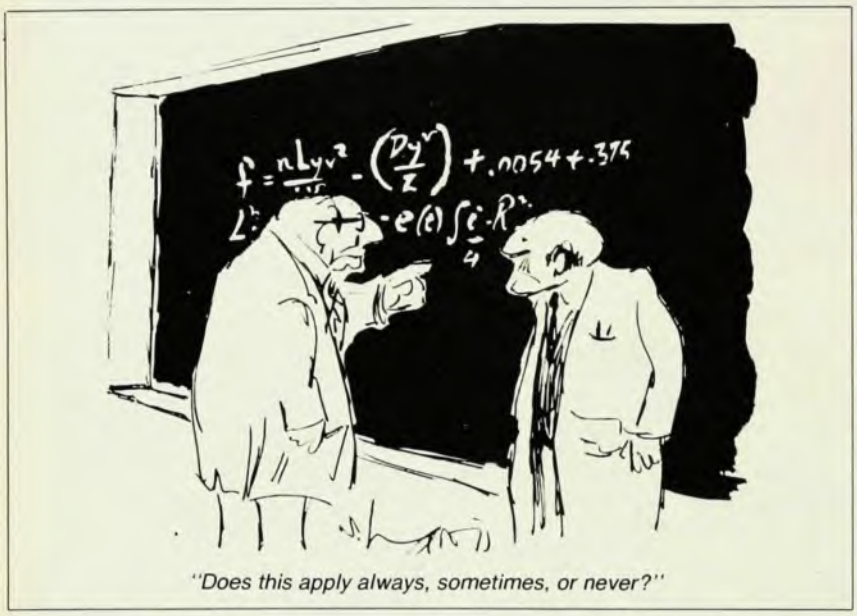
printmaking class in a Caltech art program in 1970.

The physicist's accomplishments do not stop there. *The New York Times* recently carried an article about Nicholas Kurti, the low-temperature physicist, on a visit from Oxford University to City College of the City University of New York, where he lectured on his idea that the kitchen was yet another place to enlist physics in the service of the arts. He injected a pork chop with pineapple juice to tenderize it during cooking (figure 9).

I could go on like this for pages and all of you could do the same. Physicists are not the impractical dreamers we are so often pictured to be. Many claim that theoretical physicists fit this picture in some respects; it is not so. They are constrained in their thinking by the rigorous requirement that their theories must meet the test of experiment and observation. The mind of the theorist may open a new world but it must be a world of reality.

The experimental physicist uses his hands as well as his mind. He faces a host of practical problems every day in designing, constructing and operating his instruments and facilities—this applies even when he is working to test a theory expressed in abstruse mathematical language.

In collaboration with scientists in other fields we must get across the idea of the *working scientist* in supplement to the *scientist dreamer*. We are *tinkers* as well as *thinkers*.



Stereotypes of physicists as thinkers abound. This cartoon shows them arguing over nonsense equations (don't miss the white lab coats and ties). Popular journals may encourage the image, but so do others. This joke appeared in the *American Scientist*. Figure 6

Enhancing the image of physicists can be accomplished simply by displaying their varied interests and activities. Here is Wolfgang K. H. Panofsky (left) playing chess with Donald Wheeler, while the lathe in the background takes a long traverse. They were both Caltech graduate students then, around 1940. Figure 7

The role of physicist

All of the foregoing has been but prelude to my basic concern, which I am sure is shared by many of you—what should be the role of the physicist in modern society? Thus far, I have emphasized that we must project a valid image of the physicist if we are to play a significant role in what Daniel Boorstin calls the "Republic of Technology."

Times have changed. There is no way the physicist can stand aloof from practical problems outside the laboratory any more than he can ignore practical problems inside the laboratory. During World War II physicists really fell to and made major contributions to victory. This success brought several orders-of-magnitude change in the Federal support of basic research, much of it in universities whose facilities grew in number and quality. Research and teaching both prospered—more and more students entered physics.

Now we are entering a new era. Physics staffs in universities and in the large industrial and government laboratories have leveled off in number and in some cases actually decreased. Many are very discouraged by this, but I am an incurable optimist—like the youngster playing third base in a sand-lot baseball game who was asked the score by an elderly spectator. "It's 145 to nothing," was the reply. "Whose favor?" he was asked. "Theirs" the youngster replied. "They're beating you pretty badly, aren't they?" "I don't know," replied the young fellow, "We ain't been up to bat yet."

That's the way I feel. Physicists haven't been up to bat in the real ballgame yet. Let's consider all the problem areas where one is fairly certain that our quantitative methods and the overriding laws of physics are applicable. Here are a few: energy, environment, conservation of resources, transportation, housing, communication, manufacturing, agriculture, industrial hazards and accidents in the nuclear industry, coal mining and oil transport.

But what about society's most pressing problems: overpopulation, crime, violence, terrorism and its victims, alcohol and drugs, bureaucracy, corruption in government, government reorganization, welfare, health care, unemployment, inflation, racial conflict, religious conflict, economic conflict, the international arms trade, relations between the great powers,

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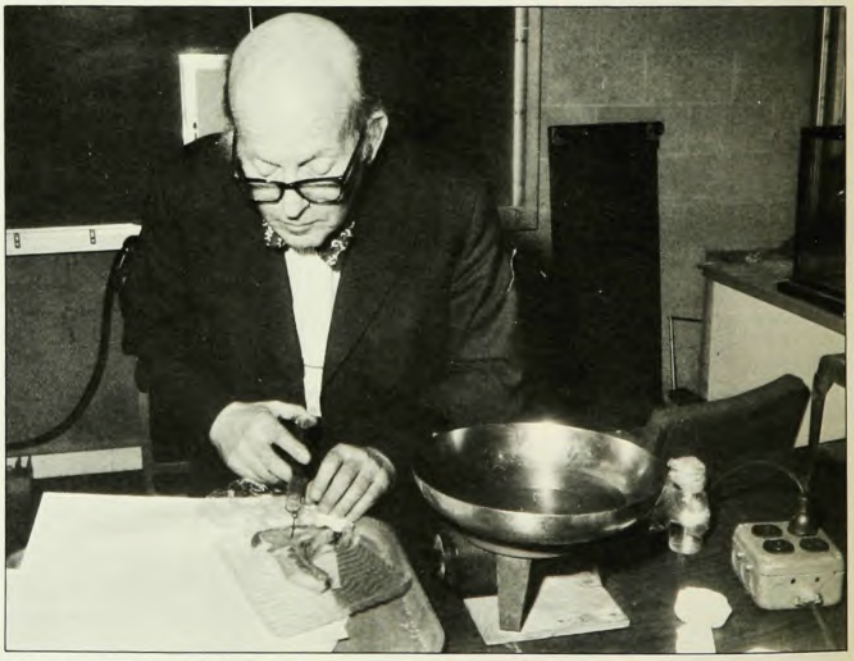
relations between developed and developing countries—one can go on and on. I maintain that we can also help in the solution of some aspects of these problems.

Now don't get me wrong. We are not to give up basic research. No one can turn off our interest, nor that of our students, nor of the public for that matter, in everything from elementary particles on the small scale to the Universe on the grand scale. Nor am I advocating that we proclaim ourselves experts in every human activity. Beware of self-proclaimed experts. They abound in all fields including the medical profession with which we all sooner or later have dealings. I'm reminded of the time I went to my physician for treatment of a sprained wrist. He took x rays, gave me

Physicists as artists. Robert Wilson of Fermilab, who is also a sculptor, puts the finishing touches here on a sculpture he created for the Institute for Advanced Study in Princeton, N.J. (left). Tending the press in this 1970 shot (right) is Richard Feynman, hard at work in a Caltech printmaking class; his sketches rival his diagrams. Figure 8



The physicist in the kitchen. A demonstration of meat tenderizing with injections of pineapple juice is carried out by Nicholas Kurti of Oxford University during a visit to City College of CUNY. Kurti, a low-temperature physicist, is hardly an impractical dreamer. Figure 9

a pain killer and just as I was leaving he said, "Now, I want you to bathe that wrist in hot water three times a day." "But Doctor," I said, "what do you mean? My mother always told me to bathe a sprain in ice water." "Well, your mother was wrong," he said. "My mother told me to use hot water."

So beware of experts. Nevertheless, it is my contention that physicists, and other scientists too, are overly modest. We can enter into areas where we have previously feared to tread, and I now come full circle. If we are to widen our areas of activity, we must project an image of what we really are—capable, practical, ingenious, innovative, and at the same time human beings like our neighbors. I'd like to put it bluntly; if our students are to get jobs we must present an accurate image of the physicist, at least to prospective employers.

We have professional standards that have served us well in the search for fundamental knowledge. These standards will also serve us well in the wise application of physical principles to the solution of mankind's problems, both within and outside, a narrow technological base. I am not talking about quick fixes nor exotic technologies; I am talking about hard work. I am not talking about displacing engineers or chemists or social scientists; there is plenty of hard work for all in helping to solve societal and technological problems. May I suggest that all of you read the National Academy of Sciences *Bellagio Conference Report*, which discusses the involvement of scientists in world affairs. The conference was headed by Lew Branscomb, our new Vice-President-Elect.

I firmly believe that the same quantitative techniques that lead to the discovery of new facts of nature can be employed with appropriate modification to optimize the societal benefits of application or *non-application* of these facts. Furthermore, we cannot escape the obligation to take part in this optimization. If society is to survive it must willingly enter an Age of Restraint. We physicists know about physical constraints; we can help society accept social restraints. It may smack of morphology, but I see no reason why we should not recognize *Social Physics* as a branch of Applied Physics. We recognize *Social Scientists*, so why not *Social Physicists* also?

I am not so naive as to believe that we can change our image and enhance our role merely by asking the science press and press bureaus in universities and industry to use candid-camera shots rather than posed ones; but it would be a start. Also, I know full well that in large laboratories, where skilled union labor is available, physicists do take on roles more as managers of technical enterprise than as individual technicians. In addition, physicists can work well with other personnel—across the spectrum from the military to university administrators. All this makes my point even more valid. There are many facets to a physicist's work, and these must all be included in the image we project to our fellow men.

Who will wind the clock?

If there were space I would like to tell you about what has been going on in our laboratory at Caltech during the past few years. We have been working on everything from the effect of Wigner cusps (due to the onset of p,n-reactions) on p, γ-reactions of importance in nucleosynthesis all the way to the design and construction of automatic, computerized radon monitors for use in the area of the Palmdale uplift. But there is little room remaining and so I must conclude, albeit with some nostalgia.

When I was a graduate student, there was a ditty we sang together in the good fellowship of graduate life. It had wonderful lines like "Who stole the sleeves out of dear old daddy's vest," and "Why did they build the shore so near the ocean?" Yet the most nostalgic line of all was "Who will wind the clock when I am gone?"

Never fear—the Society had two wonderful Presidents, Pief Panofsky and Chien-Shiung Wu while I served as Vice-President-Elect and Vice-President. The Society has also survived the past year. The future is not all rosy but in the successions to the Presidency of George Pake, Norm Ramsey and Lew Branscomb, we have captains who will steer a steady but still adventurous course. They will find, as I did, a fine headquarters crew in Bill Havens, Joe Burton and Mary Shoaf, who know the ropes and are the key to the continuing success of Society operations. I am most grateful to them for all their help during the past year. POPA has made a most auspicious start under Phil Morse and it will grow and mature under Herman Feshbach and Dick Garwin. The AIP continues to prosper under Bill Koch. Finally, I am also indebted to Mike Newman, who served as assistant to the President during the past year, and to Evaline Gibbs, administrative assistant in our laboratory who smoothed the way for me throughout 1976, just as she had done since 1953. With that, I'll wind the clock for the last time and say farewell with high hopes for all of you and The American Physical Society. □

PHOTO CREDITS: Figure 1: AIP Public Relations, photo by G. Present; figures 2, 3a, 3b, 3c and 3d: Caltech Archives; figures 4 and 5: Lawrence Berkeley Laboratory; figure 6: *American Scientist;* figure 7: SLAC; Figure 8a: Fermilab; figure 8b: Caltech Archives, photo by Sylvia Posner; figure 9: *The New York Times*.