



PIEF*

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Beyond any of my words this morning, the presence here today of all you colleagues of Pief, from places distant as well as close, and from associations long lasting out of the distant past, as well as from very recent times - your presence is the strongest evidence of the respect, the affection, the admiration we all feel for Pief. This admiration has also been warmly expressed in an array of wires and letters from all over the world sent by friends unable to be here today - to their great regret.

Pief's achievements and leadership are so important, so extensive and diverse that there is an almost endless list of reasons for us to welcome this opportunity to be here today to honor him. But perhaps no reason is more compelling than the warmth of our affection for this friend we all cherish.

I first met Pief in 1951. I had just come to Stanford as a physics instructor and that was the year that he decided to move to Stanford from Berkeley, which was then in the painful throes of a crisis over a faculty loyalty oath that poisoned its academic climate and diminished its luster for years to come. Stanford was the winner and, happily for all, Berkeley has since successfully buried that regrettable episode deep into its past. As I look back to that first meeting with Pief thirty-three years ago - and to my subsequent close association with him since my own return to Stanford twenty-eight years ago - I am amazed at the invariance principles that characterize all of Pief's actions and interactions. His optimism, his warmth, his patience, his integrity, his kindness, his courage, and his persistence - like the gravitational constant or the fine structure constant - haven't wavered or altered one bit during all these years. Neither have his clothes habits or geometry.

He first arrived at Stanford in an ancient Cadillac - and his current Mercedes is of comparable maturity - probably older and perhaps evidence of weak symmetry breaking. Furthermore, whether dealing with students in elementary physics classes or with Presidents, the anonymous or the mighty, theorists or practical scientists, the obtuse or acute, there is a universality in Pief's interactions. He always shows the same patience. I have heard a liberal defined as one

who believes in the improbability of the human being. By that definition Pief saturates the unitary bound of liberalism - and also of integrity, for I've never heard him hesitate to acknowledge when he didn't know something, as rare as such occasions are.

You will hear much today about high energy physics to which Pief has contributed so extensively and profoundly - in particular, through his beautiful, text-book experiments analyzing the γ -ray absorption in hydrogen and deuterium which determined the parity of the π mesons, showed that π^0 's were lighter than charged π 's and determined accurate pion masses. This beautiful work, done in collaboration with Lee Aamodt and Jim Hadley, introduced the term "Panofsky ratio" in the literature. He also collaborated with Jack Steinberger, and the experiments directly identified the π^0 's produced in the electron synchrotron by observing the two decay γ -rays in coincidence. In addition, after arriving at Stanford he initiated the study of meson production by electrons leading to the first information on the electromagnetic structure of the unstable excited states of the nucleon. He has also pioneered the building of beautiful machines and created a great laboratory - immodestly perhaps considered here the greatest high energy lab. He has been an inspired and inspiring teacher, and throughout his career has devoted himself unselfishly to effective, wise and innumerable contributions to science policy and budgetary considerations in Washington and to improved international collaboration in science and the free flow of scientists and science across national and ideological boundaries.

And most of you, I suspect, are at least in part aware of his profound contributions as a government adviser to official deliberations, as well as to the public debate, on vital issues of arms control and international security. You will no doubt hear more on this later. Unfortunately for us all, Pief's views have not always been accepted, not because they lacked vision or wisdom or a compelling logic, but because of the shortcomings of those in responsible positions in government to act with a comparable courage and wisdom.

But there is something about the secret life of the good Dr. Panofsky I'll

bet few, if any of you, are aware of. I've known Pief for one-third of a century and have been very close to him for many, many years - and I really know a lot about this guy. But I had forgotten this fact, and it took research in the preparation for this talk for me to be reminded that our one and only Pief was the subject of an article in PLAYBOY magazine seven years ago. As the famous saying of Ring Lardner goes, *"you could look it up."* - June 1977. No - there was no picture or centerfold of him - I have no slides for this talk; but I quote from PLAYBOY magazine:

"Dr. Wolfgang Hermann - they forgot the Kurt - Panofsky was from Berlin and was naturalized in 1942."

I will omit the next sentence in order not to embarrass Pief - were I to repeat it, it would say:

"Dr. Panofsky may be the brightest man in the world."

But in passing over that we come to "the beef" - to use a term that has already put its brand on this election campaign - for the article continues:

"He is 5' 2" tall, weighs 150 pounds, neither smokes nor drinks and is manifestly, painfully indifferent to clothes. Not that he's a nudist; just that his mind is on higher things."

That clearly is a collection of characteristics that makes it somewhat difficult for PLAYBOY to continue on into revealing depths - although the source of Pief's charms that qualified him for PLAYBOY was identified by the editors as follows: First he built a straight 10,000-foot *"long vacuum pipe that is housed in a heavy concrete casing sunk 25 feet underground that has no practical use whatsoever"*, and, second, *"he is a key figure in the Strangelove business....; he is smarter than the rest"* - among whom PLAYBOY included Edward Teller, Herman Kahn, and Eugene Wigner, to mention a random three - and *"therefore has helped them avoid potentially embarrassing crushing boo-boos."* And I can attest that is indeed true. He is smarter, and many a gaff has been avoided

when he has been heard and obeyed. Incidentally, I can think of only one other physicist to make PLAYBOY - William Schockley - and he had to found a rather unusual kind of bank down in Southern California to be so recognized.

Another published biography of Pief says that he is 5' 2" and has eyes of blue, which to many - not perhaps you younger ones in the audience - but to many automatically suggests one of the famous song lines of the flapper era, whose lines are:

*"5' 2", eyes of blue -
"Oh what those eyes can do,
"Has anybody seen ..." our Pief?*

And now I ask what other physicist you know has been immortalized in song - but unfortunately, I have to be true to Einstein and his light cone and admit Pief has an acausal connection with that verse which dates back to his early childhood.

Pief's achievements have, of course, been recognized by his being awarded almost every conceivable honor that exists, and the citations that accompany these awards themselves tell much about the breadth of his accomplishments and deep respect he has earned from so broad a community. For example, when he received the Enrico Fermi Award in 1979 the citation read:

"For his many important contributions to elementary particle physics; for his leading role in advancing accelerator technology evidenced in the success of the SLAC 20 BeV, SPEAR and PEP machines; for his positive influence on and inspiration of younger scientists; and for the depth and thoughtfulness of advice he has so generously given the United States Government...."

Similar words of praise can be found in the citations for the National Medal of Science; the Franklin Medal from the Franklin Institute, *"particularly for accelerator design, construction, and successful exploitation;"* the Ernest O. Lawrence Medal for his fundamental contributions to meson physics; the Leo

Szilard Award for his contributions to society through his arms control work; the Richtmeyer Lecture by the American Association of Physics Teachers; and the list goes on.

Every facet of Pief's activities has been honored because, in typical Panofsky fashion, he set and achieved the highest standards in each of his many undertakings. In his days as a teaching professor, he was exceedingly popular and beloved by the students from freshman courses on up because of the clarity and excitement of his lectures, the warmth of his personality, and the ease of access to him by the students; and it is characteristic of Panofsky that that's precisely the way he has been running SLAC for more than twenty-five years. His office door is always open; everyone at the Lab has access to him; more than once, running around in shirt sleeves at odd hours he has been confused as a janitor - and acted out the role. His patience and energy never seem exhausted; he has led with candor, with an innate ability to resolve conflicts constructively and by being creatively involved in every aspect of the Lab's activities - a fact for which I am particularly grateful - it made me a credible Deputy Director. He has created an organization whose spirit and lively intellectual atmosphere have nurtured individual creativity. Indeed, the style and spirit of SLAC are truly a reflection of his own personality.

The world would be a better place if one could point to achievements in the arena of arms control and international security that bear the Pief trademark as clearly and as heavily imprinted as does SLAC, but as many of us have learned to our great frustration, in the political realm a scientist often encounters insurmountable difficulties of a type not found in our scientific laboratories. In the lab we are dealing with constant and rational laws of nature; we can do repeatable experiments on well-defined systems. We recognize - and have a well-justified faith - that simplicity and beauty are the marks of understanding and truth. In the world of politics the situation is anything but that orderly and rational. The ratio of one's accomplishments to one's effort seems so discouragingly small - but there is no doubt that the countless hours and days and weeks and months,

the almost countless trips that Pief has devoted to government advising have indeed left their mark and had an important impact. Pief's involvement dates all the way back to World War II, more than forty years ago - and he has served since the late 1950s as a trusted adviser at the highest level to Presidents from Eisenhower to Carter. President Eisenhower's Science Advisers, James Killian and George Kistiakowsky, in their individual memoirs as Special Assistants to the President write of numerous meetings and occasions in which they turned to Pief for his technical advice.

And the reason is clear. Linus Pauling put his finger on it once in a public debate when he described Pief as a man whose vision was free of parallax. That objectivity - and his willingness to roll up his sleeves, to work and master the nitty-gritty details - have made him a unique national resource. For example, early in 1959 the Eisenhower Administration was preparing to open negotiations with the Russians toward cessation of nuclear weapons tests. The then Science Advisor to Eisenhower, Jim Killian, was relying on the President's Science Advisory Committee (PSAC) for the necessary technical studies on the means available to detect tests. There were unresolved technical issues and he turned to Pief, in particular, to head up a technical working group to deal with methods of detection of nuclear explosions in space. The issue at that time was the possibility of hiding nuclear explosions. Could exotic tests be concealed by exploding nuclear devices at very high altitudes or in outer space - even concealing tests behind the moon or the sun, as suggested by some scientists such as Edward Teller? If you think we particle physicists are clever in our particle and particle creations these days, you should compare them with some of the nuclear test exotica one had to face then!

As Dr. Killian wrote in his memoirs, President Eisenhower opened a diplomatic negotiation with the Russians that year which included the methods and instrumentation for space detection that were recommended by the technical committee chaired by Panofsky. Subsequently, the negotiators, with the U.S. delegates chaired by Panofsky, reached an agreement based on the correct tech-

nical assessment of limitations and potentials for detecting and identifying high-altitude explosions. Pief himself played a prominent role in that negotiation which was a basic step toward the subsequent signing and ratification of an atmospheric test ban treaty several years later during the Kennedy Administration.

The fact that background radiation from atmospheric tests has decreased by two orders of magnitude in the past twenty years since the end of aboveground testing of nuclear bombs by the U.S. and Soviet Union and the environment in which we live has been so cleaned up from threatening nuclear fallout in no small measure derives from the success of that technical effort. Our gratitude to Pief - and to Frank Press and Jerry Wiesner who were "in the front trenches" with him and who will speak later today - for their contributions to the achievement of the atmospheric test ban treaty is enormous. Had logic been able to win out over politics at that time, we might also now have a comprehensive test ban treaty banning underground, as well as aboveground nuclear weapons tests, and many of the subsequent failures at arms control, as well as the current threat of space weapons, could have been avoided.

In his diary, George Kistiakowsky, who had succeeded Killian as Science Adviser, describes a meeting of PSAC with President Eisenhower at the Newport Naval Base in July 1960 at which he charged Pief with responsibility to present to the President the case for the cessation of nuclear tests. Pief must have done so convincingly and with characteristic forcefulness, because Kistiakowsky wrote ten days later in his diary while at a Camp David meeting with Pief and others in preparation for a meeting of the Science Advisory Committee with the National Security Council, as follows:

"I succeeded in presenting myself as having been put into grave jeopardy by that briefing paper on the test ban given to the President at the Newport PSAC meeting. Could see that Panofsky was thoroughly uncomfortable and [I] thoroughly enjoyed it."

By the way, in a very humorous and revealing comment recorded by Kis-

tiakowsky in his diary, we can also learn what an incredible lobbyist Pief was against an impressive array of East Coast opposition in his battle to create SLAC. Sometimes, in some battles, the odds can be insurmountable - even for Pief. Of course, Pief won this battle - and for sure SLAC exists. But I suspect that, in spite of his indefatigability and persuasiveness as a lobbyist, Pief might not have won that titanic struggle against the effort to kill the SLAC project had it not been for the simple fact that his vision of the full beauty and power of high energy electron beams was not yet widely shared in that distant past twenty-five years ago. I'll bet that at that time some thought it was even worth \$114 million to send Pief off to his electron follies and get him and his merry band out of their hair, far away to the West across the Hudson River, not to mention across the Mississippi!

After Pief gained White House support for SLAC his struggles were far from over - monumental political barriers and self-imposed barriers of principle remained. The political one is local legend - remember the Woodside powerline controversy that made Pete McCloskey famous and led to his becoming our long-time Congressman! That controversy also brought great joy to the Palo Alto medical community who, until we inherited their mantle, were the chief villains of the area because of their plans to expand the Palo Alto Clinic and build an associated hospital for it which would have dislocated some downtown residents. The battle of principle - less widely known - was waged by Pief when he rejected the insistence by the Atomic Energy Commission (AEC - as the earlier incarnation of the Department of Energy was known) that the contract for SLAC agree, on an open-ended basis, to any regulations imposed unilaterally by the government on the basis of security requirements. Against strong outside advice, and rejecting a precedent already set by other academic labs in earlier AEC contracts, and with \$114 million sitting right out there on the table, Pief and his fellow negotiators made this a "do-or-die issue." That provision was indeed struck from the contract. Stanford won - we all won - by that display of courage. If that isn't an example of staying true to principle - shoving \$114 million in 1962 dollars back across the table after five years of hard work to get

it - then I don't know what is!

One could go on and on describing Pief's Washington campaigns. At the time of the last great debate on ballistic missile defenses starting in 1969 Pief once again was out front with great effectiveness in the national debate and in private government councils leading up the ABM Treaty of 1972. And his contributions in that area have never ended. He's out there once again now that the ABM battle has once more been joined. His active role in arms control is known today not only in Washington but just as well to hundreds of students and many colleagues here on the Stanford Campus where Pief was one of the founding members of what has now grown into the Stanford Center for International Security and Arms Control. Both the Stanford Center and the cause of arms control are at the head of line for more of Pief's attention when he hands over the SLAC directorship to Burt Richter's very capable hands next month.

To those of us privileged to work closely with him and who have followed his path to Washington, Pief has been a constant inspiration. He was our teacher and a model we have tried our best to emulate. The word used by our close colleague and friend Dick Garwin - himself no less valuable and rare a national resource - is that Pief has been to us a hero - in this age with so few heroes. He set new standards for all of us to follow - and he will no doubt continue to do so, both in the effort to reduce the threat of nuclear weapons and in supporting wise science policy.

Last year, for the most recent of his many honors, Pief received an honorary doctorate from his alma mater, Princeton University, with this citation:

"He has led our quest for the ultimate constituents of inanimate nature, using the resources of modern technology to open the realm of high-energy elementary particle physics and to catch glimpses of a fleeting world of 'color,' 'charm,' and 'strangeness.' Knowing intimately the awesome power of the atom, he has counseled us in the arena of nuclear arms, soberly reminding us of the mutually assured destruction that is the most likely outcome of their use."

As appropriate as that citation is, I remember a better one - a short and perfect tribute by Bram Pais dating back to 1951 - the summer we both first got to know Pief. That was a wonderful summer, with both Pais and George Uhlenbeck visiting and lecturing at Stanford. I was their most appreciative student. To digress a moment, I remember Uhlenbeck telling a story about Stanford that appears in the memoirs of Boltzmann. After his retirement Boltzmann spent a spring visiting Berkeley. This was shortly after Stanford was founded near the end of the 19th century. Boltzmann tells in his memoirs of his visit to the Golden West of what a strange country America is. In Europe he said the nobility live off the sweat and blood of the poor and with their wealth and power build castles for self-enlargement. But here in this strange new world, Boltzmann recounted, you have people like Senator Stanford and his colleagues - the four so-called "Robber Barons" who built our first transcontinental railway and got rich on the backs and the blood and sweat of the workers - and then lo and behold what did Stanford do with his wealth: he created a university; and, as Boltzmann said "Who knows, some day you may even hear of it."

Pief, of course, and his creations are a major reason that Stanford is indeed now heard of so far and wide. But returning to Pais, and one evening as we sat musing and drinking at a watering hole down on El Camino - at that time bars and bistros could be no closer than one and half or two miles from Campus. I remember Bram saying: "That Panofsky, what a beautiful person." Pais's tribute is as perfect today as it was in 1951. This, too, is one of the invariance principles of Pief Panofsky.