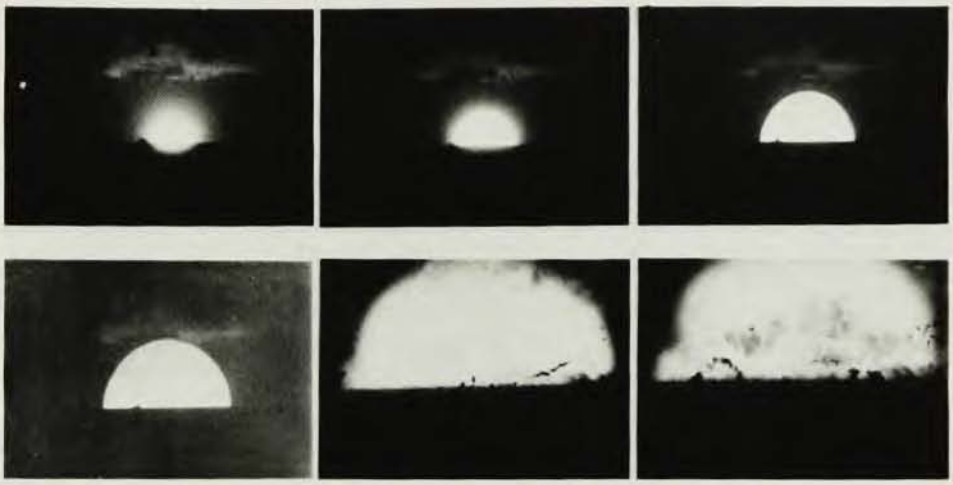
Time for public demonstrations of nuclear explosions?

C. Sharp Cook

I believe the message in Wolfgang Panofsky's article "Science, technology and the arms race" in June (page 32) is much too important to be limited to a mere bunch of physicists or to a coloquium audience. Two statements in that article which need special consideration are "Once nuclear war is initiated by any power, under any doctrine in any theater, or for any strategic or tactical purpose, the outcome will involve truly massive casualties and devastation, leading to effects on the future of mankind that are essentially uncalculable," and "Too often the radically different nature of nuclear weapons and nonnuclear arms is ignored, or at least minimized. . ."



Nuclear explosion in Pacific; dark specks in last two frames is smoke from burning feathers of terns frightened into the air by the brilliant light.

Those of us who have experienced above-ground detonations of nuclear explosives are well aware of these differences but the generation which has reached maturity since the limited test-ban treaty of 1963 has not had the same opportunities to observe directly the overpowering might of nuclear explosives. A large number of people now appear completely oblivious to the potential consequences of nuclear warfare. This attitude may even have infiltrated the corridors and offices of people in important decision-making positions, assuming that news stories can be believed. For this reason the time may have arrived to conduct a few more above-ground bursts of nuclear weapons to show people the great differences between them and conventional weapons.

I can assure from direct observations that a nuclear explosion is quite different from a chemical explosion, even a large one. On three occasions during the 1950s I had an opportunity to observe a number of near-surface detonations of nuclear explosives at the Nevada Test Site, twice spending several months there in charge of a project in which we made relatively detailed measurements of ionizing radiations, both from fallout and from neutron-induced activities. Because we had to be in our field laboratory at the time of the explosion, especially when we were experimenting with neutron-induced activities, I had several opportunities to observe above-ground detonations of nuclear explosives from a distance of about five miles. These devices had yields over a considerable range, up to an equivalent of 15 000 tons (15 kt) of trinitrotoluene (TNT). I wonder how many people have seriously thought about the size of a 15 000-ton pile of TNT. If it could ever be put together, it would produce a very impressive explosion.

Being within a few miles of a nuclear detonation provided a sense of the overwhelming power it releases, something which can never be realized from a photographic reproduction of the event. When the detonation occurred at night, the fireball momentarily lit the immediate vicinity with the same general brightness as the sun lights the earth during the day. However, the overall effect was somewhat eerie since, in the wide-open spaces of the Nevada Test Site, daytime visibility extends well beyond the region that was brightly illuminated. The ghost-like shadows danced momentarily on the surrounding hills, providing a sense of reality to the knowledge that night prevailed outside a very limited region.

Fireballs of daylight detonations also produced effects that revealed the awesome power of a nuclear explosive. Even when the sun was shining, the light from the fireball of a 10-kt device cast shadows at our position five miles from ground zero. This power was also experienced in another way during the early 1950s, when many nuclear explosives were detonated atop steel towers. Dissipation of the fireball after the detonation usually revealed that the tower had disappeared. Its iron could be found as tiny droplets in the fallout downwind from ground zero. Because of the extreme heat, the tower had vaporized and become part of the cloud. As the cloud cooled, the iron recondensed as droplets and fell, much as condensed water vapor falls as rain.

On one occasion, during our experiments on neutron-induced activities, three of us drove to within 500 meters of ground zero for a detonation which had taken place a few tens of meters above the surface, arriving there only

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C. Sharp Cook is chairman of the Physics Department, The University of Texas at El Paso.

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ten minutes after the detonation. Such an adventure was necessary to recover a sample that had a half-life of only a few minutes. As we raced toward ground zero our impression of the enormous size of the mushroom cloud was even more enhanced, based on our prior observations from five miles away, from where such clouds had appeared to be almost overhead. Now it really was overhead. Never have I seen a photograph which so dramatically gave the same feeling of insignificance that this experience did.

Once inside a region that extends to about 1000 meters from ground zero, visibility was limited to only slightly more than ten meters because of a concentration of tiny dust particles in the air. The experience gave somewhat the same impression as going through a fog, except there was no moisture. Because of the extreme heat of the detonation, vegetation was destroyed within several hundred meters of ground zero. The dust did not settle for an hour or so and any later wind motion caused the dust to blow again. Because this dirt was radioactive, anyone working in the area was obliged to wear a complete set of protective clothing, including gas masks. As we raced out of the area after picking up our sample, we encountered other experimenters entering to collect their samples. They later said that they thought of us as a Phoenix rising from the flames when they suddenly met our jeep in the dusty environment.

After observing the effects nuclear explosives produce, I have often wondered how many people wish either that nuclear fission were not possible or that its existence could have been hidden. If either alternative had been possible, we would not now be concerned with many of the problems which confront world leaders. Unfortunately, once an individual or group opens Pandora's box and discovers any specific phenomenon, there is no turning back and all of mankind must make the best of the situation. I hope that all world leaders understand what they have at their command and that they do not use it frivolously. Once a nuclear weapon is used in a wartime situation—any wartime situation—there is no way to prevent the release of a fury on the peoples of the world unlike anything they have ever experienced and more awesome than anything they will ever want to see. To emphasize this fact I suggest that the time may have arrived for another demonstration—for the benefit of the current generation of decision-makers—of an above-ground explosion of a nuclear weapon of reasonable size. □