

How did a scientific Siberia



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turn into AstroBoulder?

Joseph P. Bassi

Boulder, Colorado, grew to become an important science center in part because nearby mountains provided an excellent spot for solar observation. But local scientists' connections to the Northeast establishment and some clever PR didn't hurt.

The rise of Boulder as a city of knowledge was sudden and in many ways unexpected. In the 1940s and 1950s, a small Colorado city little known for scientific or intellectual accomplishment became a world-recognized science center as entrepreneurs and members of the local community, including state university representatives, exploited opportunities to advance Sun–Earth connection science. They created what French astrophysicist Jean-Claude Pecker was to call AstroBoulder, and they did it without centralized planning.

The early Cold War presented US physical scientists with not just new opportunities for funding but also new rationales for doing science. With the advent of ballistic missiles, defense officials realized that the upper atmosphere and space were becoming a medium that needed to be better understood; Sun–Earth connection science had an immediate relevance to perceived national needs. Also, the complexities of defense-related research almost demanded the creation of more research establishments.

As evidenced by the development of Boulder, scientists and others did not merely seize the numerous opportunities that the early Cold War–era context presented; they participated in creating and shaping those opportunities in what was then the rapidly evolving world of US science policy. Indeed, *PHYSICS TODAY* declared in its July 1950 issue (page 35) that “the springtime of Big Physics has ar-

rived.” It certainly had in Boulder by the late 1940s.

Harvard astronomy heads west

The development of Boulder is also part of the story of how, in the early and mid 20th century, US science migrated west from the northeastern scientific establishment. In the late 1930s Harvard University astronomer Donald Menzel wanted to find an optimal location for the first coronagraph in the Western Hemisphere. The device had been invented by French astronomer Bernard Lyot a few years before, and Menzel and his graduate student Walter Orr Roberts wanted to get one operational for their solar studies (see figure 1). As Menzel hailed from Leadville, Colorado, he understood that his native state was a suitable place to locate the instrument. Fremont Pass, at 3450 m in elevation, provided a confluence of good observing conditions, passable



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roads, and a willing sponsor: Max Schott, president of Climax Molybdenum Co. Menzel made the easy decision to place the coronagraph at the company's site near Leadville, mere miles from his hometown. Roberts and his wife Janet, with coronagraph in tow, soon set out for the great American West to work at the Climax solar observatory, officially known as the Fremont Pass station of the Harvard College Observatory (HCO).

The sudden onset of American involvement in World War II changed the fortunes of the tiny station and the course of science in Colorado. As Menzel predicted to various sponsors over the years, the arcane coronagraph data had important practical uses. Roberts made a significant discovery at the end of 1941 that linked Sun–Earth studies to military operations. “In late 1941,” he observed in an American Institute of Physics career survey, “I first noted from my own data, a connection of strong green-coronal line emission to the short-wave radio reception quality.” Allied scientists feared that the Germans might have similar interests with respect to radio prediction. Menzel seized the opportunity and asked the National Bureau of Standards (NBS, the predecessor of NIST) to have the Climax observatory declared a national defense project. The close bond between the observatory and the NBS Interservice Radio Propagation Laboratory (IRPL) would grow even stronger through Alan Shapley, shown in figure 2. Shapley, son of astrophysicist Harlow Shapley, Roberts’s mentor, joined the IRPL’s successor organization in 1947. The Colorado–Washington, DC, relationship he was to facilitate would profoundly influence the development of science in Boulder during the following decade.

As World War II came to a close in September 1945, the IRPL contracted with the Climax observatory to continue providing solar data (figure 3 shows the image quality obtainable at that time). That agreement gave some measure of security for continued operations, but not nearly enough to expand the site’s modest facilities and research agenda as Roberts and Menzel hoped to do. As with many Americans facing the uncertainty of the postwar world, Menzel and Roberts had to wonder what the immediate future held—in their case, for Harvard’s Fremont Pass station and solar science. The answer pointed them to the city of Boulder and the University of Colorado.

An innovative arrangement

Scholars often describe the post–World War II years as a period of institution building in the evolving discipline of solar physics. Having seen the benefits of the government’s large-scale science support during the war, Menzel and others wanted to continue the government–scientist relationship. Choosing to exploit new sources of government grants rather than relying on the research and funding decisions of, for example, a lone observatory director, they quickly began to exercise their own authority. That new approach is essential to understanding the progress of Sun–Earth connection science and postwar developments in Boulder. For one thing, it enabled astronomers to expand their discipline beyond its traditional emphasis on stellar and galactic research. Solar research therefore underwent a period of significant expansion in the postwar years, and Boulder benefited from that growth. Roberts moved there in 1946 to help create one of the institutions enabled by the shifting patronage patterns. It was to be a new type of corporation, one made of associated universities and dedicated to solar science.

The idea to transform the HCO station at Climax into a joint

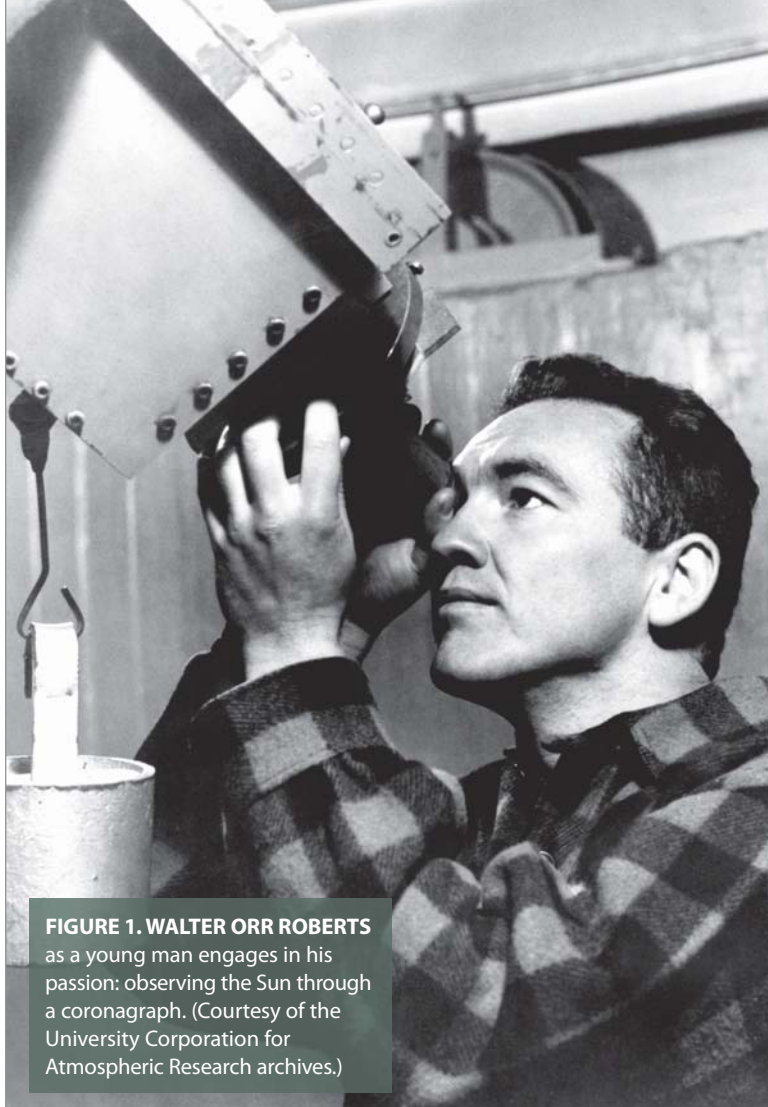


FIGURE 1. WALTER ORR ROBERTS as a young man engages in his passion: observing the Sun through a coronagraph. (Courtesy of the University Corporation for Atmospheric Research archives.)

Harvard–University of Colorado endeavor originated in Menzel’s desire to have stronger ties to the state of Colorado so as to enhance his possibilities for local fundraising. Apparently, HCO director Harlow Shapley resurrected the idea of a joint project in October 1944 and proposed the University of Colorado Boulder as a candidate partner. Shapley volunteered that he could help Menzel “very carefully and cautiously feel out the situation” with Robert Stearns, president of the University of Colorado. Stearns liked the idea of a joint project because the partnership would associate his university with the Climax observatory, already a noted astronomical research facility, and thus forge a research link with the prestigious Harvard.

In September 1945 Denver attorney J. Churchill Owen wrote to Stearns that Harvard and the University of Colorado should form a nonprofit corporation with a governing board of trustees. Development of the observatory proceeded quickly. The new joint Harvard–Colorado solar observatory began life as the High Altitude Observatory (HAO) of Harvard University and the University of Colorado on 12 April 1946. It was in the first wave of a new type of scientific research organization: a corporation for science. Perhaps reflecting a natural Coloradan tendency for the use of wildlife metaphors, founding board member William Jackson, a member of the Colorado Supreme Court, recalled his initial thought that the HAO was a “strange beast.” Another board member asked, “Have you ever seen an animal like this before?”

After the Robertses’ period of relative isolation at Fremont

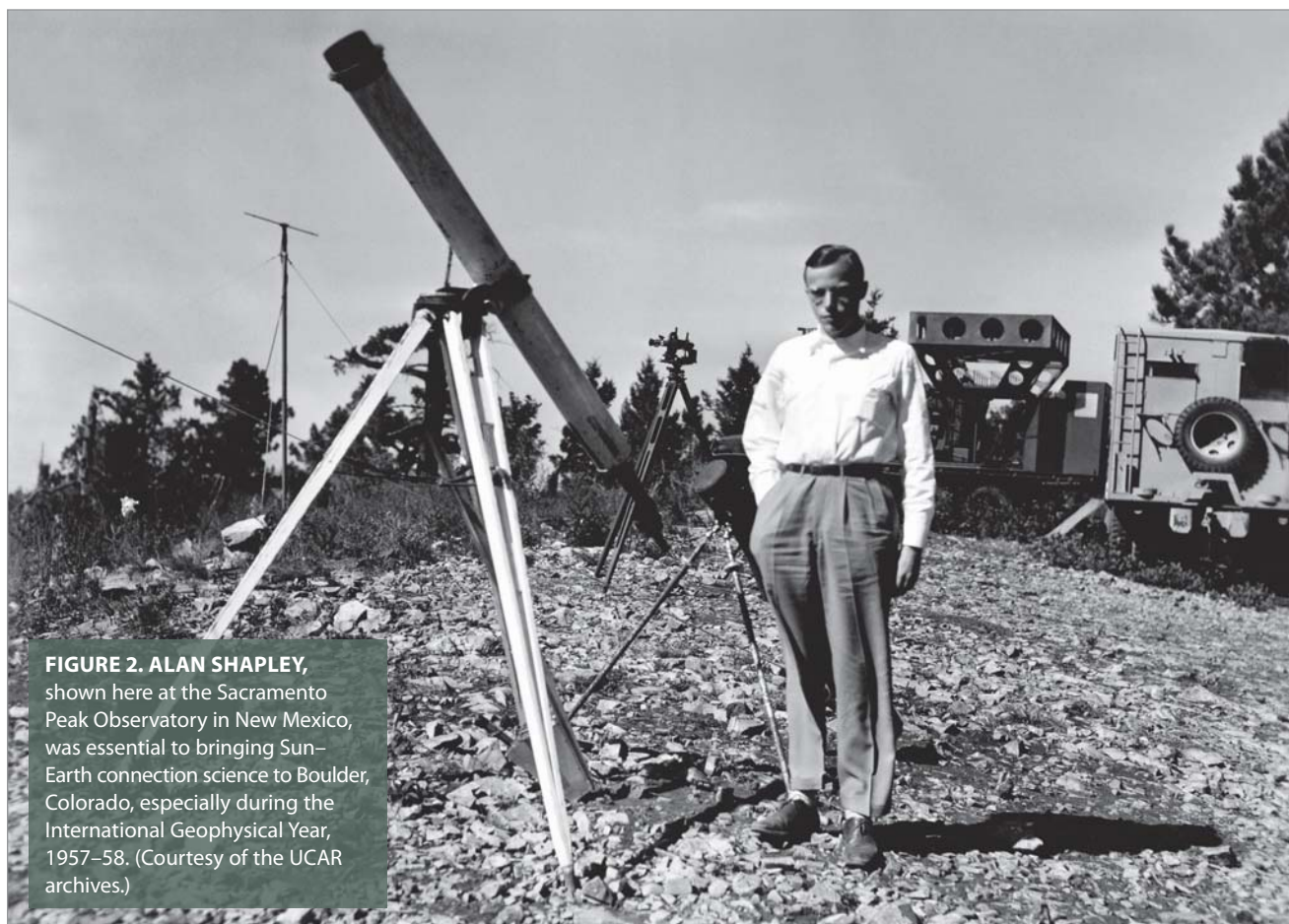


FIGURE 2. ALAN SHAPLEY, shown here at the Sacramento Peak Observatory in New Mexico, was essential to bringing Sun–Earth connection science to Boulder, Colorado, especially during the International Geophysical Year, 1957–58. (Courtesy of the UCAR archives.)

Pass (see figure 4), Walter needed new outlets for both his scientific curiosity and his personal ambitions. The University of Colorado was not Harvard, nor was Boulder Cambridge, Massachusetts. But the university was good enough for Menzel and Roberts’s short-term goal to bring solar astronomy and Sun–Earth connection science west. After six long years, Walter and Janet came down from the mountain to Boulder, where Walter worked at the HAO offices. Hired observers ran daily operations at the Climax station.

On the chopping block

Boulder’s development as a place for Sun–Earth connection science was almost stillborn. There was a move in the summer of 1947 to shift the Harvard solar observing operation to a new site in New Mexico. Menzel, no doubt stimulated by his wartime activities and the success of creating the HAO, sought to expand his astronomical activities after the US Air Force offered support for the second of what Menzel would eventually refer to as his western solar stations.

Physicist Marcus O’Day and his group at the Air Force Cambridge Research Laboratories had found themselves leading the air force’s effort to use captured V-2 rockets for upper-atmosphere research. O’Day suggested to Menzel that the air force might fund solar research to augment the V-2 studies. American V-2 research centered at the White Sands Proving Ground, and a key requirement was that the new observatory’s site offer total surveillance of V-2 flight paths so that personnel could couple solar observations and rocket flights. That criterion restricted the new observatory to a location somewhere in the Sacramento Mountains, to the east of White Sands. Roberts initially supported Menzel’s plan and stated to Harlow Shapley

that “the establishment of a south station now looks to me like a very desirable thing.”

However, some astronomers at the HCO in Massachusetts began to question the wisdom of having a growing number of HCO research stations out west. Events, and the possibility of large amounts of government funding for the newer, bigger site in New Mexico, put what Shapley had previously called “our lovely Colorado project” on the chopping block.

Roberts was shocked by the possibility of losing his new Colorado operation to New Mexico. His response to Shapley kept Boulder’s nascent scientific community viable and thus established the foundation for many future developments in the city with respect to Sun–Earth connection science. “I do not think this will be a feasible thing,” he wrote on 26 August, referring to Shapley’s proposal to slowly dissolve HAO work and shift operations to New Mexico. As reasons for his opposition he cited the isolation of the proposed site as compared with Boulder, the “extreme unpleasantness” of temperatures in Alamogordo, uncertainty about site observing conditions, the lack of “a campus atmosphere,” and “the undesirability of a very close relationship with the Army or military in these research programs.” He also wrote that “it would be of utmost difficulty to keep our [spouses] in a state of happiness” if they had to move to the new Sacramento Peak Observatory.

To handle the threat to the HAO’s continued existence in Colorado, Roberts suggested a compromise. To avoid a head-to-head competition with the observatory in New Mexico, he suggested each site have a suite of instruments that complemented the other’s. Personnel at Boulder and Sacramento Peak could then work as a team and not as rivals.

The US Department of Defense approved the Sacramento

Peak site in April 1948. Roberts and others were important guiding hands in constructing the New Mexico observatory while they also enlarged the HAO site at Climax (see the image on page 36). Roberts's compromise saved the HAO from being terminated. With it, he ensured that solar research and Sun–Earth connection research stayed in Boulder, a *sine qua non* for the city's future development as a center for science.

“Our minds were already made up”

The Central Radio Propagation Laboratory (CRPL), founded in 1946 as the successor to the IRPL, was the US hub for predicting radio propagation. As such, it stood at the center of Sun–Earth connection research. Within a couple of years, US government officials began to think about moving the CRPL facility from its location in the Washington, DC, area. At the time, relates CRPL scientific administrator Alan Shapley, the northeastern-based scientific establishment viewed Boulder as a “scientific Siberia,” because it was “west of the Hudson River.”

Several factors contributed to Boulder's becoming the location of the new CRPL facility despite the attitudes of the scientific establishment. Contrary to popular wisdom, those factors do not include that Mamie Eisenhower hailed from Colorado. Rather, a combination of early Cold War defense policies and, perhaps, political machination brought the CRPL to the foothills of the Rockies.

Most renditions of the move to Boulder begin with the account of NBS director and noted physicist Edward Condon. Head of the NBS from 1945 to 1951, Condon wrote in a letter to his wife that the government wanted to build the new lab facility outside Washington for generic “military strategic considerations” and that Boulder would make a good “summer capitol [*sic*]” for him. Condon composed that letter in the summer of 1949, after Menzel and Roberts invited him to tour Colorado following a conference on cosmic rays, held in Idaho Springs. Documentary evidence suggests at least one other genesis of the idea for the CRPL's relocation to Colorado. In this alternate version, Condon was forced to head west, and the long-distance journey had little to do with national security concerns. The prime mover in the alternate understanding is powerful Colorado senator Edwin “Big Ed” Johnson.

“It has been rumored that Dr. Condon brought the Central Radio Propagation Laboratory to Boulder,” wrote the retired Johnson to Francis Reich of the Boulder Chamber of Commerce in 1967. He added, “The truth is that this tremendously famous Laboratory brought Dr. Condon to Boulder.” Historical consensus is that Condon, prompted by Johnson, did have strong pro-Colorado sentiments. Even so, a major \$4.5 million relocation effort by the US government needed strong justification to the public and other politicians. Officials formed a four-person site selection committee. Although Alan Shapley was not an official member, he served as an unofficial secretary. He was in continuous communication with Roberts, ostensibly because of the professional and scientific links between the HAO and the CRPL.

Events proceeded quickly after Condon's summer sojourn to Colorado. The existing air force–sponsored activities at the University of Colorado and the military-funded HAO paled in comparison with the prospect of a multimillion-dollar federal government research center in the heart of Boulder. Roberts, Stearns, and the Boulder community rallied around making the enticing possibility a reality. The Boulder Chamber of Commerce took immediate action. President John Allardice and secretary Reich “are in touch with Colorado's members of Congress,” reported a Boulder newspaper. Allardice and Reich communicated not only with Colorado's elected officials but also with Roberts and others. As the campaign intensified, Roberts served as an important link connecting the NBS's site selection committee and the Boulder Chamber of Commerce. His position in the world of Sun–Earth connection physics and his interest in the establishment of the new lab made him ideally suited to serve in that intermediary role.

The NBS created a formal site selection procedure. Though Boulder advocates needed to navigate that process, there was little doubt as to what the final result would be. The selection criteria ensured that Boulder would be a front-runner in the competition. And, as Alan Shapley confessed years later in an interview about a site selection committee trip, “If the truth be known, our minds were already made up before we reached Boulder.” Nonetheless, 28 university towns made the first cut. A second round reduced the list to three: Palo Alto, California; Charlottesville, Virginia; and Boulder.

Before the final decision was to be made, Shapley wrote to Roberts about land. “The way these things work,” he commented, “the *free availability* of land may become an important factor in the selection of a site.” A land offer made it easier for the committee to justify and sell the decision that they had in effect already made. “Of the three primary locations under consideration,” wrote the NBS board in its final report to Condon on 13 December, “only one, Boulder, has formally offered a suitable tract of land, comprising 210 acres, to the Federal Government.” Later that month, on the basis of the NBS report, Secretary of Commerce Charles Sawyer made the decision to move the CRPL to Colorado.

Prosperity insurance

After helping to get Boulder selected as the site for the CRPL and other new NBS labs, the Chamber of Commerce needed to deliver the land it had promised. To do so required collecting \$70 000, the estimated purchase price for the land pledged to the government. But where would they find the funds?

“Boulder citizens to be asked for nearly \$70,000 to purchase

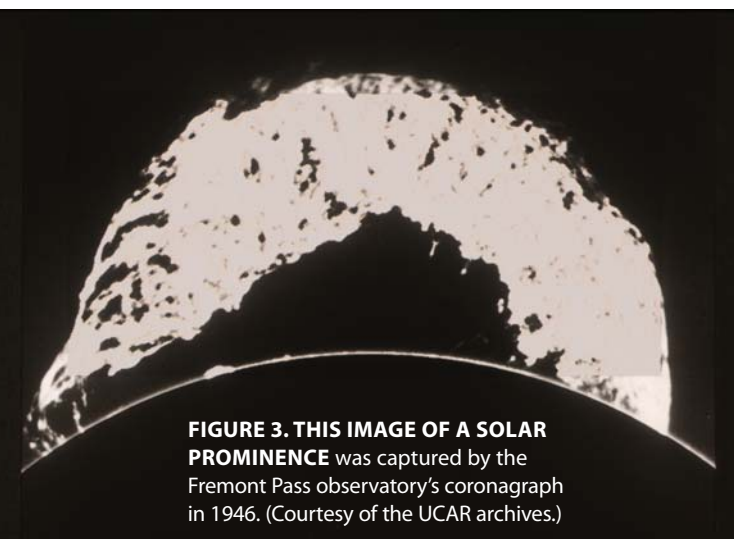


FIGURE 3. THIS IMAGE OF A SOLAR PROMINENCE was captured by the Fremont Pass observatory's coronagraph in 1946. (Courtesy of the UCAR archives.)



FIGURE 4. WALTER AND JANET ROBERTS enjoy some recreational time outside the Fremont Pass observatory in the Colorado mountains. The couple lived for many years in isolation there before moving to Boulder. (Courtesy of the UCAR archives.)

laboratory site” read a subheading to a 27 February 1950 *Daily Camera* article about the Chamber of Commerce’s fundraising campaign. The chamber decided on 11 April as the kickoff day to begin the drive. The Rotary Club and local unions were among the first to make pledges, a mix that indicates the diversity of support for the drive among Boulder’s citizenry.

A major part of the solicitation effort included the pitch that a donation was a type of insurance. “You probably now have health, accident and life insurance,” ran a full-page ad in the *Daily Camera*, “but how about your business? Will you have the customers and clients next year you have now?” It also asked, “Don’t you wish you knew?” Bringing the CRPL to Boulder, the argument went, should bring a \$2 million per year payroll “dividend” to the city for the \$70 000 “premium” needed for the site. The page spread ended enthusiastically and optimistically with “Pay your share of the premium—TODAY!” and “Collect your share of the dividends—TOMORROW!” The drive, an overwhelming success, yielded more than enough money for the land.

Dwight Eisenhower, the first incumbent US president ever to visit Boulder, dedicated the NBS labs on 14 September 1954 (see figure 5). He spoke of the labs as representing a “new type of frontier . . . of greater romantic value and greater material value than some of the discoveries of those earlier days.”

The International Geophysical Year

The greatest East–West collaboration of the Cold War era may well have been the International Geophysical Year (IGY), a 67-nation project that gestated in the 1950s and officially ran from July 1957 to the end of 1958. (See the article by Fae L. Korsmo, *PHYSICS TODAY*, July 2007, page 38.) From the beginning, many IGY researchers saw Boulder as a potential, if not obvious, candidate for IGY activities, both for the scientists who had migrated to the city and for the institutions that had developed there.

Roberts and Alan Shapley, because of their particular scientific interests and positions as administrators and scientific entrepreneurs, played particularly important roles in the IGY almost from its formal beginning at an international meeting held in 1953. Roberts and Shapley’s research agendas aligned with many of the broad goals of the IGY. But they also aligned with the research interests of IGY spark plug Sydney Chapman. A renowned space physicist, Chapman had formed and maintained close working relationships with both the HAO and the CRPL and routinely traveled to Boulder.

The CRPL’s mission to understand “the nature of the media through which radio waves transmitted” was also highly compatible with core IGY investigations. Shapley, keenly aware of the unique circumstance presented by a major international effort devoted to geophysics, wrote to NBS head Allen Astin in early 1954 that “the IGY provides the Central Radio Lab with an unparalleled opportunity” and that “a large fraction of CRPL current activities have objectives quite similar to those of IGY.” He could have written the same sentence about Boulder.

By the mid 1950s, all the parts were in place to make Boulder a centerpiece of IGY research activity—an infrastructure based on Sun–Earth connection science and the personal associations that connected Boulder to national and international IGY science. The relative ease by which Boulder transformed into a major site for IGY science is therefore not difficult to explain. Of the 12 technical panels the US National Committee for the IGY had formed by 1958, Boulder-based groups had research activities related to seven of them. The scientific links between Boulder and the IGY, strong from the start, only intensified.

As Shapley noted, the CRPL served as something of a mini-IGY by its very nature. One example of the laboratory’s close relation to the IGY began when Boulder scientists designed and constructed the latest version of an ionosonde, an instrument

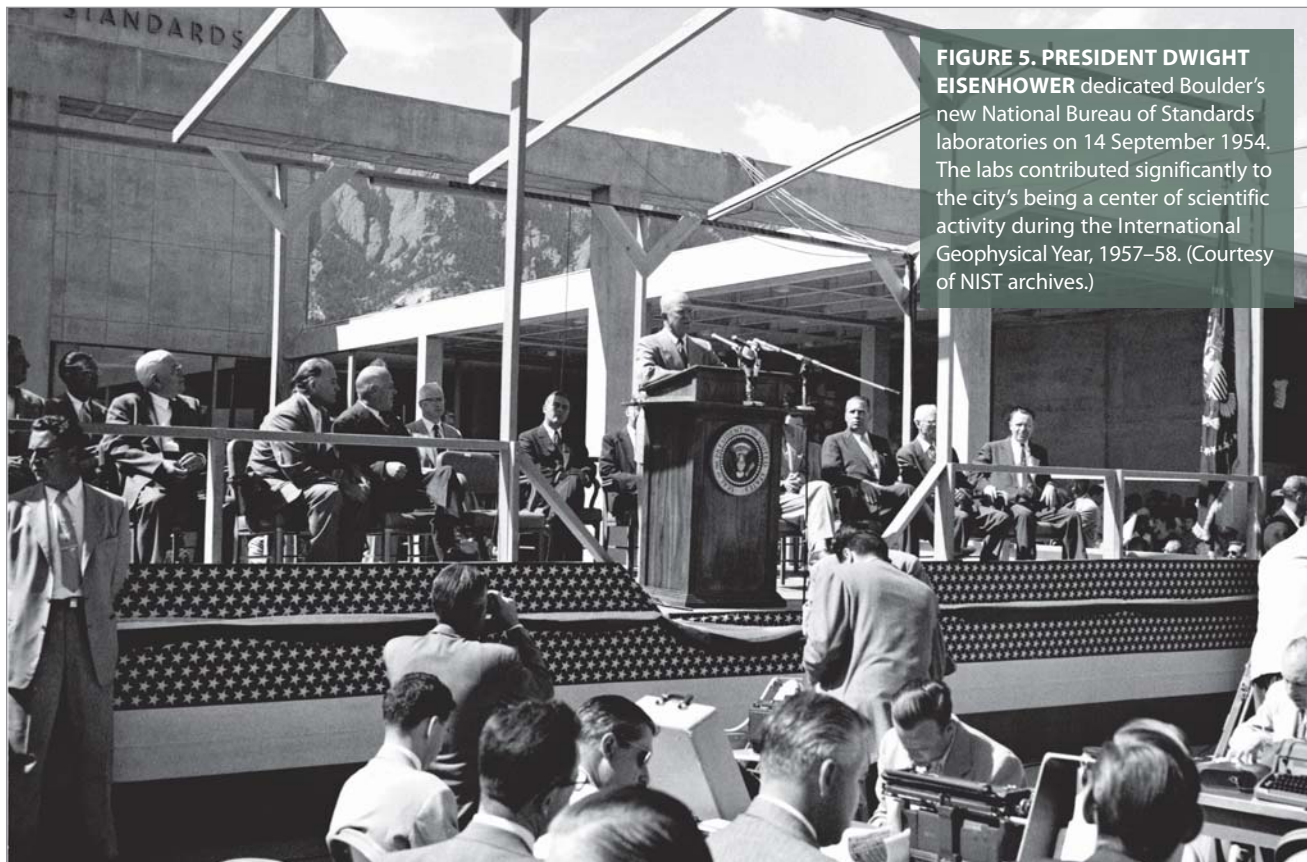


FIGURE 5. PRESIDENT DWIGHT EISENHOWER dedicated Boulder's new National Bureau of Standards laboratories on 14 September 1954. The labs contributed significantly to the city's being a center of scientific activity during the International Geophysical Year, 1957–58. (Courtesy of NIST archives.)

used to examine the ionosphere. Those activities dovetailed naturally with the HAO's solar work and observations, as the ionosphere was often the physical realm where HAO and CRPL interests connected. Thus an important part of the Sun–Earth connection science of the IGY was well represented by Boulder science. In turn, the IGY stimulated the burgeoning astrophysical work that began in Boulder in the late 1940s and early 1950s.

Boulder also distinguished itself as a data handling center. On the one hand, it had organizations that could coordinate IGY activities by alerting collaborating groups to geophysically significant events. On the other, it provided repositories from which researchers could obtain the IGY's globally collected disparate data sets, even years in the future.

Only the Washington, DC, area housed more of those important data repositories than Boulder. Given that less than a decade before, Boulder had the reputation of a “scientific Siberia,” the award of those highly visible IGY data centers served as an important indication of the city's rapid rise to prominence as a place for scientific research. As the city's reputation as a science hub grew, so did its possibilities. Soon, major research centers arose in Boulder—for example, the National Center for Atmospheric Research and the Joint (NBS–University of Colorado) Institute for Laboratory Astrophysics. By the early 1960s, Boulder had become a place for Big Science in America. The city had benefited from a confluence of shifting science patterns in the Cold War, shrewd politics, ambitious scientists and politicians, and fortunate timing. Those factors, coupled with the simple fact that Donald Menzel hailed from Leadville, Colorado, made AstroBoulder and set the stage for the city of science that Boulder is today.

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