

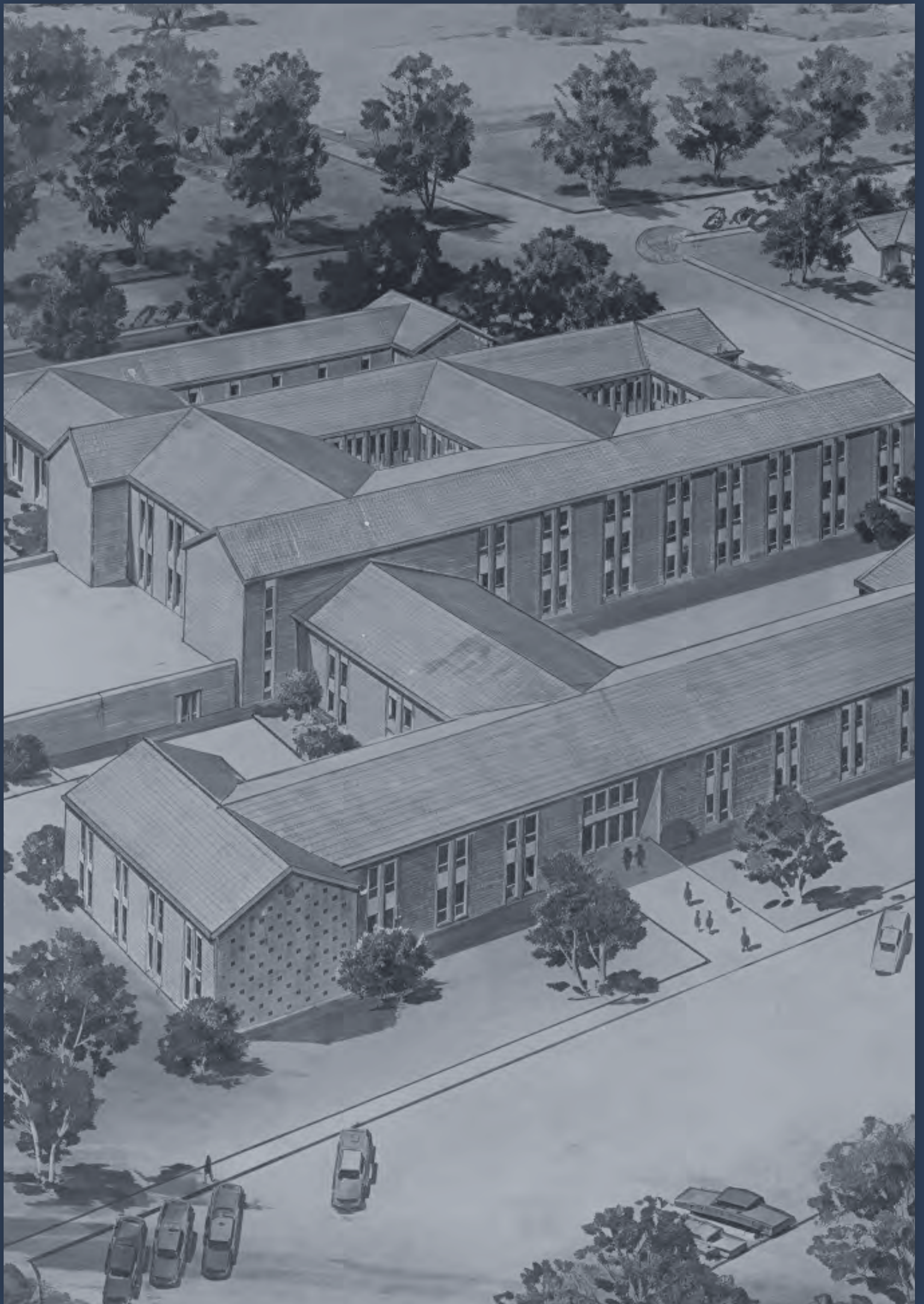
ORAU



Charting the Course:

ESSAYS ON ORAU's FOUNDERS AND EARLY LEADERS





Dedication

This book is dedicated to the generations of men and women who have worked at ORAU throughout the past 80 years.

ORAU has often been known as “the quiet contractor,” carrying out important work behind the scenes in service to science, education, health and national priorities. But quiet work is not insignificant work. The contributions of ORAU employees have helped strengthen communities, advance research, support public health, educate future leaders and expand opportunities for people across the nation.

Their dedication, expertise and commitment to service are woven throughout the history captured in these pages. This book stands as a tribute to all who helped shape ORAU’s legacy and continue its mission today.



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Preface

For more than 80 years, ORAU has stood at the intersection of science, education and service, helping connect people, institutions and ideas in ways that have strengthened our region and advanced the nation's scientific enterprise.

This collection of essays honors that legacy through the stories of the men and women who helped shape ORAU and the community around it. Each chapter highlights pioneers whose vision, leadership and determination contributed not only to scientific progress, but also to the growth of institutions and partnerships that continue to influence research, health, workforce development and education today.

ORAU's story is inseparable from the story of Oak Ridge. In the years following World War II, as Oak Ridge emerged from its identity as a secret city into a globally recognized center for science and innovation, ORAU played an anchoring role in helping build the educational and research infrastructure needed to support that transformation. Through collaboration with universities, federal agencies and national laboratories, ORAU helped create opportunities for scientists, students and communities to engage in work that would shape generations of discovery.

The impact of that work extends far beyond our campus and beyond East Tennessee. Across more than eight decades, ORAU has supported advances in scientific research, strengthened the nation's workforce, contributed to public health efforts and expanded access to educational opportunities for countless students and professionals. Just as importantly, ORAU has remained a committed neighbor and community partner, invested in the growth and vitality of the region we call home.

As you read these essays, I hope you will see more than a historical record. I hope you will see the enduring spirit of collaboration, curiosity and public service that continues to define ORAU today. The people featured in these pages helped lay the foundation for an organization that still believes deeply in the power of science and education to improve lives.

We are honored to celebrate their contributions and to share these stories as part of ORAU's 80th anniversary.

Meghan Millwood

Meghan Millwood,

*ORAU President and
Chief Executive Officer*



CHAPTER ONE
WILLIAM G. POLLARD
and the Founding of ORAU

Throughout history, few individuals have successfully balanced careers in science, education, administration and ministry. Dr. William Grosvenor Pollard (1911–1989) managed to do all four. A nuclear physicist, teacher, administrator, author and Episcopal priest, Pollard became one of the most influential figures in the history of Oak Ridge and Southern higher education. Best known as the founder of Oak Ridge Associated Universities (ORAU), Pollard helped shape the future of scientific collaboration in the South while also becoming an important voice in conversations about science, ethics and faith during the atomic age.



Those who knew Pollard often remembered his warm smile, his trademark pipe and his seemingly endless curiosity. His life reflected an unusual blend of intellectual rigor, public service and spiritual searching.

Pollard was born in New York, but his family relocated to Knoxville, Tennessee, when he was 12 years old. Tennessee would remain his lifelong home. He attended the University of Tennessee and earned a bachelor's degree in mathematics in 1932. That same year, he married Marcella, a woman whose Christian faith would profoundly influence the course of his life. Together they raised four sons.

Pollard continued his education at Rice University, earning a Ph.D. in physics in 1934 during what he later described as one of the most exciting periods in scientific history. Physics was rapidly evolving. James Chadwick had recently discovered the neutron, and scientists such as Marie Curie and Enrico Fermi were transforming understanding of the atom.

While Pollard immersed himself in science, religion played a far smaller role in his early life. Although raised in a Christian home, he considered himself skeptical and even anti-religious as a young man. Marcella, however, expected church attendance to be part of family life. Pollard later recalled a defining moment early in their marriage when Marcella walked alone to church while he stayed home intending to study. Unable to focus, Pollard eventually decided to attend with her regularly, though he admitted he still refused to recite the creed because he found it “too ridiculous.”

After earning his doctorate, Pollard returned to Knoxville and joined the University of Tennessee faculty as an assistant professor of physics. He was ambitious and eager to continue pursuing advanced research, but he quickly became frustrated by the lack of opportunities available at Southern universities during the 1930s and early 1940s. Compared with elite institutions in the Northeast and on the West Coast, many Southern schools focused primarily on teaching rather than scientific research.

Years later, Pollard reflected on that frustration in an article titled “The Coming of Age of Southern Universities in Science.” He described returning to Tennessee “full of



ambitions and dreams” only to find the region largely isolated from the nation’s major centers of scientific discovery. That realization helped prepare him for the opportunity that would eventually define his career.

During World War II, Pollard was recruited into the Manhattan Project, the secret U.S. effort to develop the atomic bomb. He reported to Columbia University, where he worked on research involving the gaseous diffusion method used to separate uranium-235 from natural uranium. Another University of Tennessee physicist, Dr. Katharine Way, joined the wartime effort at the University of Chicago, contributing to nuclear reactor calculations and reactor design.

When the war ended in 1945, both Pollard and Way returned to East Tennessee. Pollard resumed teaching at the University of Tennessee, while Way worked in Oak Ridge. At a dinner party that October, the two physicists discussed the future of the massive federal research facilities that had been built in Oak Ridge during the war.

Both shared concerns about the limited scientific reputation of Southern universities. Way described efforts underway around Chicago to continue nuclear research partnerships between universities and government laboratories. She suggested a similar approach could help preserve Oak Ridge’s scientific infrastructure while also creating new opportunities for Southern universities.

The idea immediately resonated with Pollard. He recognized that Oak Ridge represented a once-in-a-generation opportunity to elevate scientific research throughout the region.

Over the following months, Pollard worked tirelessly to organize a consortium of universities that could collaborate with the federal government and Oak Ridge National Laboratory. On Oct. 15, 1946, Tennessee granted the charter for the Oak Ridge Institute for Nuclear Studies (ORINS), the organization that would later become ORAU. Fourteen universities initially joined the consortium.

The organization’s impact was immediate. ORINS helped secure continued federal investment in Oak Ridge after World War II while opening research and training opportunities to universities across the South. Historians have credited the organization with helping transform Southern higher education into a more research-oriented system.

Pollard took enormous pride in ORINS’ growth. In the organization’s 1956 annual report, he compared its development to the growth of a child into adulthood, marveling at how quickly the small consortium had matured into a major scientific institution.

As ORINS expanded, so did its mission. The Atomic Energy Commission asked the organization to help advance nuclear medicine research and physician training. This led to the creation of the ORINS Medical Division, one of the nation’s early cancer research hospitals specializing in radiation medicine and nuclear science.

The Medical Division became known for important advances in radiation treatment, medical imaging, dosimetry and bone marrow transplantation research. ORINS also developed extensive educational programs that trained scientists, physicians and health physicists from around the world.

In 1965, the organization officially changed its name to Oak Ridge Associated Universities, or ORAU, reflecting its broader mission and growing university membership. Today, ORAU includes more than 170 member institutions and supports work in research, workforce development, STEM education, national security and public health.

While Pollard was helping build one of the nation's leading scientific organizations, his personal spiritual journey was also evolving.

The atomic bombings of Hiroshima and Nagasaki deeply affected him. Although Pollard had initially felt pride in contributing to the Manhattan Project, the use of a second

atomic bomb caused him to confront troubling moral questions about science and human responsibility. He later admitted that his excitement about scientific achievement had given way to fear about humanity's capacity for destruction.

At the same time, Pollard became increasingly involved in St. Stephen's Episcopal Church in Oak Ridge. Initially, he volunteered simply because the young congregation needed help. The church lacked resources and was still meeting in a school gymnasium. When Pollard asked whether the parish would ever have its own building, the rector responded by asking him to lead the fundraising campaign.

Pollard accepted the challenge and successfully helped raise thousands of dollars for the church building fund. Before long, he was also teaching Sunday school. Preparing lessons forced him to study scripture more seriously, and he found himself unexpectedly drawn to theology.

Pollard later explained that he became fascinated by the intellectual depth of religious scholarship. He appreciated that theology demanded serious historical and philosophical inquiry rather than blind acceptance. What began as curiosity gradually became conviction.

He eventually became a licensed lay reader and entered formal theological study while continuing his scientific and administrative work. Time magazine famously referred to him as the "atomic deacon" in a 1951 article because of his unusual dual identity as a nuclear physicist and church leader.

In 1952, Pollard was ordained as an Episcopal deacon at St. Stephen's Church — a church he had literally helped build. His sons served as acolytes during the ceremony. Two years later, he was ordained as a priest. Mrs. Pollard told *The New Yorker*, "And all I ever hoped was that maybe Bill would go to church on Sundays."

Rather than viewing science and religion as contradictory, Pollard believed they complemented one another. He argued that science revealed the complexity and wonder of creation while faith addressed humanity's moral responsibilities. Throughout the Cold War era, he became a respected voice in national discussions about nuclear ethics, scientific responsibility and religion.

Pollard's perspective was uniquely important in the post-World War II science-religion dialogue. The man who graduated from Rice University with a Ph.D. in physics is the same man who bi-vocationally served his church in the clergy. As someone whose career and calling straddled both worlds, he took opportunities to deliver lectures and





write books addressing the struggle between advancing nuclear science and its potential consequences.

Pollard retired as ORAU's executive director in 1974 but remained active as a distinguished scientist with ORAU's Institute for Energy Analysis. He also dedicated time to documenting the organization's history, eventually publishing "ORAU: From the Beginning."

In 1972, Pollard had been diagnosed with malignant melanoma. Despite undergoing difficult treatments, he continued writing, researching and serving as a priest associate at St. Stephen's Episcopal Church. Friends and colleagues often remarked on his resilience and determination during those years.

Pollard died on Dec. 26, 1989, but his influence remains deeply woven into the identity of ORAU and the Oak Ridge community.

Eighty years after its founding, ORAU continues to support scientific research, education and workforce development across the nation. What began as a consortium of 14 universities has grown into a major organization supporting federal agencies, academic institutions and national laboratories.

As interest in nuclear energy grows again in the 21st century, ORAU remains involved in preparing the next generation of scientists, engineers and technical professionals. In many ways, the organization continues pursuing the same vision Pollard championed after World War II: expanding access to scientific opportunity through collaboration and education.

Pollard once described nuclear energy as "the universal common and natural kind of energy in creation as a whole." That perspective reflected both his scientific optimism and his belief that knowledge carried ethical responsibility.

His life never fit neatly into a single category. He was a scientist who became a priest, an administrator who remained a teacher and a man of faith who never abandoned intellectual inquiry. Through ORAU, his legacy of curiosity, collaboration and service continues to shape scientific education and research today.

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CHAPTER TWO

THE MEDICAL DIVISION AND THE ATOMIC AGE



Medical breakthroughs are often driven by institutions willing to innovate and tackle complex challenges. One such institution was the ORINS Medical Division—later the ORAU Medical Division—better known publicly as the Oak Ridge Cancer Research Hospital.

For 24 years, from 1950 to 1974, the hospital treated more than 3,500 patients while advancing research in radiation medicine and cancer therapy. Its work helped shape modern cancer treatment and left a lasting mark on medical science.

After World War II, Congress passed the Atomic Energy Act of 1946, creating the Atomic Energy Commission (AEC) to oversee the nation's nuclear activities. Lawmakers wanted civilian – rather than military – oversight of atomic energy, opening the door for broader scientific initiatives, including peaceful medical applications.

Among its responsibilities, the AEC produced and distributed radioisotopes for medical diagnostics and

cancer research. In 1950, it established three national research hospitals: one at the Argonne National Laboratory near Chicago, one at Brookhaven National Laboratory in Upton, New York, and the ORINS Medical Division in Oak Ridge, Tenn.

Oak Ridge was already known as a center of scientific innovation; during World War II, the city played a critical role in the Manhattan Project. In the years that followed, Oak Ridge evolved into a hub for research and development across multiple disciplines, including medicine.

When it was first founded in 1946, ORINS, later renamed ORAU, adopted an organizational structure of three divisions: medical, university relations and special training. This framework uniquely positioned ORINS to address the urgent need for advancements in cancer treatment and research.

At the time, cancer remained poorly understood, and treatment options were limited. The hospital's mission

was to pioneer research into radiation therapy and other experimental approaches to cancer care. By combining clinical treatment with leading-edge scientific exploration, the institution sought to improve patient outcomes while expanding the world's understanding of cancer biology.

This facility had only 30 beds, and patients were admitted through physician referrals. Because it was part of a national program to address public and scientific interest in using radiation to treat cancer, federal regulations prohibited patients from paying for their care.

Patients also had to meet strict admission criteria. In many cases, they were suffering from diseases for which radioisotope therapies had already shown promise. Treatment plans were reviewed and approved by a medical board that included health physicists. For several of the patients, the Medical Division represented a final opportunity for treatment.

A 1970 article in *The Oak Ridger* described the facility this way: "An unimposing L-shaped building site is located in a wooded, inconspicuous setting in East Tennessee. Painted stark white, only the 12-foot ceramic mural entitled 'Hymn to Life,' and the words MEDICAL DIVISION, Oak Ridge Associated Universities, hint that it is something special." It was.

Beyond the personal stories of hope and compassion, the hospital also became a center for groundbreaking science. One of the hospital's defining areas of focus was radiation therapy. Oak Ridge's expertise in nuclear science provided a unique opportunity to explore how radiation could be used to target and destroy cancer cells while minimizing damage to healthy tissue. Researchers and clinicians worked side by side to refine these approaches, helping lay the foundation for many modern radiation oncology techniques used today.

The hospital also became a center for multidisciplinary research. Scientists investigated the molecular and genetic mechanisms behind cancer, contributing to the development of diagnostic tools and treatment strategies that later became standard practice in oncology. In addition, the Medical Division helped train the next generation of physicians, scientists and researchers – a mission that continues at ORAU today. By fostering an environment that emphasized both patient care and scientific discovery, the institution helped prepare professionals to meet the growing challenges of cancer treatment.

The success of the Oak Ridge Cancer Research Hospital stemmed largely from its collaborative approach. The institution brought together experts in medicine, biology, chemistry and physics, creating an interdisciplinary model that encouraged innovation and accelerated the pace of discovery.

Through ORINS' consortium of educational institutions and partnerships with research organizations and government agencies, discoveries made at the Medical Division were shared widely, influencing cancer research and treatment nationally and internationally.



Although the Medical Division no longer operates in its original form, its legacy continues through ORAU's ongoing commitment to scientific research, education and workforce development. Research conducted at the hospital had a lasting influence on oncology and helped shape how cancer is diagnosed and treated today. The institution's work in radiation therapy and whole-body scanning contributed to sophisticated medical technologies now used around the world.

Its contributions to cancer biology also helped advance targeted therapies and immunotherapies that are transforming cancer care. By improving scientists' understanding of the molecular mechanisms of cancer, researchers were able to develop treatments designed to attack cancer cells while preserving healthy tissue.

Because ORAU's Medical Division is recognized as a catalyst for the very lifesaving cancer treatments doctors all over the world use today, the Tennessee Historical Commission designated a marker on the site where the hospital used to sit.

While ORAU's work has expanded beyond oncology, the organization remains committed to addressing critical challenges in medicine and public health. ORAU's initiatives include supporting research partnerships, providing training opportunities for health care professionals and promoting STEM education to inspire future innovators. These efforts reflect the same spirit of collaboration and discovery that defined the Oak Ridge Cancer Research Hospital.

The Medical Division demonstrated the power of science, innovation and collaboration in addressing one of medicine's greatest challenges: cancer. Through pioneering work in radiation therapy, cancer biology and interdisciplinary research, the institution made significant contributions that continue to shape the field of oncology.

As ORAU carries that legacy forward, it remains a reminder that scientific progress depends on curiosity, collaboration and commitment to improving human health.



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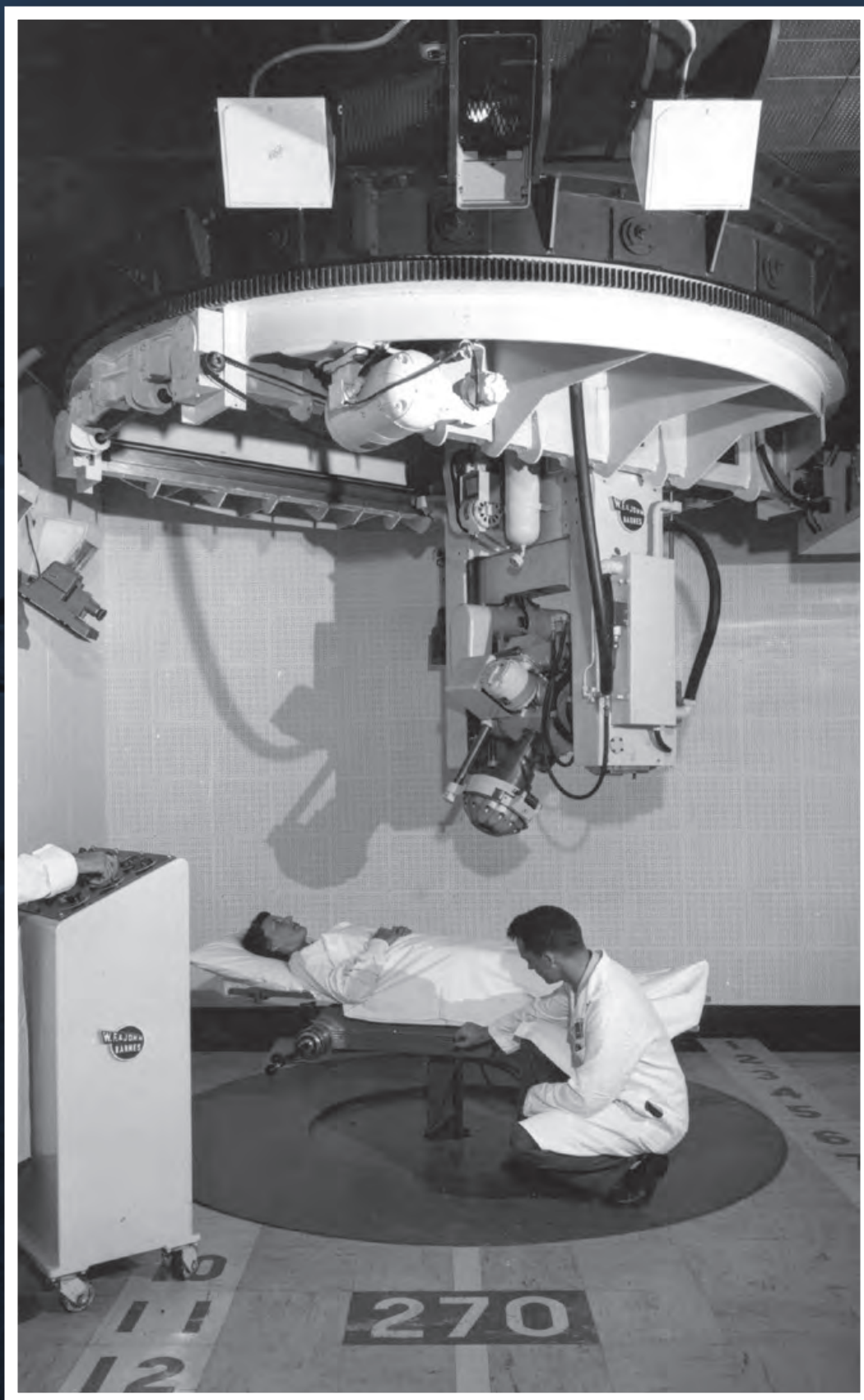
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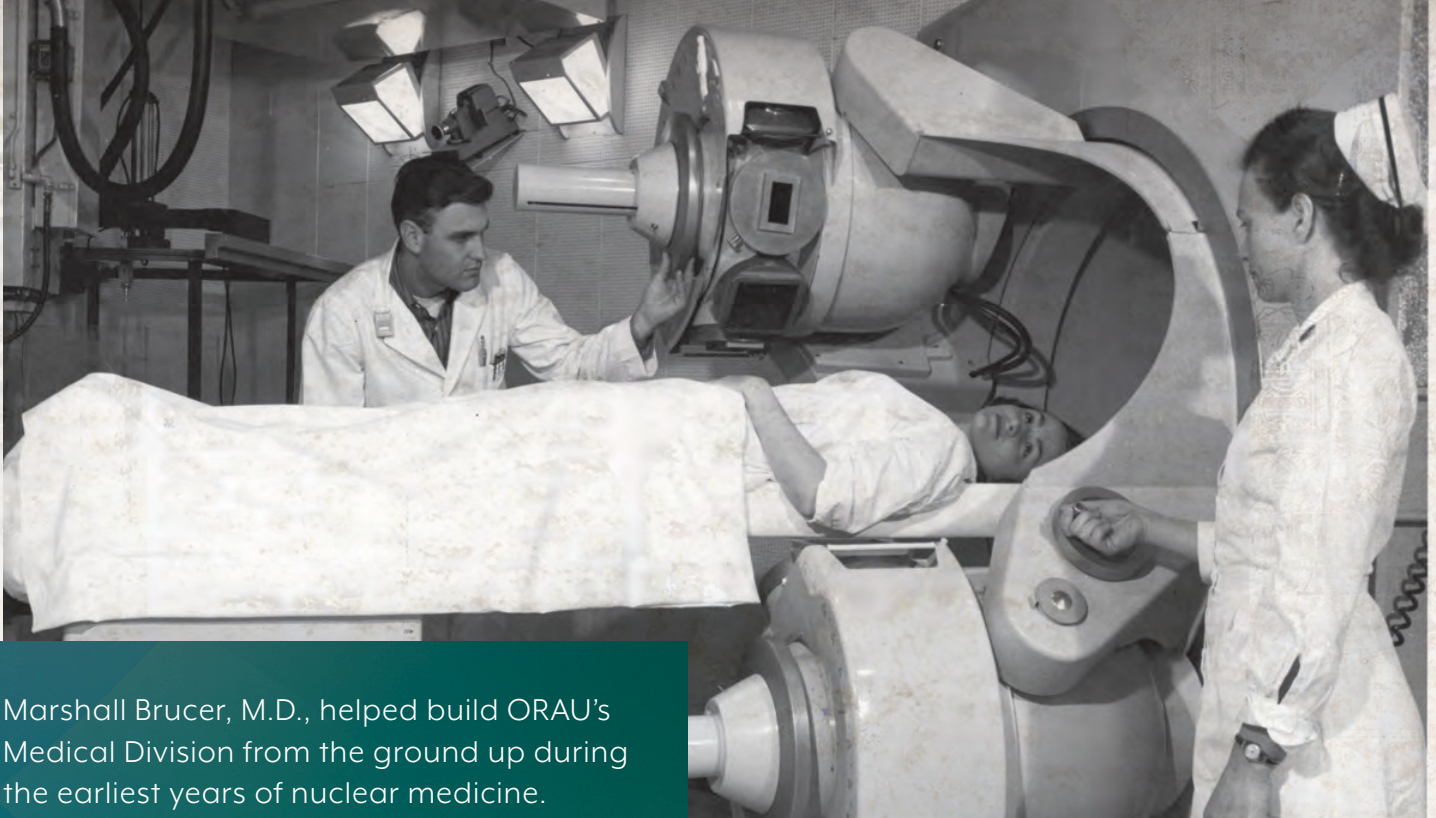
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CHAPTER THREE
MARSHALL BRUCER
and the Rise of Nuclear Medicine





Marshall Brucer, M.D., helped build ORAU's Medical Division from the ground up during the earliest years of nuclear medicine.

Long before radiation therapies and radioactive tracers became common parts of cancer treatment, Brucer was among the physicians and researchers working to understand how atomic science might be used to diagnose and treat disease. His work at the Oak Ridge Institute for Nuclear Studies (ORINS), now ORAU, helped place Oak Ridge at the center of that emerging field.

Brucer was born in Chicago and earned both his bachelor's degree and medical degree from the University of Chicago. Known for his relentless curiosity and work ethic, he remained heavily involved in research while completing his education and later interned at the Mallory Institute of Pathology in Boston during the early 1940s.

During World War II, Brucer served as a surgeon with the Airborne Command's Airborne Test Board at Camp Mackall, North Carolina. Much of the medical equipment later used by the U.S. Air Force underwent testing connected to his work during that period.

After the war, he briefly served at Bruns General Hospital in Santa Fe, New Mexico, before joining the faculty at the University of Texas Medical School in Galveston as a professor of physiology. Then, in 1948, ORINS came calling.

Less than two years after ORINS was established, Brucer was selected from a field of 90 candidates to lead the organization's new Medical Division. He officially assumed the role on Dec. 31, 1948. The task before him was enormous. Brucer was responsible not only for developing research programs but also for recruiting physicians, scientists, technicians and administrators to help build

an entirely new medical operation focused on radioactive materials and cancer treatment.

Under his leadership, ORINS established one of only three cancer research hospitals created by the Atomic Energy Commission following the Manhattan Project to study the medical uses of radioisotopes. The hospital became an early center for experimental cancer therapies and radiation research.

Over the next 24 years, approximately 3,500 cancer patients were treated there. Most arrived after exhausting conventional treatment options elsewhere, and many cases were considered terminal.

At the same time, the ORINS Medical Division gained international recognition for its research output and scientific innovation. During Brucer's tenure, division staff published more than 200 scientific reports and articles across American and international journals. Researchers investigated nearly 70 radioactive isotopes for diagnostic and therapeutic use while also developing specialized equipment designed to safely handle and measure radioactive materials.

Among Brucer's most important contributions was his work involving thyroid disease and radiation measurement. Recognizing the need for more accurate ways to evaluate thyroid function and radiation exposure, Brucer developed what became known as "thyroid phantoms" — simulated models of the human neck and thyroid gland used to calibrate medical equipment.

The devices helped standardize thyroid uptake studies at hospitals and medical centers around the world. At the time, physicians understood that the thyroid gland was especially vulnerable to radioactive iodine exposure, which could increase the risk of thyroid cancer and other diseases. Brucer's work improved the accuracy and

consistency of thyroid-related diagnostic testing during a period when nuclear medicine techniques were still rapidly evolving.

His research extended into cancer treatment technology as well. Brucer became a key figure in developing cesium teletherapy, which used cesium-137 as an alternative to cobalt or radium for targeted radiation treatment. Working alongside physicians and physicists, he helped develop specialized treatment machines designed to deliver radiation more precisely while limiting damage to surrounding healthy tissue.

Around 1951, Brucer also began experimenting with radioactive cobalt in radiotherapy. During that work, he helped develop a cobalt-based treatment machine that staff members nicknamed the “iron maiden.”

Installed in Oak Ridge later that year, the machine represented an important advancement in radiation therapy and was eventually acquired by General Electric for wider production.

Brucer also pursued early breast cancer treatment techniques using radiation therapy in combination with surgery. In 1955, he worked with a specially designed metal breastplate device intended to target remaining cancer cells following surgical procedures.

By the end of the 1950s, Brucer had become one of the most recognized figures in nuclear medicine.

He served as president of the Society of Nuclear Medicine while continuing research involving radiation exposure and bone marrow transplantation. Alongside colleagues including Dr. Melvin Jacobs and physicist Leon Pape, Brucer also helped establish a full-body radiation treatment facility at City of Hope Medical Center in Los Angeles.

Throughout his later career, he frequently spoke at scientific meetings about radiation injury treatment and radiation medicine.

After retiring from ORINS in 1962, Brucer relocated to Tucson, Arizona, but he remained active in research and scientific publishing for years afterward.

By 1965, he had authored more than 200 scientific publications and received the Atomic Energy Commission’s citation for outstanding service. The University of Arizona later established the Marshall Brucer Award to recognize distinguished contributions in radiation medicine.

Today, many of the technologies and treatment approaches Brucer helped pioneer have evolved far beyond their earliest forms. But during the formative years of nuclear medicine, when physicians and researchers were still learning how atomic science might reshape health care, Brucer stood at the center of that work.

His legacy remains deeply connected to the ORINS Medical Division and to Oak Ridge’s role in advancing radiation medicine during the 20th century.



More to the story.
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CHAPTER FOUR

NOT A HAREM: HOW ORAU'S STANDARD SCANNING MANIKIN CONTRIBUTED TO THYROID CANCER TREATMENT

Did you catch the spelling? A manikin, not a mannequin. Mannequins display clothing in stores; manikins simulate medical situations. In the early 1950s, Marshall Brucer, M.D., of the Oak Ridge Institute for Nuclear Studies (ORINS, now ORAU) Medical Division set out to create a standardized model for studying how radioactive iodine behaves in the human body.

The thyroid gland is especially vulnerable to radiation because it absorbs iodine, including radioactive isotopes released during nuclear accidents or medical procedures. Exposure can increase the risk of thyroid cancer and other thyroid diseases. At the time, physicians relied largely on mathematical estimates and animal studies to understand radiation exposure, and there was no consistent method for evaluating thyroid scans.

Brucer wanted something more realistic. He designed a manikin, also called a “phantom,” roughly the size of an adult woman and made from Lucite, a plastic transparent to radiation. Inside were simulated organs and tissue-density materials that mimicked the human body. He named the first model Anne Boleyn, a nod to the second wife of King Henry VIII.

Brucer described Anne Boleyn as containing a movable mock thyroid gland, simulated metastases, a mock spinal cord filled with “mock iodine,” and artificial blood vessels. The neck also contained a gel-like material that changed color when exposed to radiation. Pleased with the results, he built another model named Bonnie Boleyn.

Anne and Bonnie were only the beginning. Over time, Brucer created a growing “family” of manikins with names including Chloe, Drusilla, Felicia, Jezebel, Lulu, Ophelia, Queenie and Terry Toma. Around the ORINS Medical Division, colleagues jokingly referred to the collection as Brucer’s “harem.”

The humor aside, the manikins served an important medical purpose. Brucer loaned them to hospitals and research facilities around the world so physicians could calibrate rectilinear scanners and improve their interpretation of thyroid scans. Rectilinear scanners created images by moving across the body and detecting radioactive material concentrated in organs such as the thyroid. The resulting image quality depended on factors including scan speed and dot size on the film output.

The manikins allowed doctors to practice with standardized cases before working with patients. Some models simulated hyperthyroidism, in which the thyroid produces too much hormone. Others represented hypothyroidism or normal thyroid function. Brucer also developed both head-and-neck versions and larger half-body models so physicians could observe how radioactive iodine scattered throughout the body, more closely resembling real patient conditions.

The manikins became widely used during the 1950s and 1960s and even helped physicians understand radiation uptake patterns after the 1986 Chernobyl disaster. Although modern imaging technology has largely replaced these early devices, Brucer’s work helped establish more consistent standards for nuclear medicine and thyroid imaging.

Today, the scanning manikins may look dated, but they remain an important reminder of how researchers at ORAU helped advance radiation safety, medical imaging and thyroid cancer treatment.



**More to the story.
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CHAPTER FIVE

ORAU TEACHES WHAT IS NUCLEAR ENERGY



ORAU has been connected to nuclear science and energy education since its earliest days, with roots tracing directly to the Manhattan Project and the dawn of the Atomic Age. In the years following World War II, the public was trying to understand a revolutionary new technology that had changed the course of history: nuclear energy.

At the time, nuclear science was both fascinating and intimidating. Americans associated atomic energy with the devastating power of the bomb, but scientists and policymakers also saw enormous peaceful potential in medicine, electricity generation and scientific research. ORAU — then known as the Oak Ridge Institute for Nuclear Studies (ORINS) — became part of the national effort to educate the public about nuclear science and its applications.

One of ORAU's earliest and most influential efforts was “This Atomic World,” a traveling science education program launched in 1955 for the Atomic Energy Commission, the predecessor to today's Department of Energy. Supported through National Science Foundation grants, the program aligned closely with President Dwight Eisenhower's “Atoms for Peace” initiative, which promoted peaceful uses of nuclear technology around the world.

“This Atomic World” brought nuclear science directly into classrooms and communities across the country. Science-trained teacher-demonstrators traveled from school to school with vans full of laboratory equipment and interactive demonstrations. Each presenter typically visited about 140 schools per year, speaking to students through assemblies, classroom lectures and community events. Some presentations even reached local Boy Scout groups.

The goal was to make complex scientific ideas understandable and engaging. Students learned about radiation, atomic structure, nuclear reactors and the growing role of nuclear technology in modern society. The program blended technical instruction with

entertainment, helping make science approachable during a time when public curiosity about atomic energy was rapidly growing.

By the early 1960s, “This Atomic World” had become widely recognized as an effective science enrichment program for high schools. Its success even inspired similar traveling education programs, including NASA's “Spacemobile,” which used lecture-demonstrators to teach students about space exploration.

As nuclear power expanded during the 1960s, utility companies also began taking interest in ORAU's educational model. Public utilities in states such as Texas, Michigan, North Carolina and New York partnered with ORAU to support more focused education about nuclear power generation. The curriculum gradually shifted from broad introductions to atomic science toward discussions about energy production and nuclear reactors.

That evolution led to additional traveling education programs, including “Energy Today and Tomorrow,” “Energy Adventure” and “Gas Works.” Research conducted by the University of Georgia found that students participating in these programs gained meaningful knowledge about energy issues and developed more positive attitudes toward energy technologies.

ORAU's traveling teacher initiatives continued until the late 1980s and reached millions of students nationwide during their decades of operation. The programs reflected ORAU's longstanding belief that scientific literacy and public understanding are essential to the nation's future.

At the same time, ORAU was also educating professionals in nuclear science and radiation safety. Since 1948, ORAU's Professional Training Programs have trained scientists, physicians, engineers, regulators and health physicists in radiation protection and radiological science. Those programs continue today through both in-person and online instruction.



ORAU's work in nuclear education also extended into medicine. Through its ORINS Medical Division, the organization became a pioneer in nuclear medicine research and radiation therapy. Scientists and physicians in the Medical Division helped advance cancer treatment, radiation dosimetry, imaging technology and bone marrow transplantation research during the mid-20th century.

Now, as interest in nuclear energy grows again, ORAU continues supporting the next generation of nuclear workforce development and education.

Recognizing the increasing demand for skilled workers in the nuclear sector, ORAU launched the Partnership for Nuclear Energy as part of its STEM Accelerator initiative. The effort focuses on strengthening STEM education pathways and preparing students and workers for careers in nuclear energy and related technologies.

ORAU has also developed a Nuclear Energy Academic Roadmap designed to address workforce shortages and

identify strategies for expanding nuclear education and training opportunities nationwide.

Beyond workforce development, ORAU also supports nuclear emergency preparedness through Exercise Builder Nuclear, an online platform that helps emergency preparedness managers organize and evaluate drills required by the Nuclear Regulatory Commission.

From traveling classroom demonstrations in the 1950s to advanced workforce and emergency preparedness initiatives today, ORAU's role in nuclear education has remained remarkably consistent: helping people better understand nuclear science and preparing the nation for the opportunities and challenges that come with it.

Eighty years after its founding, ORAU continues building on that legacy by supporting education, collaboration and innovation in nuclear energy for the next generation.



**More to the story.
Just scan here.**

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CHAPTER SIX

HAIR-RAISING HISTORY BETWEEN ORAU AND THE AMERICAN MUSEUM OF SCIENCE AND ENERGY

One of the most popular exhibits at the American Museum of Science and Energy (AMSE) in Oak Ridge, Tennessee, is the Van de Graaff generator demonstration, where visitors watch static electricity make their hair stand on end. Few realize the exhibit also has a connection to ORAU: the organization's Technical Services Department built and donated one of the generators decades ago.

A Van de Graaff generator is an electrostatic generator that uses a moving belt to build electric charge on a hollow metal dome mounted atop an insulated column. American physicist Robert Van de Graaff invented the machine in 1929 as a particle accelerator for scientific research. The device produces high-voltage direct current electricity at very low current levels, making it useful for accelerating subatomic particles and generating X-ray beams for nuclear research and medicine.

Today, Van de Graaff generators are also common in science museums because they provide a safe and memorable demonstration of static electricity. When a person stands on an insulated surface and touches the metal dome, electric charge transfers onto the body. Because like charges repel one another, strands of hair push apart and rise away from the head. The same principle explains everyday static electricity, such as the effect caused by removing a sweater or rubbing a balloon against hair.

ORAU's involvement with Van de Graaff generators grew from the organization's broader role in nuclear education and outreach during the Cold War. In the 1950s, ORAU — then known as the Oak Ridge Institute for Nuclear Studies (ORINS) — participated heavily in the Atoms for Peace program launched by President Dwight D. Eisenhower in 1953. The initiative promoted peaceful applications of atomic energy through international cooperation, scientific research and public education.

Because ORAU already supported nuclear training, radiation safety and research partnerships among universities, government agencies and industry, building educational scientific equipment aligned naturally with its mission. The organization constructed dozens of Van de Graaff generators to support demonstrations and educational programs connected to Atoms for Peace.



The American Museum of Science and Energy was also tied closely to those efforts. Established by the Atomic Energy Commission, the predecessor to the U.S. Department of Energy, the museum originally operated as the American Museum of Atomic Energy. Its purpose was to educate the public about nuclear energy, peaceful atomic research and Oak Ridge's role in the Manhattan Project. ORINS managed the museum on behalf of the Atomic Energy Commission during its early years.

As the Atoms for Peace era wound down, many of the Van de Graaff generators built by ORAU were distributed to museums and educational organizations that could continue using them for public demonstrations. Because of the close partnership among ORAU, federal agencies and the Oak Ridge community, AMSE became a natural home for several of the machines.

Today, AMSE houses two working Van de Graaff generators used in demonstrations, along with one display shell. One of the operating units still bears the original ORAU plaque. In recent years, Oak Ridge National Laboratory refurbished both generators using updated components and 3D printed housing to help preserve the exhibit for future visitors.

The Van de Graaff generator remains one of AMSE's most recognizable attractions and a lasting example of ORAU's role in science education and public outreach.



**More to the story.
Just scan here.**

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CHAPTER SEVEN

ELIZABETH RONA

and the Hidden History
of Nuclear Science



RIDGE
TUTE
UCLEA
STUDIES

When Elizabeth Rona, Ph.D., joined the Oak Ridge Institute for Nuclear Studies (ORINS) in 1950, she was already an internationally respected nuclear chemist. Over the course of her career, the Hungarian-born scientist worked alongside some of the most influential figures in modern physics and chemistry, including Nobel Prize winners Marie Curie, Otto Hahn and George de Hevesy. Yet Rona's own accomplishments were remarkable in their own right. Her expertise in radioactivity and radiochemistry helped shape early nuclear science during one of the most consequential scientific periods in history.

Rona entered science at a time when women were rarely encouraged to pursue careers in research. In her memoir, "How It Came About: Radioactivity, Nuclear Physics, Atomic Energy," she described being fascinated by science from childhood. Although she initially hoped to study medicine, her father — himself a physician — worried the profession would be too difficult for a woman and encouraged her to pursue chemistry instead.

At the University of Budapest, Rona became one of the few women in her classes and earned a Ph.D. in chemistry. Her talent quickly opened doors to research opportunities across Europe. During the early decades of the 20th century, radioactivity and nuclear physics were rapidly evolving fields, and Rona found herself working among many of the scientists driving those discoveries.

Her career took her from laboratory to laboratory in Germany, Austria and France, where she studied radioactive tracers, atomic structure and radiochemistry. Along the way, she developed specialized expertise in extracting and concentrating polonium, a radioactive element discovered by Marie Curie. That skill eventually made her highly sought after within the scientific community.

Although Rona worked alongside celebrated male scientists, women in research often received little public recognition for their contributions. Still, she remained focused on the science itself. Each position expanded her knowledge and helped establish her reputation as a gifted radiochemist.

As political tensions rose across Europe in the years leading up to World War II, Rona also faced growing antisemitism as an ethnic Jew. In 1941, she fled Europe and immigrated to the United States. During the war, she shared her methods for concentrating polonium with the U.S. government, and those techniques contributed to the development of the atomic bomb as part of the Manhattan Project effort.

After the war, Rona continued working at Oak Ridge National Laboratory in Tennessee before joining ORINS, the organization that would later become Oak Ridge Associated Universities (ORAU). ORINS had been founded in 1946 by University of Tennessee physicist Dr.

William Pollard to connect universities with emerging nuclear research opportunities in Oak Ridge.

Recognizing the growing need for scientists and medical professionals trained in radioisotope techniques, Pollard established ORINS' Special Training Division, known today as ORAU's Professional Training Programs. The program offered extensive laboratory instruction in handling radioactive isotopes, and Rona was an ideal addition to the faculty.

"Dr. Rona's long experience with radioactivity from the early period of its discovery made her an especially valuable member of the teaching staff," Pollard later wrote. Her fluency in multiple languages also proved valuable after ORINS began welcoming international participants through President Eisenhower's "Atoms for Peace" program in 1954.

Pollard admired Rona deeply and encouraged her to document her experiences in science. The result was her 1978 memoir, which blended autobiography with the history of nuclear physics and radioactivity. In the book's foreword, Pollard noted that Rona's personal relationships with many of the scientists shaping 20th-century physics placed her in a unique position to tell the story of the field's development.





During her 15 years at ORINS, Rona continued conducting research, particularly in the study of naturally occurring radioactivity in ocean sediments and seawater. Her work helped advance understanding in both geology and oceanography while further strengthening her reputation as an international expert in radioactive elements.

Today, artifacts connected to Rona's work are preserved in ORAU's Museum of Radiation and Radioactivity. Among them are laboratory devices she used during her time in Oak Ridge, including a Frisch Grid ionization chamber and specialized "rabbits," pneumatic sample holders used to transport radioactive materials through reactor systems.

Despite her accomplishments, Elizabeth Rona never received the widespread recognition awarded to many of her contemporaries. She dedicated more than six decades to scientific advancement and died in 1981 at age 91.

In recent years, however, historians and institutions have begun revisiting her contributions. In 2015, she was posthumously inducted into the Tennessee Women's Hall of Fame. In 2020, The New York Times featured her in its "Overlooked" obituary series, which honors notable individuals whose deaths were largely unrecognized at the time.

Rona's career reflects both the challenges and possibilities faced by early women in science. As a woman and a Jewish immigrant navigating political upheaval and discrimination, she repeatedly had to fight simply for the opportunity to participate in scientific research. Yet her determination and curiosity never wavered.

Today, Elizabeth Rona is increasingly recognized not only for the famous scientists she worked beside, but for the lasting scientific contributions she made herself during the formative years of nuclear science.



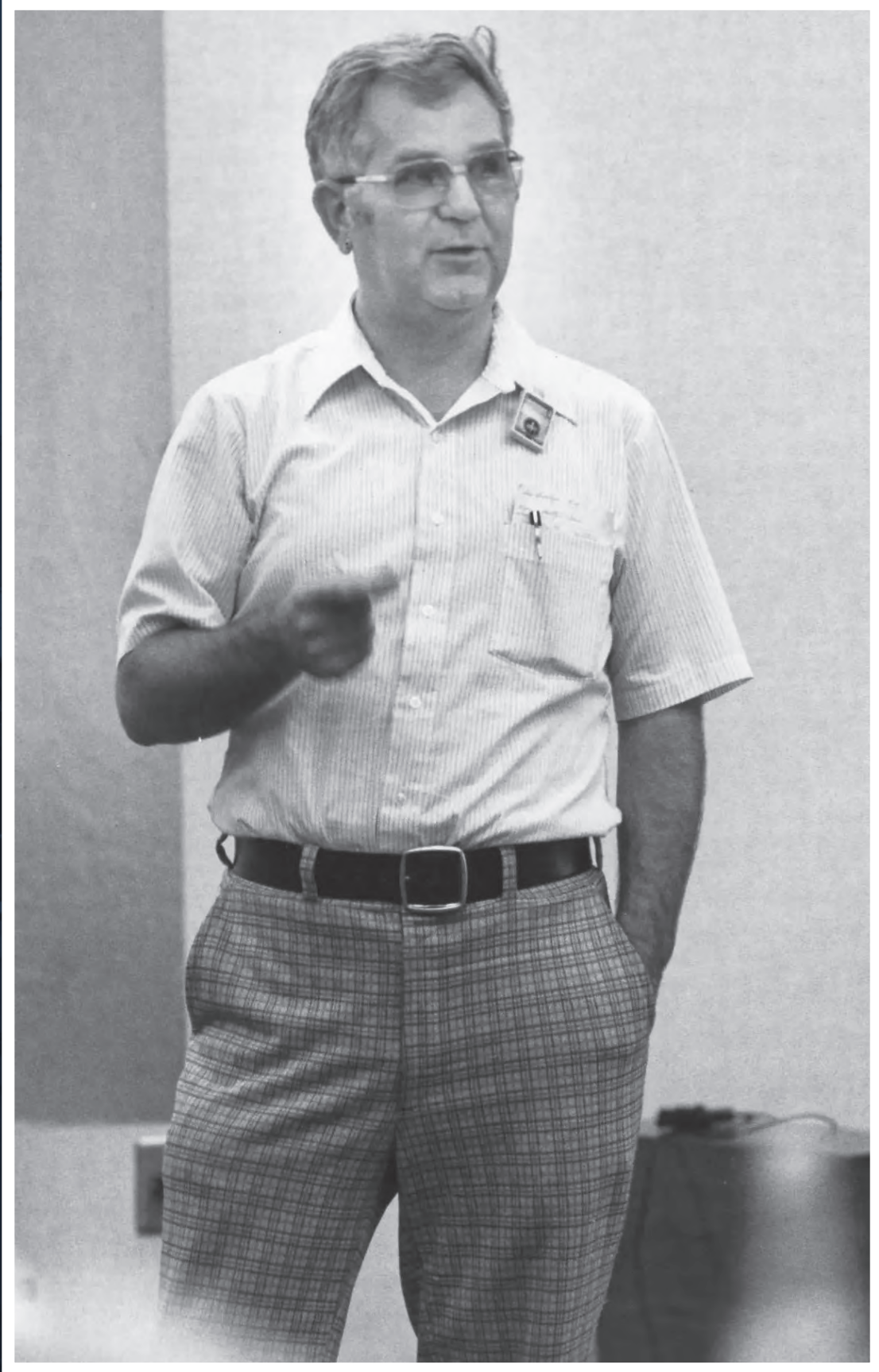
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Just scan here.**

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CHAPTER EIGHT
ROGER CLOUTIER
and the Dawn of Health Physics





“Well, there’s a saying: ‘It was the best of times,’” retired ORAU health physicist Roger Cloutier recalled with a smile during an oral history interview reflecting on his long career in radiation protection.

Cloutier entered the field just as radiation science was rapidly expanding. Over 33 years at ORAU, he helped shape programs in health physics, medical physics and environmental sciences during a period of extraordinary scientific growth.

“I came along just as this whole business was getting started,” he said. “It was an opportunity to meet a lot of young researchers and so on. It was a great time to be in the business.”

Born in 1930 into a middle-class family in North Attleboro, Massachusetts, Cloutier was one of 13 children. He joked that because he was “toward the end of the line,” at least he didn’t have to share a bed.

He was still in junior high school when World War II began. As men in his community left for military service, jobs opened for teenagers. Cloutier worked everywhere from farms to shoe repair shops, learning responsibility and adaptability early in life.

Knowing the military draft likely awaited him after high school, he enlisted in the Navy in 1948. During the Korean War, he served as a Radarman 2nd Class aboard the USS Toledo and USS Gainard.

After leaving the Navy, Cloutier studied physics at the University of Massachusetts. His education included work at Brookhaven National Laboratory and a graduate fellowship through the Oak Ridge Institute for Nuclear

Studies (ORINS). It was his first connection to Oak Ridge and the institution that would define much of his career.

In 1956, he accepted a position in industrial hygiene and health physics near Pittsburgh, Pennsylvania. The work blended his physics background with the growing field of radiation protection. Not long afterward, an opportunity opened at ORINS.

Oak Ridge intrigued him professionally, though he had concerns about moving his family to East Tennessee during the desegregation era. Ironically, one of his first challenges there had less to do with politics and more to do with accents.

“I came down to Oak Ridge to be interviewed, and I was assigned somebody to take me all over town,” Cloutier recalled. “She spoke with a Southern drawl that was predominant then. I would say something and she couldn’t understand me because I spoke with the Boston drawl. We spent the whole day together going from place to place, and we hardly communicated at all.”

Still, he was drawn to the work happening in Oak Ridge. In 1958, a criticality accident at the Y-12 nuclear facility had exposed several workers to significant radiation doses. ORINS managed the medical response, and Cloutier wanted to be part of this emerging field where science, medicine and public safety intersected.

After relocating, he quickly grew fond of Oak Ridge’s strong sense of community.

Cloutier also became active in civil rights efforts. Passionate about equality, he served as president of the

Oak Ridge Community Relations Council and worked with the Tennessee Human Resources Council to help desegregate local businesses. He proudly remembered visiting a barbershop on the first day it opened its doors to everyone.

Professionally, Cloutier immersed himself in nearly every aspect of ORINS. He worked with ORINS founder Dr. William Pollard to develop radiation safety programs and collaborated with the organization's Special Training Division to teach physicians and scientists about dosimetry, the science of measuring radiation absorbed by the body.

His work eventually took him across the United States and internationally, including training programs throughout Central and South America.

As nuclear medicine emerged, Cloutier helped establish safety procedures for new radiation therapies. When ORINS Medical Division director Dr. Marshall Brucer introduced cobalt-60 therapy machines for cancer treatment, Cloutier helped develop the dosimetry and radiation safety systems needed to support the work.

He later helped design the Low Exposure Rate Total Body Irradiator (LETBI), a facility used to study radiation treatment for blood disorders. Patients undergoing treatment stayed inside a specially shielded room while receiving continuous low-dose radiation over several days.

"The idea was that it would be constant low-level radiation," Cloutier explained years later. Researchers believed spreading radiation over time might improve treatment effectiveness while reducing harmful side effects.

In the late 1960s, concern about internal radiation exposure grew alongside the expansion of nuclear medicine and nuclear energy. Recognized as a leader in dosimetry, Cloutier was asked by the Atomic Energy Commission and the Food and Drug Administration to establish the Radiation Internal Dose Information Center (RIDIC).

The center became an important national resource, collecting and distributing information about how radioactive materials behave inside the human body. RIDIC helped researchers, physicians and regulators improve radiation dose calculations during a critical period in nuclear science.

Cloutier later described building the center as a "great fortune."

Equally important to him was mentoring younger scientists. He trained future leaders such as Evelyn Watson, who

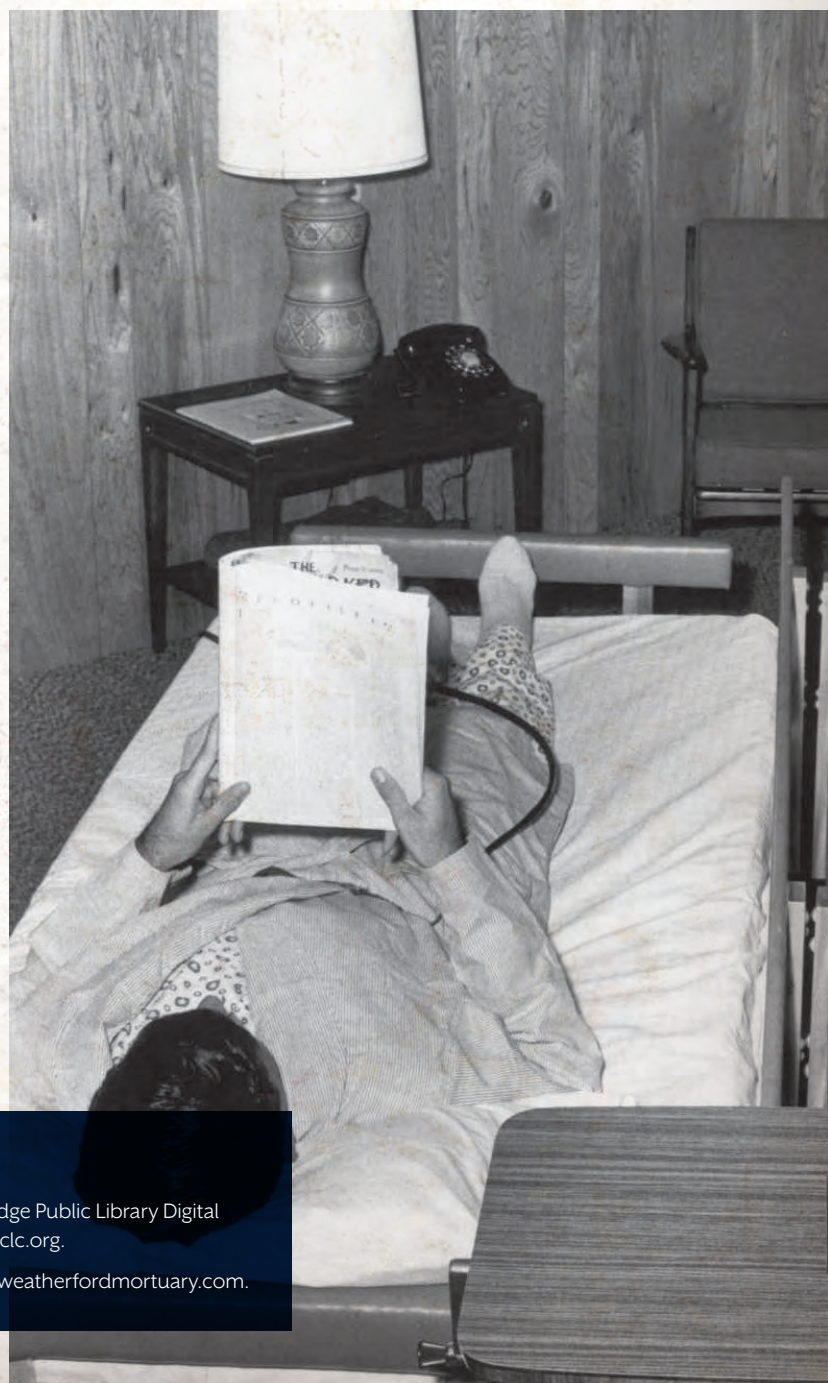
worked closely with him on RIDIC and eventually succeeded him. Supporting the next generation of health physicists became one of his greatest sources of pride.

After 33 years with ORAU, Cloutier retired as director of the Professional Training Programs, which still provides radiation safety and health physics education today.

Over his career, he authored more than 70 publications, served as president of the Health Physics Society and received numerous professional honors. But colleagues often remembered him less for his accolades than for his curiosity, humor and kindness.

"With a ready wit and ever-present twinkle in his eye," his obituary noted, "he would probe, inquire, suggest, cajole, question and question again without ever belittling the beliefs of his companion."

He entered radiation science at its dawn and helped guide it into maturity. Through research, education, mentorship and public service, Roger Cloutier left a lasting mark on ORAU and the field of health physics.



**More to the story.
Just scan here.**

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CHAPTER NINE
EVELYN WATSON,
the Self-Taught Nuclear Physicist



It's the kind of workplace story that almost sounds made up: a records clerk with an English degree becomes one of the nation's most respected experts in radiation dosimetry. But that was Evelyn Watson's life.

By the time she retired from ORAU in 1994, Watson had earned multiple lifetime achievement awards, authored or co-authored roughly 90 scientific papers and become a leader in the field of nuclear medicine. Yet she never planned on becoming a scientist at all.

Born Virginia Evelyn Egner in Corbin, Kentucky, Watson was academically gifted from an early age. Her mother taught her to read, write and spell before she was 4 years old. She attended a two-room elementary school, skipped seventh grade and graduated high school as valedictorian at just 15 years old.

Though teachers encouraged her to pursue science and mathematics, Watson loved English literature and grammar. She graduated from the University of Kentucky in 1949 with a degree in English and initially worked in education, teaching in a coal-mining town before becoming an office manager for a school system.

Her life changed after meeting Earl Watson, a young man working in Oak Ridge, Tennessee. They married in 1954, and Watson moved to Oak Ridge, where she quickly embraced life as a wife and mother.

When she became pregnant with her second child, Watson began looking for work again. Jobs for expectant mothers were scarce in the 1950s, and she was turned away from several employers before landing a records clerk position at the Oak Ridge Institute for Nuclear Studies (ORINS), now ORAU.

At first, the work didn't excite her. She left after nearly two years, but when her husband was laid off from the K-25 plant, Watson returned to ORINS seeking employment again.

That second chance changed everything.

She started as a clerk in the Special Training Division, but only stayed there briefly before Roger Cloutier, ORINS' Radiation Safety Officer, recruited her for his team.

In an oral history interview, Watson remembered Cloutier telling her he noticed her résumé because one reference mentioned she was a "good cattle judge," something he found amusing. More importantly, he saw that she had coursework in chemistry and math and believed she had untapped potential.

"So, I did," Watson said about accepting the position. "Now, that turned around my life. Completely turned my life around."

Under Cloutier's mentorship, Watson entered the world of radionuclide dosimetry in 1961. Her early assignments involved analyzing smears for radioactive contamination and learning the fundamentals of radiation safety.



At first, she often had little idea what she was doing.

“Over his shoulder, he would give me some instructions,” Watson recalled with a laugh, “and I didn’t have any idea what to do.”

But she was resourceful. Cloutier surrounded her with books, scientific papers and opportunities to learn. Watson studied constantly, relying on the expertise of physicians, nurses and technicians throughout the ORINS Medical Division.

“He had books on everything,” she said. “If I couldn’t figure it out, I could go find a book and read on it and work on it.”

As computers began transforming scientific research, Cloutier encouraged Watson to learn programming and data analysis. The training sharpened her mathematical and technical skills, and over time she evolved from clerk to researcher, lab technician and eventually recognized expert in radiation dose assessment.

Her granddaughter, Jayme Evelyn Watson, later reflected that the English major and mother of two had become “a proper scientist.”

The timing could not have been better. During the 1960s, nuclear medicine expanded rapidly as radioactive materials became increasingly common in patient care and medical research.

Cloutier and Watson helped physicians understand dosimetry — the science of measuring radiation doses delivered to the body. Their work attracted the attention of the Atomic Energy Commission and the Food and Drug Administration, which asked them to establish a national internal dose information center.

That effort became the Radiation Internal Dose Information Center (RIDIC), an ORINS program that provided physicians and researchers with critical information about radiation dose calculations and radioactive materials in medicine.

Watson eventually succeeded Cloutier as director of RIDIC, leading the center for 20 years. She became especially well known for her work in fetal dosimetry, helping improve understanding of radiation exposure during pregnancy.

Over her career, Watson authored scientific publications, edited professional journals and spoke at conferences around the world. Despite her expertise, she always found it amusing when colleagues referred to her as “Dr. Watson.”

“I am an English major,” she joked in her oral history interview. “I used to try to correct that, but they didn’t pay any attention to me.”

By the time Watson retired, she had become one of the most respected figures in health physics and nuclear medicine. She received lifetime achievement awards from both the Health Physics Society and the Association for Women in Science, became the first woman to receive the Loevinger-Berman Award for Excellence in Medical Internal Radiation Dosimetry and earned national recognition throughout the scientific community.

Watson died in 2016, but her story remains one of ORAU’s most remarkable examples of curiosity, mentorship and determination.

She arrived in Oak Ridge as an English major looking for a steady job. She left as a pioneering scientist whose work continues to influence radiation safety and nuclear medicine today.



**More to the story.
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SOURCES:

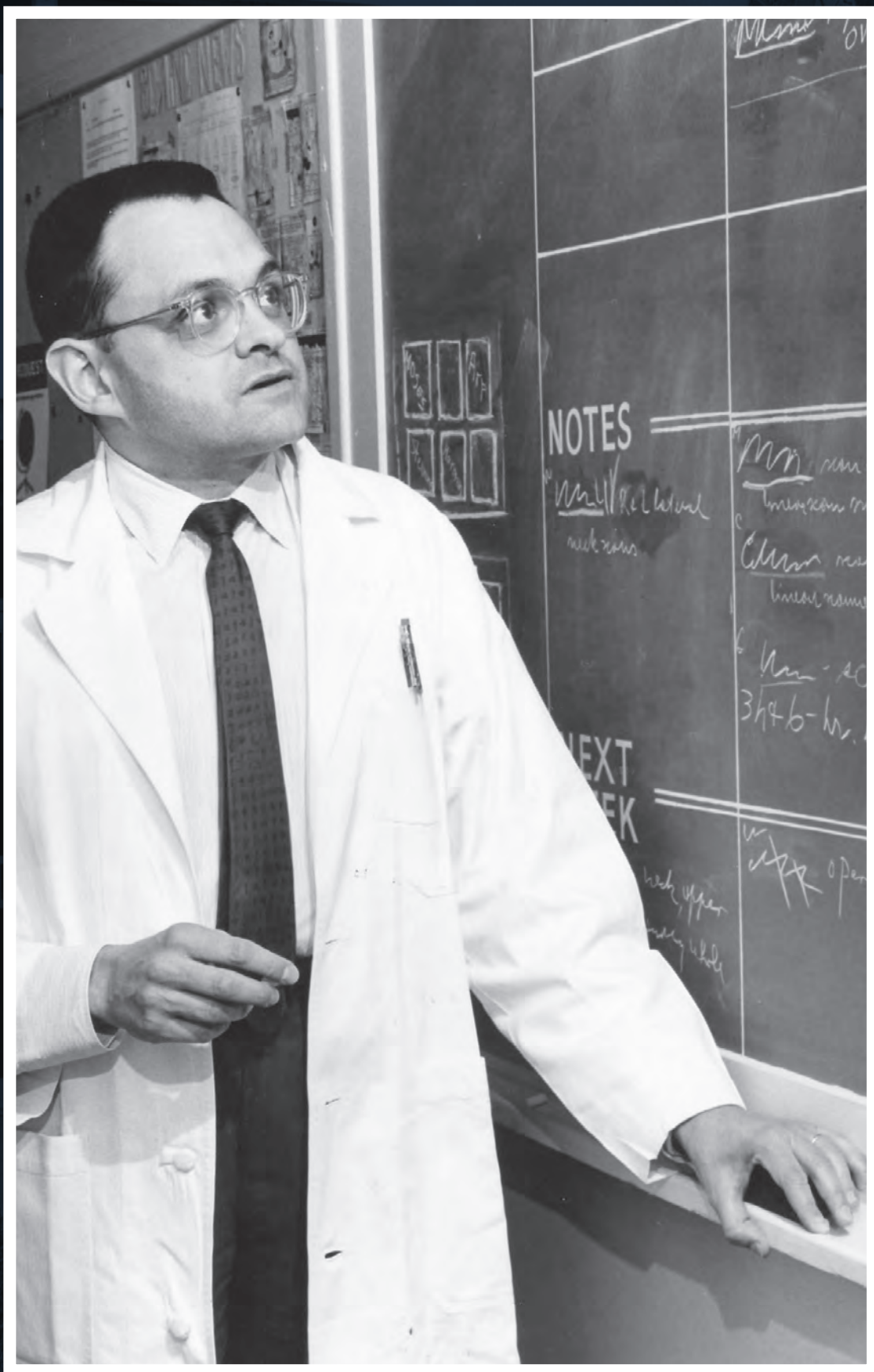
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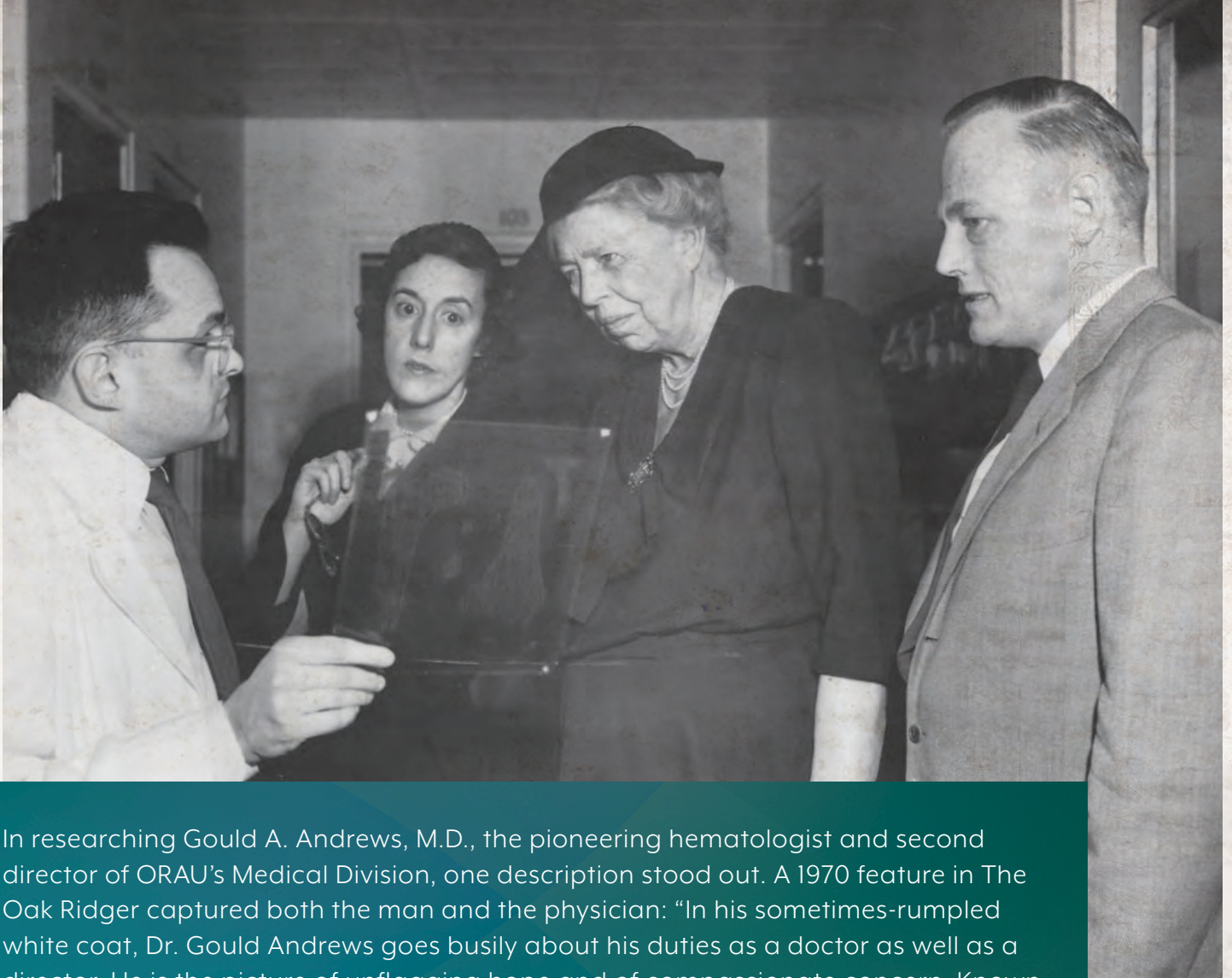


CHAPTER TEN

GOULD ANDREWS,

Compassion, and the Hymn to Life





In researching Gould A. Andrews, M.D., the pioneering hematologist and second director of ORAU's Medical Division, one description stood out. A 1970 feature in *The Oak Ridger* captured both the man and the physician: "In his sometimes-rumpled white coat, Dr. Gould Andrews goes busily about his duties as a doctor as well as a director. He is the picture of unflagging hope and of compassionate concern. Known by his friends and cohorts as 'Andy,' the small, stocky, dark-haired man hunches over a patient's chart, his brows furrowed as he studies it."

The article explored Andrews' philosophy of medicine and posed a timeless question: "Is the oath of Hippocrates valid today?" For Andrews, the answer seemed evident in the way he approached both research and patient care.

Originally from Grand Rapids, Michigan, Andrews came to Oak Ridge in 1949 while the ORINS (later renamed ORAU) Medical Division was still under construction. The Atomic Energy Commission had established the Medical Division as one of three national cancer research hospitals dedicated to advancing the medical use of radioisotopes.

As chief of clinical studies, Andrews practiced nuclear medicine in Oak Ridge at a pivotal moment in history – the dawn of the Atomic Age. On June 16, 1958, the world's first industrial nuclear criticality accident occurred just miles from the hospital when eight workers at the Y-12 National Security Complex were exposed to high levels of radiation. Andrews treated the eight men, all of whom recovered, and continued monitoring them for decades afterward.

His careful analysis of the incident helped define the biological and hematological effects of high-dose radiation exposure in humans and laid the groundwork for modern acute radiation exposure protocols. The experience

deepened Andrews' commitment to hematology and strengthened his expertise in predicting and treating the effects of accidental radiation exposure.

When Dr. Marshall Brucer retired in 1961, Andrews succeeded him as chairman of the ORINS Medical Division. Under his leadership, researchers advanced bone marrow transplantation studies for radiation injury treatment and developed early radiopharmaceuticals, including gallium-67 for soft tissue tumor imaging and carbon-11 amino acids for whole-body scans. Andrews also oversaw total body irradiation studies used in treating leukemia and lymphoma patients at the Oak Ridge Cancer Research Hospital.

ORINS became internationally recognized for its medical and radiological research programs. The groundbreaking work underway in Oak Ridge attracted visitors from home and abroad, including First Lady Eleanor Roosevelt and even scientists and dignitaries eager to see the Medical Division firsthand.

Andrews' name became closely associated with the Medical Division, also referred to as the Oak Ridge Cancer Research Hospital, and the institution's broader



legacy. He later authored Chapter 11, detailing the Medical Division's history, in *From the Beginning*, the book chronicling ORAU's founding and early years.

Colleague Dr. Karl Hubner credited "Andy" with shaping the "truly clinical investigative program in nuclear medicine and radiation therapy" for which ORINS became known. Hubner wrote that Andrews was "extremely conscientious and always demonstrated deep concern for the patients involved in his research programs, never forgetting the human element. He appeared conservative but nevertheless he had a sense of and foresight for important new developments."

By 1974, the Oak Ridge Cancer Research Hospital had largely fulfilled its mission. Hospitals across the country had begun establishing their own nuclear medicine programs, prompting the Atomic Energy Commission to close the three specialized facilities it had created to explore radioisotopes in medicine.

After the inpatient clinical research facility closed, Dr. Andrews shifted his focus back to direct patient care and teaching. He joined the University of Maryland Hospital in Baltimore as a professor of medicine and radiology.

Andrews died unexpectedly in 1980 at age 62, leaving colleagues and friends convinced he still had so much more to contribute. In a 1981 memorial published in the *Journal of Nuclear Medicine*, Hubner wrote that Andrews had served as both mentor and friend to many in the field. His scientific contributions included more than 100 journal articles and numerous nuclear medicine symposium proceedings that became widely known as the "Oak Ridge Symposia." He also served on the Board of

Trustees for the Society of Nuclear Medicine and on the editorial board of the *Journal of Nuclear Medicine*.

Hubner perhaps summarized Andrews' legacy best when he described him as a "kind and gentle man to whom we owe so much."

For ORAU, Andrews' legacy – built across 26 years of service – extends far beyond scientific achievement. He helped establish Oak Ridge as a center for nuclear medicine research while insisting that compassion remain at the heart of innovation.

That commitment is reflected in the Hymn to Life mosaic that hangs in ORAU's Pollard Center. Andrews and Dr. Ralph Kniseley, associate chairman of the Medical Division, originally envisioned the artwork for the entrance of the Oak Ridge Cancer Research Hospital. Funded through donations from grateful patients' families and friends, the mosaic depicts a plant reaching toward a dove carrying an olive branch – a symbol of hope, healing and peace. Composed of thousands of one-inch ceramic tiles, the artwork became a lasting tribute to the hospital's mission and the people it served. Years later, the weathered mosaic was carefully preserved, restored and reinstalled at ORAU's main campus.

In an era defined by rapid scientific advancement, Andrews never lost sight of the people behind the research – the patients whose lives depended on it. Like the 3,500 patients treated by the Medical Division during its 24 years of operation, Gould Andrews remains a part of the mosaic that defines ORAU's enduring commitment to discovery, compassion and a better tomorrow.



**More to the story.
Just scan here.**

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CHAPTER ELEVEN

NAZARETH GENGOZIAN, Marmosets, and the Origins of Bone Marrow Transplantation



What's with the monkeys?

That's a fair question when looking back at one of the more unusual chapters in ORAU history. But the answer leads to a remarkable story about cancer research, bone marrow transplants and scientific curiosity.

In 1961, ORAU Chief Scientist Dr. Nazareth Gengozian established a colony of South American marmosets to study transplant immunology and radiation effects on the immune system. At the time, bone marrow transplantation was still experimental, and researchers were searching for ways to improve survival rates for patients with leukemia and other blood cancers.

Gengozian was uniquely prepared for the challenge. Before joining ORAU, he worked at Oak Ridge National Laboratory studying irradiated mice in the Mammalian Recovery Program, where researchers explored whether marrow infusions could help repair radiation damage. When he moved to ORAU, he was tasked with developing a marrow transplant program focused on patients with hematologic malignancies — cancers affecting blood and immune-forming tissues.

His years studying ionizing radiation and immune responses made him one of the leading experts in a

rapidly developing field. Around that time, Gengozian learned about a laboratory in Miami using marmosets for nutritional studies. He saw a different opportunity entirely.

Why marmosets?

Because they held a biological clue researchers desperately needed.

Marmosets are among the only non-human primates that regularly produce fraternal twins, and those twins exchange tissues while developing in the womb. As a result, they naturally tolerate each other's foreign cells and tissues.

That characteristic made them ideal for studying transplantation and immune compatibility. Researchers began learning how the body distinguishes its own cells from foreign ones, leading to a greater understanding of histocompatibility and the importance of matching donors and recipients in bone marrow transplantation.

The work helped move cancer treatment forward in meaningful ways.

Studies involving marrow transplants showed that animals receiving genetically different marrow often developed weakened immune systems, reinforcing the need for better donor matching and post-transplant care. Building on those findings, ORAU established a cytogenetics laboratory in 1964 that became an important resource for studying chromosome damage and radiation injury in humans.

As researchers refined donor selection and immune-matching techniques, bone marrow transplantation outcomes improved dramatically.

Gengozian also discovered that radiation delivered over a few minutes produced stronger immunosuppressive effects than the same dose spread over an hour. That insight helped shape modern bone marrow transplant preparation.

At the time, bone marrow grafts were typically reserved as a last resort for critically ill patients already weakened by infection and disease. Gengozian believed outcomes could improve if physicians intervened earlier and better controlled the transplant process.

His approach involved administering immunoglobulin treatments, followed by total-body irradiation and then a bone marrow graft shortly afterward using higher dose rates over shorter periods of time. The strategy contributed to one of the first successful bone marrow transplants for a leukemia patient.

And the discoveries did not stop there.

Researchers working with cotton-top tamarins, an endangered marmoset species, noticed something unexpected: the animals developed spontaneous colon





cancer and acute colitis. Outside of humans, no other mammal was known to naturally develop this type of colon cancer.

That finding created an entirely new research opportunity. Scientists began studying whether treatments for colitis could also reduce colon cancer risk, leading to advances in understanding inflammatory bowel disease and cancer development.



As the colony's importance grew, ORAU expanded the program significantly. In 1967, the organization built a 10,000-square-foot facility to house laboratories, offices and space for up to 450 marmosets in carefully controlled environments. It became the only marmoset colony in the United States developed specifically for general laboratory research.

A second breeding facility followed in 1979.

By 1980, the colony had grown to nearly 400 animals. But despite the scientific value of the work, research funding became increasingly difficult to secure. In 1981, Gengozian lost federal support for the program and moved to Oklahoma to continue research involving monoclonal antibody production.

The colony remained active under ORAU's Comparative Animal Research Laboratory, and interest in marmoset

research continued. In 1988, ORAU helped establish the Marmoset Research Center of Oak Ridge (MARCOR), a consortium supporting biological research involving marmosets and tamarins.

Ultimately, however, operating costs became unsustainable. ORAU transferred ownership of the center to the University of Tennessee Medical Center in 1992, and the program ended several years later.

Still, Gengozian's impact endured.

He eventually returned to East Tennessee, serving at the Thompson Cancer Survival Center and teaching at the University of Tennessee before retiring at age 77. Over a 52-year career, he published 140 research papers, contributed to multiple scientific books and helped shape the fields of transplant immunology and experimental medicine.

Most importantly, his work helped lay the scientific foundation for modern bone marrow transplantation and contributed to advances in cancer treatment still benefiting patients today.

Dr. Nazareth Gengozian died in 2020, having lived long enough to witness the lasting impact of discoveries that began with a small colony of marmosets in Oak Ridge.

Not bad for a monkey story.

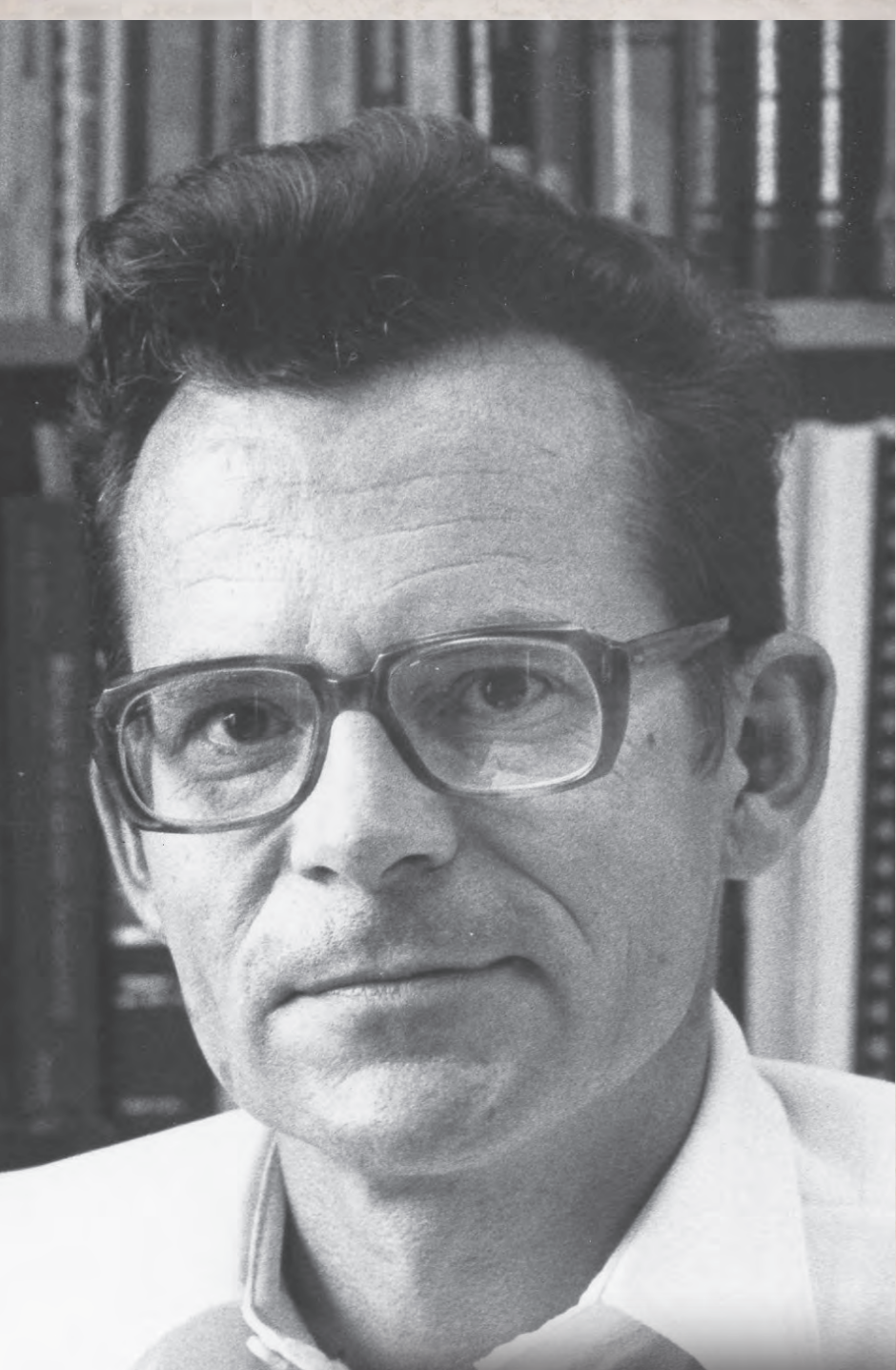


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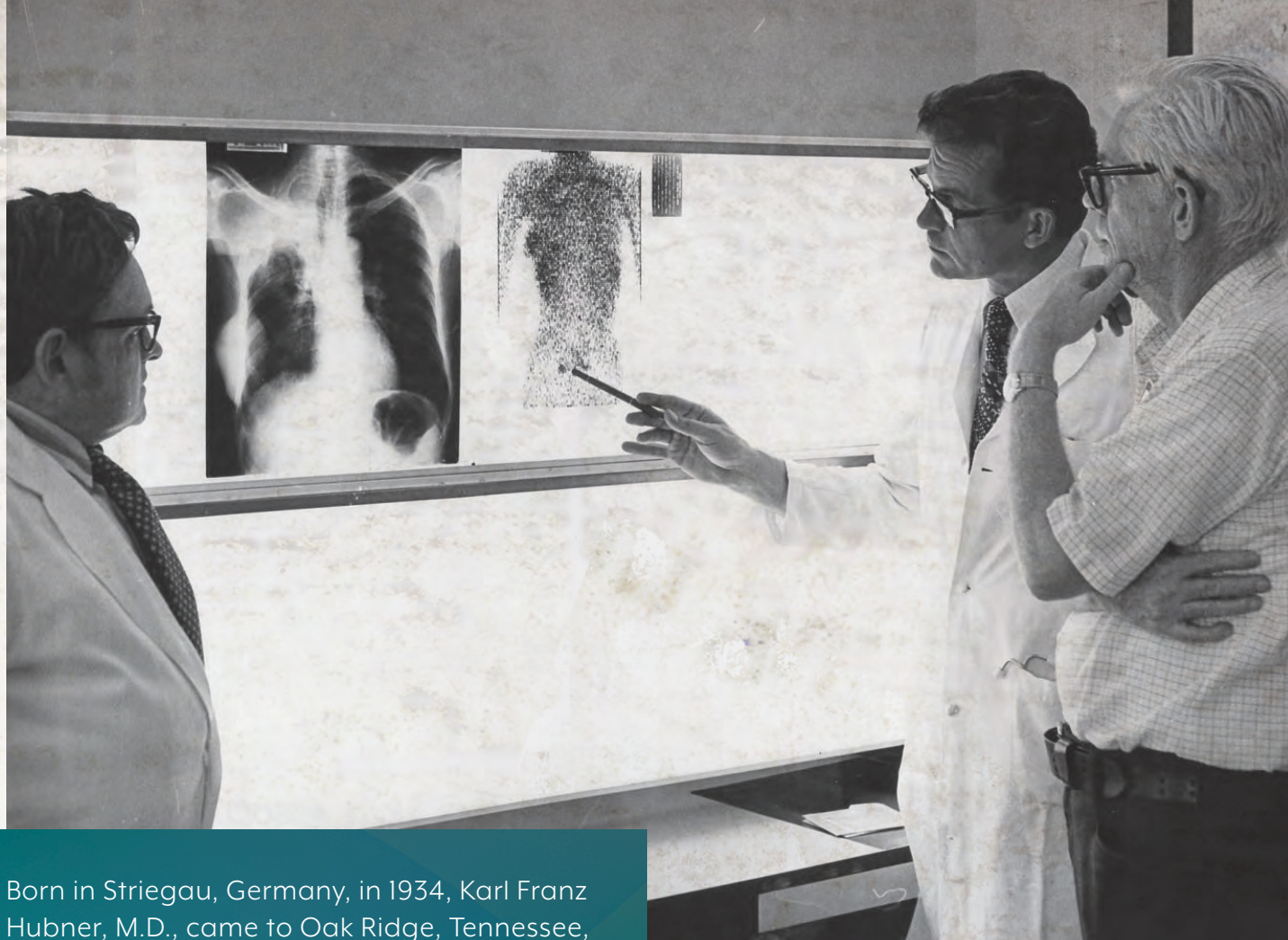
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CHAPTER TWELVE
KARL HUBNER
and the Science of Seeing





Born in Striegau, Germany, in 1934, Karl Franz Hubner, M.D., came to Oak Ridge, Tennessee, with a very specific goal: learn everything he could about nuclear medicine.

As a young medical student in the early 1960s, Hubner had become fascinated by hematology, blood disorders and the emerging field of bone marrow transplantation. At the time, bone marrow grafts were still experimental, but word had spread internationally that physicians in Oak Ridge were preparing to push the field forward following the 1958 criticality accident at the Y-12 nuclear facility, where eight workers received potentially lethal radiation doses.

For an ambitious young doctor, Oak Ridge represented opportunity.

Hubner applied for a nuclear medicine residency at the Oak Ridge Institute for Nuclear Studies (ORINS), later renamed ORAU, and arrived in 1962 eager to immerse himself in the science.

“It was all there in Oak Ridge,” Hubner later recalled in an oral history interview. “The basic biology, radiation biology and hematology in this small clinical unit.”

That “small clinical unit” was the ORINS Medical Division, one of only three hospitals established by the Atomic Energy Commission to study radiation and cancer treatment. During those years, Oak Ridge attracted many of the brightest scientists and physicians working in nuclear medicine, creating an environment unlike almost anywhere else in the world.

Some even called Oak Ridge “the cradle of nuclear medicine.”

At ORINS, Hubner trained alongside pioneers in the field while gaining hands-on experience in dosimetry, radiopharmaceuticals, hematology, oncology and tomography. There was no established curriculum for nuclear medicine at the time, so physicians from around the world came to Oak Ridge to learn directly from experts developing the science in real time.

“One of the missions of the Oak Ridge Institute for Nuclear Studies was to train people in the applications and use of radionuclides,” Hubner explained. “Nobody had that experience.”

The work fascinated him. But during his two-year residency, ORINS had not yet advanced to performing the bone marrow transplants Hubner hoped to study firsthand. So, when his residency ended, he returned to Germany with unfinished business on his mind.

Back home, Hubner focused on pediatric cancer treatment, particularly leukemia and immune deficiency disorders. For three years he worked closely with young cancer patients, an experience that deepened his interest not only in treatment but also in improving methods for detecting cancer and measuring how patients responded to therapy.

Then, in 1967, an opportunity opened at ORINS for an experimental immunology research assistant.

Hubner did not hesitate.

This time, his return to Oak Ridge became permanent.

The position placed him directly in cancer therapy research involving total-body irradiation and bone marrow transplantation. At last, the work he had traveled across the Atlantic to pursue was happening. The early transplant studies Hubner participated in helped establish techniques and treatment approaches that later influenced cancer programs around the world.

But as his research continued, Hubner found himself increasingly drawn toward another frontier: medical imaging.

While still interested in hematology and oncology, he became fascinated by detecting tumors using X-rays and radioactive tracers. Oak Ridge again proved to be exactly the right place at the right time.

Hubner joined teams developing whole-body scanners and Emission Computerized Axial Tomography (ECAT), an early technology that eventually evolved into modern positron emission tomography, better known today as PET scanning.

These advances transformed cancer diagnosis by allowing physicians to visualize metabolic activity inside the body, helping detect tumors earlier and monitor how treatments were working.

In 1970, Hubner joined the clinical staff of ORAU's Medical and Health Sciences Division. Seven years later, the Department of Energy awarded ORAU funding to purchase one of the first commercially available PET scanners.

That same year, Hubner became director of the newly established Radiation Emergency Assistance Center/

Training Site (REAC/TS), a program that continues today as an international leader in radiation emergency medicine and training.

Hubner led REAC/TS for five years before accepting a position in 1982 at the University of Tennessee Medical Center, where he was tasked with rebuilding its nuclear medicine program.

One accomplishment especially stood out to him.

In his oral history interview, Hubner proudly recalled helping establish the first clinical PET center in the United States. It was another example of his instinct for identifying where nuclear medicine was heading next and helping move the field there.

Even after shifting his focus toward imaging and radiopharmaceuticals, Hubner continued consulting with REAC/TS through 1990, maintaining close ties to the Oak Ridge scientific community that had shaped his career.

Over decades of work, Hubner contributed to some of the most important advances in modern nuclear medicine, from early bone marrow transplantation research to the development of PET imaging technology still used worldwide today.

There is also an irony woven into the story of his life.

Near the end of it, the imaging technology Hubner helped pioneer detected his own bone cancer.

Dr. Karl Franz Hubner died in January 2024, just weeks before his 90th birthday.

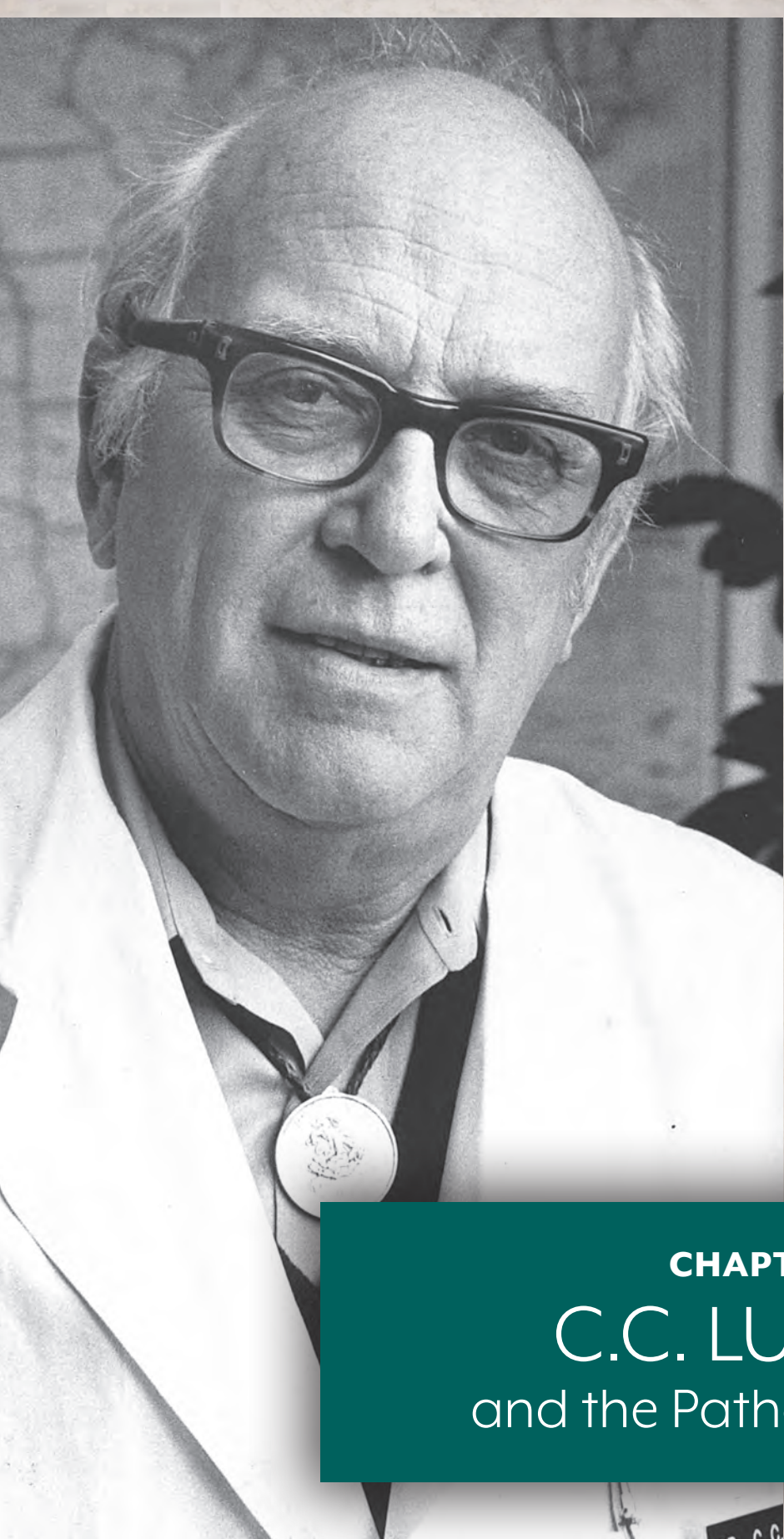
His career stretched across some of nuclear medicine's most transformative decades, and his work helped change how physicians diagnose, monitor and treat cancer around the world.



**More to the story.
Just scan here.**

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CHAPTER THIRTEEN
C.C. LUSHBAUGH
and the Pathology of Radiation



Known professionally as C.C. Lushbaugh, Dr. Clarence Lushbaugh preferred that friends simply call him “Lush.”

It suited him. Brilliant, curious and a little unconventional, Lushbaugh built a career during what many consider the golden age of radiation research, when scientists were still discovering how radionuclides affected the human body and exploring how radiation might be used in medicine. By the end of his career, he had become one of the world’s leading experts in radiation injury and pathology.

His fascination with medicine began early and was deeply personal. Lushbaugh’s father died during the influenza epidemic of 1918, when he was still a toddler.

From then on, he became fascinated — and frightened — by death and decided he wanted to become a doctor. He later credited his mother for supporting that dream. Thirty years after his father’s death, she gave Lushbaugh the \$300 she had received after becoming widowed, money she had carefully saved to celebrate his graduation from medical school.

Lushbaugh earned a bachelor’s degree in anatomy from the University of Chicago in 1938. Instead of heading directly into medical school, he entered a Ph.D. program in pathology after becoming captivated by the subject during pre-clinical coursework.

That decision shaped the rest of his career.

Even as a graduate student, Lushbaugh was making important scientific contributions. In 1941, he co-authored research helping identify pulmonary embolism as a cause of death in obstetrical shock cases, work that

advanced understanding of amniotic fluid embolism, then a poorly understood condition.

After earning his doctorate in experimental pathology in 1942, he joined the University of Chicago faculty, continuing research and teaching while also serving as pathologist for the university’s toxicology laboratory.

Then World War II changed everything.

As the United States expanded military research efforts, Lushbaugh began studying chemical agents, including nitrogen mustard. He noticed similarities between the effects of mustard compounds and ionizing radiation and proposed using nitrogen mustard to treat cancer.

At first, few physicians took the idea seriously.

Frustrated by struggling to persuade doctors as a non-physician scientist, Lushbaugh decided to return to medical school so he could speak to them as a peer. He earned his M.D. in pathology from the University of Chicago in 1948.

The idea he pushed so hard eventually became historic. The discovery that nitrogen mustard could shrink lymphoma tumors is now widely recognized as one of the foundations of modern chemotherapy.

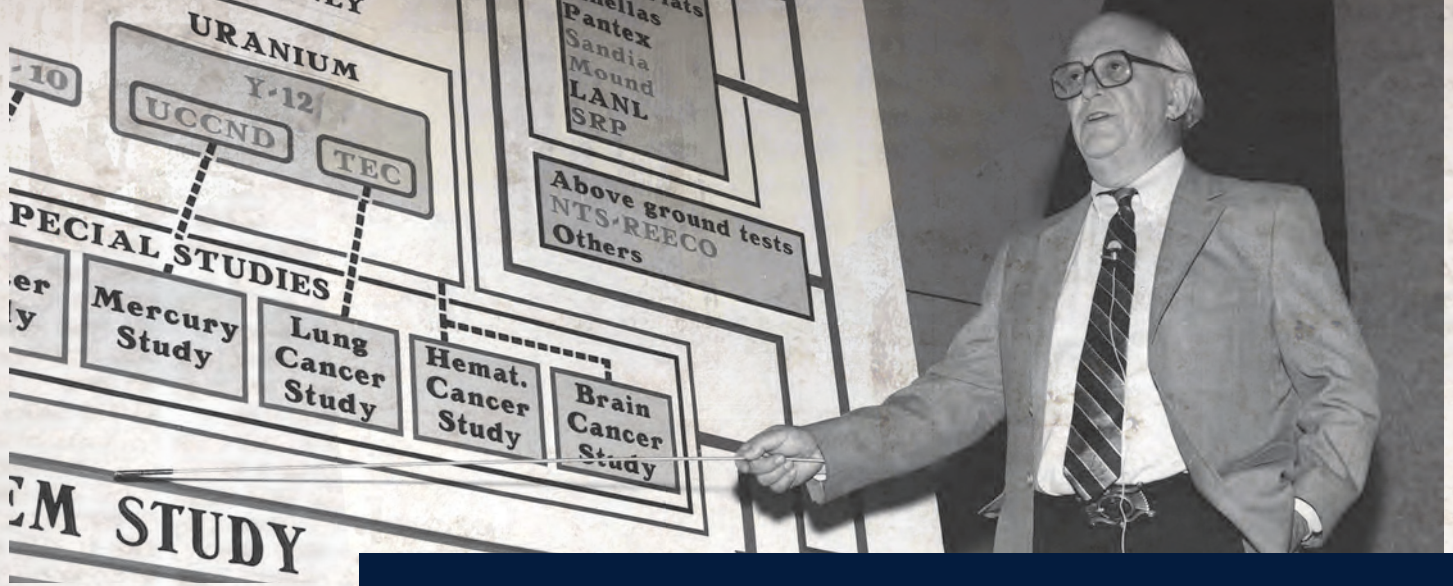
Lushbaugh later called it “probably the greatest idea I ever had in my career.”

In 1949, he moved to Los Alamos, New Mexico, becoming pathologist at Los Alamos Medical Center and joining the Biomedical Research Group at Los Alamos Scientific Laboratory. Like Oak Ridge, Los Alamos had emerged from the Manhattan Project and remained deeply involved in nuclear research.

One of the most significant cases involved Cecil Kelley, a Los Alamos chemical operator who died after a criticality accident exposed him to a lethal radiation dose. Lushbaugh conducted the autopsy and helped document the progression of radiation sickness and the damage caused by extreme radiation exposure.

Lushbaugh also investigated fallout exposure linked to aboveground nuclear testing in Nevada during the 1950s. One famous case involved “Cedar City Sue,” a sheep believed to have been exposed to fallout after drifting radioactive clouds passed over Utah. Through observation





and autopsy studies, Lushbaugh helped scientists better understand radiation exposure risks to living organisms.

During his Los Alamos years, he conducted extensive research on LD50/30, the estimated radiation dose expected to kill 50 percent of exposed individuals within 30 days. The work became an important benchmark in radiation biology and emergency medicine, helping physicians estimate survival risks following radiation exposure.

In 1963, Lushbaugh moved once again, this time to Oak Ridge.

He joined the Oak Ridge Institute for Nuclear Studies (ORINS), later renamed ORAU, as chief scientist in the Medical Division's applied radiobiology department. ORINS operated one of the nation's few research hospitals focused on studying radioisotopes in cancer treatment, making it an ideal place for Lushbaugh to continue combining medicine, radiation science and patient care.

One of the division's most ambitious projects was the Low Exposure Total Body Irradiator (LETBI), a groundbreaking facility where patients received carefully controlled radiation treatments while living in specially designed treatment rooms.

The rooms resembled small apartments more than hospital wards. Patients could read, watch television and carry on daily activities while receiving continuous low-level radiation therapy.

Lushbaugh oversaw patient care and research at LETBI, helping refine total-body irradiation techniques used in treating leukemia, lymphoma and other diseases.

When ORAU closed its Medical Division in 1974, Lushbaugh helped launch the Radiation Emergency Assistance Center/ Training Site, better known as REAC/TS.

Established in 1976, REAC/TS provides medical expertise, emergency response and training related to radiation accidents and contamination incidents worldwide. Lushbaugh became its first director.

His expertise soon made him an internationally sought-after advisor. He consulted for the World Health Organization and responded to radiation emergencies in Chernobyl, Brazil, Mexico and El Salvador. He also worked with the Food and Drug Administration on studies involving DTPA, a treatment used to remove radioactive materials from the body after contamination.

Despite his global reputation, colleagues at ORAU also remembered another side of him: the stained-glass artist.

Lushbaugh and his wife created elaborate stained-glass pieces together, including a large installation honoring ORAU's member universities that hung in the Center for Epidemiologic Research.

Over nearly five decades, Lushbaugh authored more than 150 scientific articles, books and chapters related to radiation biology, pathology and medicine. He received numerous honors, including the Health Physics Society's Distinguished Scientific Achievement Award.

He retired in 1990 as ORAU's chief of radiation medicine.

After battling Alzheimer's disease for several years, Clarence "Lush" Lushbaugh died in 2000.

His longtime friend John Storer later remembered him as a brilliant nonconformist who celebrated every Friday the 13th as "Pogo Day," named after the comic strip character Pogo. Fittingly, Lushbaugh died on Friday, Oct. 13. It seemed appropriate for a scientist who spent his life doing things his own way — and changing medicine because of it.



**More to the story.
Just scan here.**

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CHAPTER FOURTEEN
ANN SIPE
and the Human Side of Cancer Care





Cancer nurse Ann Sipe never stopped talking about Oak Ridge's pioneering Cancer Research Hospital.

She was proud of the work. Proud of the patients. Proud of the staff who showed up every day to care for people facing impossible diagnoses. Even years after retiring from ORAU, Sipe remained one of the hospital's strongest advocates and storytellers.

From 1966 to 1993, she devoted 27 years to caring for cancer patients and supporting families navigating fear, uncertainty and grief.

When Sipe arrived in Oak Ridge, she joined the ORINS Medical Division. ORINS later became ORAU. Established in 1950 at the request of the Atomic Energy Commission, the hospital was part of a national effort to explore peaceful applications of atomic research after World War II.

Scientists who had helped unlock the power of the atom during the Manhattan Project were now investigating whether radioisotopes could help diagnose and treat disease, particularly cancer.

The Oak Ridge facility was small, housing only 30 beds, but its influence stretched far beyond East Tennessee. It was one of only three hospitals in the country dedicated to studying radiation-based cancer treatment under the Atomic Energy Commission's program.

Patients came from across the nation through physician referrals. Many had already exhausted conventional

treatment options elsewhere. Care was provided at no cost, and admission standards were strict.

Sipe eventually became the hospital's day-to-day manager, overseeing patient care while also helping families understand treatment options and navigate deeply emotional decisions.

Although she has since died, Sipe's memories survive through oral history interviews recorded years later. In those conversations, her compassion for patients is unmistakable.

She emphasized that patients were fully informed about experimental treatments, including potential risks and outcomes. Consent mattered. Patients understood they could stop treatment at any time.

For Sipe, however, cancer care extended far beyond procedures and paperwork.

"This disease, cancer, is such a personal disease," she said in one interview. "And all of us took it so personal, trying so hard to help them fight."

Her perspective was shaped not only by her nursing career but also by her own family experiences with illness. She once described how her husband underwent successful treatment at the hospital following a pancreatic cancer scare and credited radioisotope therapy for helping save his life.



In another interview, she reflected on her seriously ill brother and said she would willingly choose an experimental treatment if there were even a small chance it could help.

The hospital itself developed a culture unlike many traditional medical facilities. Staff and patients often formed close relationships because treatments could stretch across months or even years.

“When patients were allowed to leave the hospital for a few hours and no family members were available, a staff member would drive them,” Sipe recalled. “I’ve had pie at Shoney’s [with patients].”

Sometimes they walked through local arboretums. Sometimes they simply drove around Oak Ridge because former residents who had moved away wanted to see the town again after returning for treatment.

Staff members baked cakes, prepared favorite foods and organized surprises for patients whenever they could.

To outsiders, a cancer hospital might seem defined by sadness. Sipe remembered something more complicated: hope.

Some patients far outlived their original prognoses. Children expected to survive only weeks sometimes lived for years. Teenagers grew into adulthood, became parents and experienced milestones they might never have reached otherwise.

“Regardless of the time some had left, they were given hope for another day, another month, another year,” Sipe said.

The hospital did not promise miracles. But Sipe believed it offered something equally important: dignity, honesty and care during frightening circumstances.

“The security, the care and the interest that was felt by the patients at this hospital made their walk against this devastation so much easier,” she said. “The hospital was a small oasis in their world of no hope.”

Even after the hospital closed, former patients and families

continued sending letters, Christmas cards and photographs to staff members who had cared for them.

For Sipe, those connections mattered deeply.

“I was there. I was involved,” she said years later. “And I have to tell you these precious people gave to me so much more than I ever gave to them.”

She credited patients with teaching her about faith, resilience and end-of-life care long before hospice programs became common.

“I still to this day see their faces,” she said. “I hear their voices.”

By the early 1970s, nuclear medicine programs had expanded nationwide, many shaped by research conducted at ORAU’s Medical Division. In many ways, the mission envisioned by the Atomic Energy Commission had succeeded.

But changing priorities, inflation and tightening federal budgets led the government to close the three Atomic Energy Commission hospitals in 1974.

ORAU continued treating some patients on an outpatient basis while shifting its focus toward radiation emergency medicine. In 1976, the organization established the Radiation Emergency Assistance Center/Training Site, known as REAC/TS, which remains a global leader in radiation emergency response today.

Sipe transitioned into that program, helping conduct studies involving radiation workers and managing patient records and archives until her retirement in 1993.

Still, the Cancer Research Hospital remained close to her heart for the rest of her life.

She believed the patients who volunteered for experimental treatments helped advance cancer care for future generations. Their participation contributed to broader developments in radiation therapy and nuclear medicine that continue benefiting patients around the world.

Today, the hospital itself no longer stands.

But its legacy survives through the science it advanced, the treatments it helped shape and the people who dedicated themselves to caring for patients during some of the hardest moments of their lives.

For Ann Sipe, that legacy was never measured only in research breakthroughs.

It lived in the patients who searched for hope and the caregivers who walked beside them every step of the way.



**More to the story.
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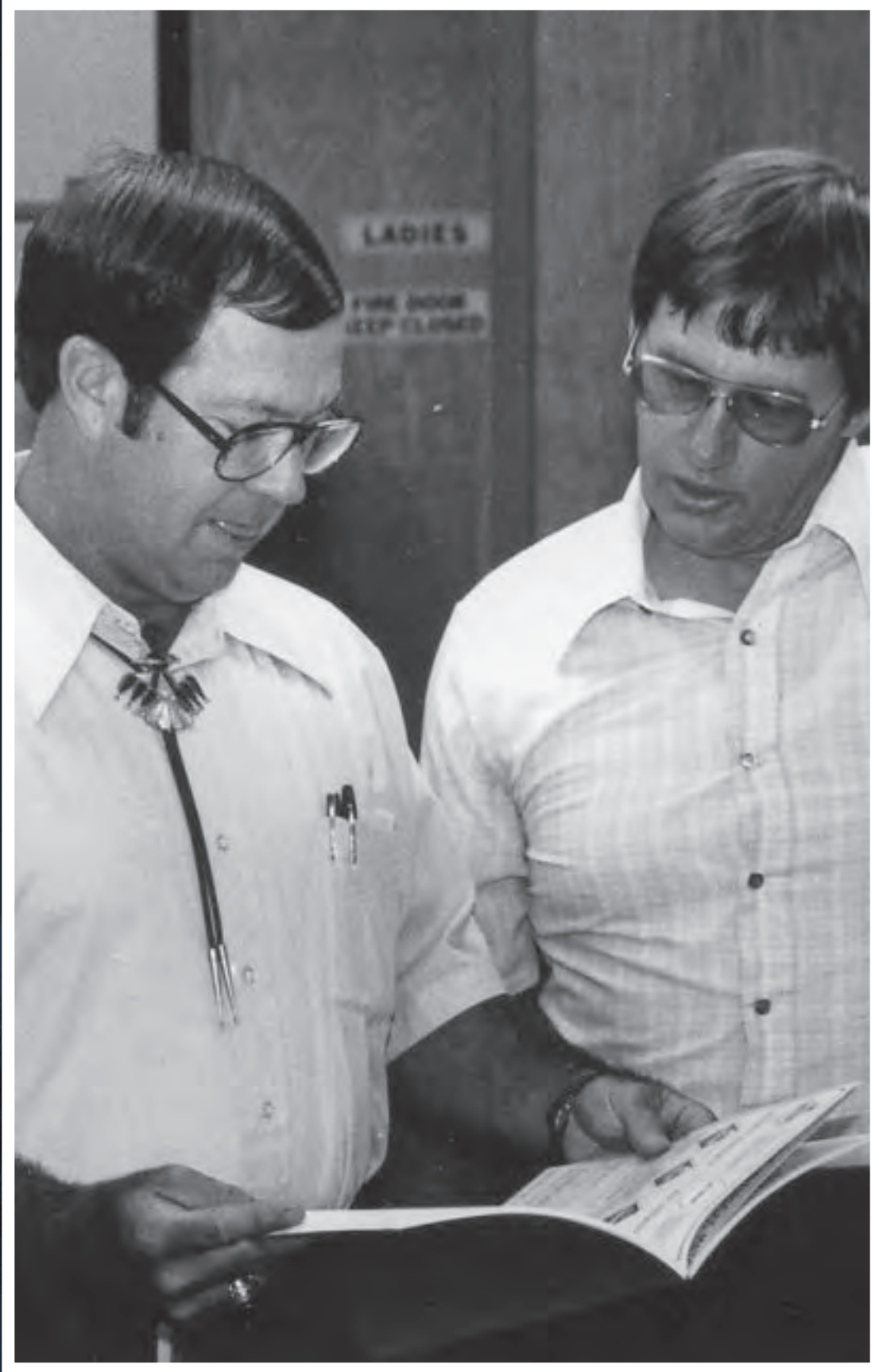
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CHAPTER FIFTEEN
JACK BECK
and the Quiet Work of Science





Some people build remarkable careers without ever seeking much attention for it. Jack Beck was one of those people.

Over four decades, Beck helped shape some of ORAU's most important programs, from cancer treatment research and radiation safety training to emergency response and environmental cleanup. Colleagues described him as committed, trustworthy and deeply people-oriented. His work touched countless lives, even if his name rarely appeared in headlines.

Beck grew up in northeast Georgia, where he loved sports and spent much of his free time fishing in nearby lakes, rivers and creeks. He excelled in school, serving as both class president and valedictorian.

One of his high school math teachers encouraged him to consider engineering. Beck later joked that he misunderstood the suggestion at first.

"No," he replied, "I don't want to drive a train."

Once he realized what the teacher meant, Beck decided to give engineering a closer look. He enrolled at the University of Tennessee at Chattanooga, earning a degree in engineering physics before continuing graduate studies at the University of Tennessee, Knoxville.

While in graduate school, Beck participated in a 10-week internship at Oak Ridge National Laboratory. Part of the internship included a week at the Oak Ridge Institute for Nuclear Studies (ORINS), later renamed ORAU.

That brief visit changed the course of his career. Beck joined ORINS in 1965 and quickly became involved in a wide range of projects tied to radiation science and public health.

One of his earliest assignments involved research for NASA during the height of the space race. Working through ORAU's Medical Division, Beck and his colleagues studied the effects of radiation exposure on astronauts, an increasingly important field as space missions grew longer and more ambitious.

The work helped launch Beck's lifelong career in radiation science.

As a certified health physicist specializing in radiation protection, Beck also contributed to pioneering cancer

treatments at ORAU's Medical Division. He helped design the Low Exposure Total Body Irradiator, known as LETBI, a groundbreaking facility used to study total-body radiation treatments for cancer patients.

At the time, many of the patients receiving treatment had exhausted other medical options. The therapies remained experimental, but the research produced important advances in cancer care and helped establish protocols for bone marrow transplantation still influencing treatment approaches today.

Beck's work extended beyond research laboratories and hospital settings.

He also became involved in ORAU's Special Training Division, helping train health physicists in radiation safety, inspection methods and the use of radiation detection equipment. Those educational programs helped prepare thousands of scientists, engineers, physicians and regulators to work safely with radioactive materials.

ORAU continues that training mission today through its Professional Training Programs.

Perhaps Beck's most enduring contribution came in the mid-1970s with the creation of the Radiation Emergency Assistance Center/Training Site, better known as REAC/TS.

Established in 1976, REAC/TS provides specialized medical expertise and emergency response support for radiation accidents around the world. Beck helped write the original proposal for the program, oversaw aspects of the facility's construction and played a key role in coordinating care for its first patient.

Nearly 50 years later, REAC/TS remains one of the Department of Energy's most important emergency response assets, operating around the clock to assist with radiological incidents and train medical professionals worldwide.

Beck's expertise in radiation protection also led him into epidemiological research. Working with ORAU teams studying radiation exposure, he helped investigate the



long-term health effects experienced by workers exposed to varying radiation levels throughout their careers.

After 17 years at ORAU, Beck shifted into environmental cleanup work under a Department of Energy contract with Bechtel. He served as radiation safety manager for the Formerly Utilized Sites Remedial Action Program, commonly known as FUSRAP.

The program focused on identifying and cleaning up contamination tied to early atomic energy activities at sites across the country, including locations in New York, New Jersey and Oak Ridge.

The work reflected another side of Beck's career: applying radiation science not only to medicine and research but also to environmental restoration and public safety.

In 1990, Beck returned to ORAU. A few years later, he joined the Oak Ridge Institute for Science and Education (ORISE), which ORAU manages for the Department of Energy.

By 1995, Beck had become director of ORISE's Environmental Survey and Site Assessment Program, overseeing environmental assessments and remediation efforts that continue today.

Even retirement did not fully slow him down.

After retiring in 2007, Beck continued consulting with the National Institute for Occupational Safety and Health on the Energy Employees Occupational Illness Compensation Program Act, known as EEOICPA.

The program helps provide compensation and medical coverage for former atomic workers diagnosed with radiation-related illnesses. Beck considered the work

especially meaningful because it directly supported workers whose careers exposed them to significant health risks.

Today, ORAU teams involved in the program have completed tens of thousands of radiation dose assessments for federal review.

By the end of his career, Beck's influence could be seen across multiple fields: cancer research, radiation emergency medicine, occupational health, environmental cleanup and scientific training.

The Health Physics Society recognized those contributions by naming him a Fellow in 1998, an honor reserved for distinguished scientists who have made major contributions to the profession. In 2014, the organization awarded him its prestigious Founders Award.

Still, outside the office, many people simply knew him as someone who loved to fish.

In an interview preserved by the Oak Ridge Public Library, Beck joked that he worked mainly to support his fishing habit. When he died in 2023, his family chose a photograph of him holding a fish for his obituary.

For all the programs he helped build and all the scientific work he contributed to, Beck remained grounded, practical and quietly devoted to the work in front of him.

His career helped shape radiation medicine, emergency response and environmental safety in ways that continue benefiting people today.

That's pretty impressive — especially for a kid who once thought engineers drove trains.



**More to the story.
Just scan here.**

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CHAPTER SIXTEEN
HELEN VODOPICK-GOSWITZ
and the Practice of Oncology





When Dr. Helen Vodopick-Goswitz died on July 8, 2025, at the age of 94, Oak Ridge lost one of the early pioneers of nuclear medicine.

As a physician in the Oak Ridge Institute for Nuclear Studies (ORINS) Medical Division, later renamed ORAU, Vodopick helped shape some of the organization's earliest cancer research efforts during a transformative period in radiation medicine. She was also among the relatively few women physicians working in the field during the early 1960s, building a career at a time when opportunities for women in medicine remained limited.

Her path to Oak Ridge began almost by accident.

After graduating from the Marquette University School of Medicine in 1956, Vodopick married fellow medical student Dr. Francis Goswitz one day before commencement. The couple completed internships and residencies at University of Iowa hospitals before moving through a series of medical and military assignments tied to Goswitz's service in the U.S. Army.

During those years, conversations within medical circles increasingly turned toward Oak Ridge, Tennessee, where scientists and physicians were exploring how radioisotopes might be used in medicine and cancer treatment.

Then came a chance encounter.

At a medical meeting in California, Goswitz met ORINS physician Dr. Gould Andrews, who mentioned an opening in ORINS' Special Training Division. The division

trained physicians and scientists in the use of radioactive materials and radiation-related medical equipment.

"My husband was very interested in that position," Vodopick later recalled in a 2013 oral history interview. Andrews responded that if Goswitz came to Oak Ridge, his wife would need a position too.

"I was fitted into the Medical Division of ORINS at that time," she said.

That unexpected conversation ultimately brought both physicians to Oak Ridge, where they would spend decades building careers and serving the community.

Vodopick joined the ORINS Clinical Division under Dr. Marshall Brucer, one of the leading figures working to merge nuclear science with cancer treatment. ORINS operated one of only three hospitals established by the Atomic Energy Commission to study the medical use of radioisotopes following World War II and the Manhattan Project.

The Oak Ridge Cancer Research Hospital became an early center for experimental cancer therapies and nuclear medicine research. Patients arrived from around the country seeking treatments that were often unavailable elsewhere.

During her early years at ORINS, Vodopick contributed to research involving radioactive iodine and gallium-67, a radioactive tracer that proved valuable for identifying tumors and later detecting postoperative infections.

At the time, much of this work was still experimental.

Researchers at ORINS helped pioneer gallium-67 as a scanning agent for locating soft-tissue tumors, advancing techniques that would later become standard tools in nuclear medicine. Vodopick's role focused heavily on developing immunology-related experiments and helping care for patients receiving these emerging therapies.

Many remained connected to her for years afterward.

"So, we had a fair number of patients that we followed through the years," she said during her oral history interview. "I just had one lady die this past week that I've treated since 1976."

The patient was 92 years old.

"When I pulled her chart out of the rack to put it away, I found that her chart measured 9 inches in thickness," Vodopick said. "I tell the patients, we've both grown old together."

That long-term connection to patients became one of the defining features of her career.

In 1974, the federal government closed the ORINS Cancer Research Hospital after many of the nuclear medicine techniques pioneered there became more widely available in hospitals nationwide. In many ways, the hospital had accomplished the mission it was created to pursue.

But Vodopick's work in Oak Ridge was far from over.

She and her husband remained in the community and founded the Oak Ridge Medical Clinic, which served local patients for decades. At Methodist Medical Center, Vodopick specialized in oncology and hematology, continuing her work treating cancer and blood disorders.

According to her obituary, during the 1970s and early 1980s, she was one of only three female physicians practicing at the hospital.

That visibility mattered.

At a time when women remained underrepresented in medicine, Vodopick helped open doors for future generations of female physicians entering oncology, hematology and nuclear medicine.

Outside the clinic, she was deeply involved in family and community life. She and Goswitz raised three children in Oak Ridge and became active participants in civic and medical organizations throughout the region.

Still, patient care remained central to her identity.

She viewed medicine not as a series of appointments or procedures, but as long-term relationships built over years, sometimes decades. Patients were not simply cases to manage; they became part of the rhythm of her life and career.

That perspective reflected the culture of ORINS itself during its pioneering years. Physicians and researchers there were not only advancing science, but also navigating the uncertainty of experimental treatments alongside patients willing to place hope in emerging medical technologies.

For many of those patients, physicians like Vodopick became trusted companions through frightening and deeply personal experiences.

What brought her to Oak Ridge may have been chance.

What kept her there was commitment.

Over the course of her career, Helen Vodopick-Goswitz helped advance nuclear medicine, cared for generations of East Tennessee patients and helped establish a place for women physicians in fields where they had once been rare.

Her work left a lasting mark on both ORAU history and the broader medical community.

And for many patients and colleagues, she remained exactly what she had always set out to be: a doctor who stayed.



**More to the story.
Just scan here.**

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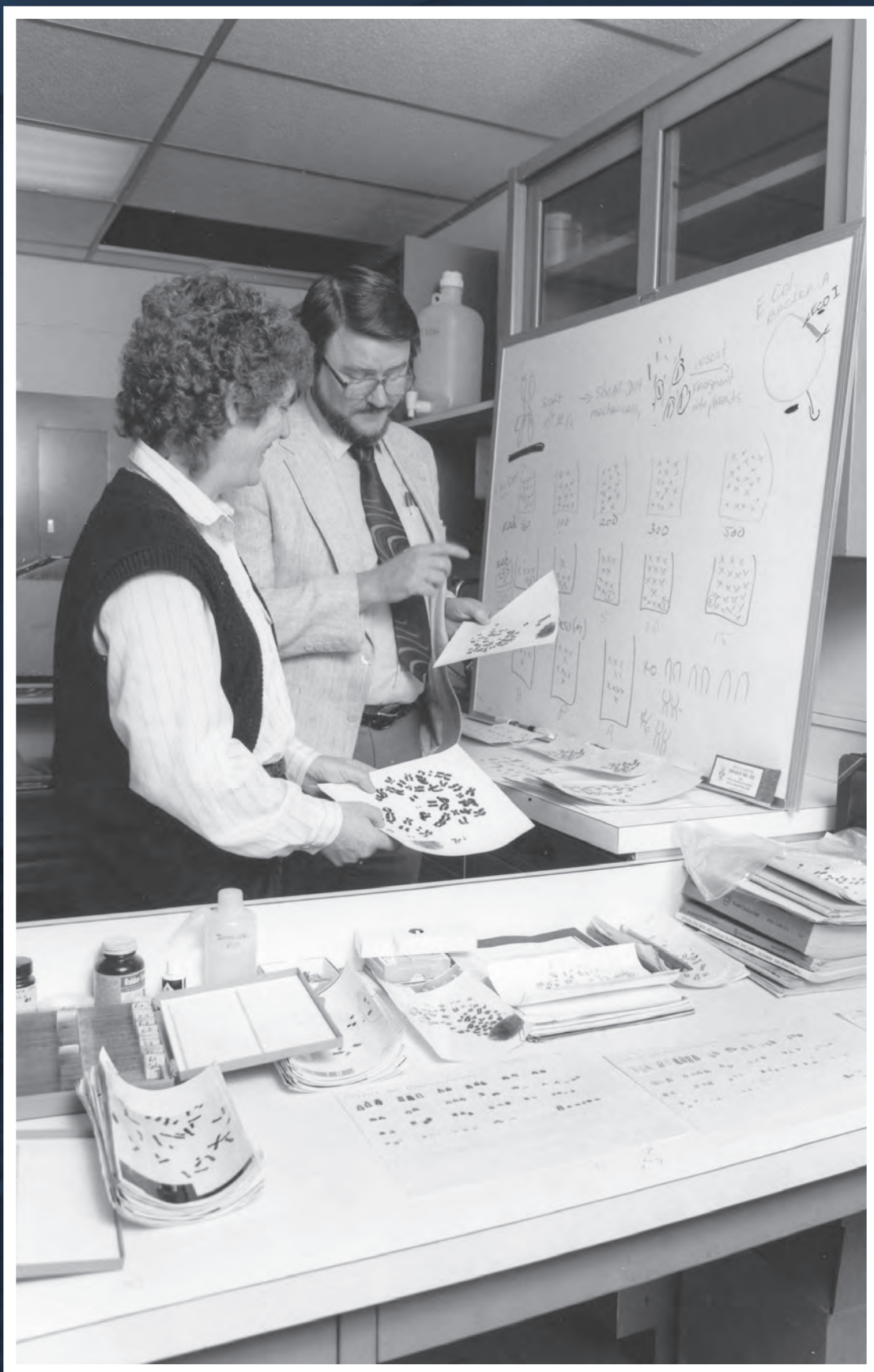
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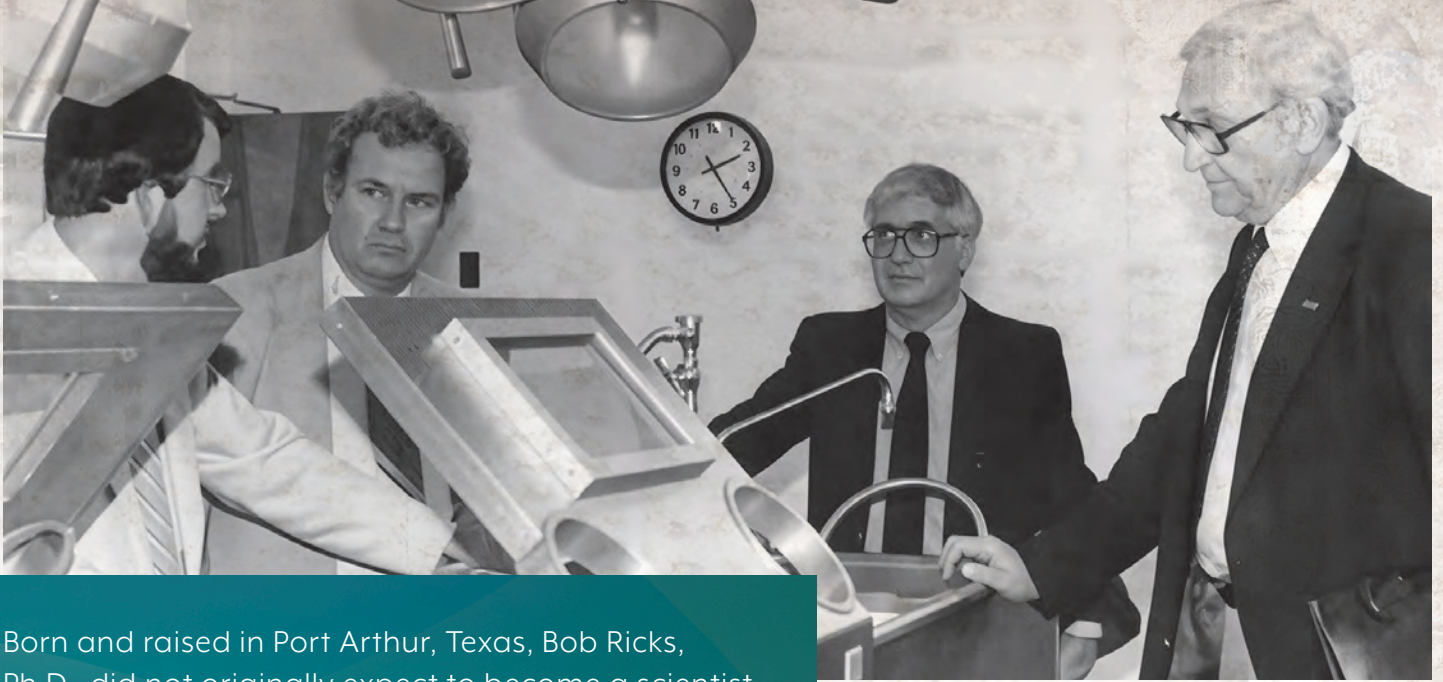
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CHAPTER SEVENTEEN
BOB RICKS
and the Development of REAC/TS





Born and raised in Port Arthur, Texas, Bob Ricks, Ph.D., did not originally expect to become a scientist. In fact, he once doubted whether college would play much of a role in his future at all.

Born and raised in Port Arthur, Texas, Bob Ricks, Ph.D., did not originally expect to become a scientist.

In fact, he once doubted whether college would play much of a role in his future at all.

During high school, one of his instructors suggested he probably was not suited for advanced academic work. Ricks took the comment personally.

"I took that as a challenge," he later recalled during an oral history interview. The challenge changed his life.

Ricks went on to earn both a master's degree and doctorate in radiobiology from Texas A&M University, studying the effects of radiation on pregnant laboratory animals during a period when relatively little research existed in that area.

That work unexpectedly opened the door to Oak Ridge. In 1967, researchers at the Oak Ridge Institute for Nuclear Studies (ORINS), which later became ORAU, selected Ricks for a summer internship in the organization's Medical Division. Out of 26 applicants, only one position was available.

"Only because I had this experience in the effects of radiation on animal life, I got accepted," he said.

For a young scientist raised along the Gulf Coast, East Tennessee made an immediate impression. "There are things besides the swampy Gulf Coast," he remembered thinking as he saw the mountains surrounding Oak Ridge.

The internship lasted only three months, and Ricks assumed he would eventually return permanently to Texas. But a few years later, while searching for another short-term research opportunity, he contacted ORAU again.

The application deadline had already passed. "I did

something that was not like my upbringing," Ricks joked later. He asked one of the physicians he had worked with to "push some buttons" and help him get back into the program. Two weeks later, he received another acceptance letter. The timing could not have been better.

By 1969, the Apollo program was approaching its historic moon landing, and NASA had become increasingly concerned about radiation exposure during spaceflight. Astronauts traveling beyond Earth's atmosphere faced potential exposure to trapped radiation within the Van Allen belts, creating risks that included nausea, incapacitation and long-term health effects.

At ORAU, Ricks began working with Clarence Lushbaugh, M.D., who held a NASA grant studying radiation's effects on astronauts. At the same time, ORAU's Medical Division was conducting some of the nation's earliest total-body radiation treatments for leukemia patients. Some patients volunteered to participate in studies measuring how radiation exposure affected breathing patterns associated with nausea and vomiting.





Ricks helped develop a system designed to predict when radiation sickness might incapacitate astronauts during space missions. “Everybody goes through the same pattern,” he explained. “You just have to measure it.”

As nausea intensified, breathing patterns changed in measurable ways. NASA ultimately used that knowledge to help monitor astronauts during missions, particularly because vomiting inside a sealed spacecraft presented serious dangers.

Still, Ricks always emphasized that the most important part of the research involved the patients themselves. “They were very, very cooperative,” he said. “No one participated unless they volunteered. They felt like they were making a contribution to science.”

The work proved successful enough that Ricks’ temporary appointment continued through additional NASA-funded studies. But eventually NASA completed the research it needed, and ORAU’s Medical Division also approached the end of its original mission.

By the mid-1970s, many of the experimental nuclear medicine techniques pioneered at ORAU had become more common nationwide, and the federal government closed the Medical Division.

Ricks prepared to leave Oak Ridge. “I was all set to leave,” he later recalled. “I had a job offer to work in Los Alamos.”

Then Lushbaugh proposed something new. Rather than allowing the Medical Division’s expertise in radiation medicine to disappear, ORAU began developing a program dedicated to radiation emergency response, medical treatment and professional training.

The program became the Radiation Emergency Assistance Center/Training Site, better known as REAC/TS.

Ricks made what he later called “the best decision I’ve ever made” by staying in Oak Ridge to help build it.

Established officially in 1976, REAC/TS became a Department of Energy asset capable of responding to radiation emergencies anywhere in the world. In 1981, Ricks became director.

Under his leadership, the program quickly gained international recognition for combining emergency

medical response with hands-on radiation training for physicians, scientists and first responders.

At the time, only a handful of comparable programs existed worldwide.

Over the next two decades, Ricks helped lead responses to major international radiation incidents, including accidents in Mexico, Brazil, El Salvador and the 1986 Chernobyl disaster in Ukraine.

One of the earliest incidents involved Juarez, Mexico, in 1984, after a discarded radiation therapy machine was unknowingly dismantled for scrap metal. Radioactive cobalt-60 pellets spread through a junkyard before the contamination was discovered after a truck carrying radioactive rebar accidentally triggered detectors at Los Alamos National Laboratory.

Ricks and the REAC/TS team assisted with radiation assessment, public safety guidance and medical consultation.

Three years later, another serious contamination incident occurred in Goiania, Brazil, when scavengers dismantled an abandoned radiotherapy device containing cesium-137. The radioactive material spread through an entire neighborhood before authorities understood what had happened.

REAC/TS again provided medical guidance and technical expertise during the international response.

The 1986 Chernobyl disaster brought even greater global attention to radiation emergency medicine. Following explosions and fire at the Soviet nuclear plant, REAC/TS advised U.S. agencies and international partners on radiation sickness, dose assessment and long-term health monitoring for exposed workers.

He directed REAC/TS until retiring in 2004 after helping lead assistance missions in 46 countries.

Looking back, he remained grateful for the opportunities Oak Ridge had given him.

“This young guy from the swamplands and Texas coast ended up traveling all over the world and meeting all these wonderful people,” he said.

Ricks died in 2017 at the age of 76. His career stretched from the early days of the space race to some of the world’s most significant radiation emergencies, helping shape modern radiation medicine and emergency response along the way.

All because one teacher told him he probably could not do it.



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CHAPTER EIGHTEEN

Important Gifts the Medical Division Gave the World



During its 24 years of operation, the ORAU Medical Division advanced nuclear medicine and cancer treatment in countless ways. Here are seven significant contributions from the ORAU Medical Division:

IMPROVED THYROID CANCER DIAGNOSIS AND TREATMENT

Because the thyroid absorbs radioactive iodine, ORAU researchers focused heavily on thyroid disease and radiation exposure. Dr. Marshall Brucer developed “mock iodine,” a longer-lasting calibration material that helped hospitals accurately measure iodine uptake in patients. He also created thyroid phantoms that simulated the human neck and thyroid. These “manikins” simulated the internal distribution of radiation within the human body and could be customized to mimic different body types and sizes. It was groundbreaking and used extensively for a few decades.

ADVANCED WHOLE-BODY RADIATION THERAPY

In the 1960s, ORAU designed specialized total-body irradiation facilities to deliver more uniform radiation treatments for cancer patients. Experimental therapies conducted at the Medical Division helped establish whole-body irradiation as an important treatment approach for cancer, particularly in preparation for bone marrow transplantation.

IMPROVED BONE MARROW TRANSPLANTATION

Research led by Dr. Nazareth Gengozian significantly improved understanding of immune suppression and donor compatibility in bone marrow transplantation. During this time, ORAU’s cytogenetics laboratory became an important resource for chromosome analysis and radiation injury assessment. Dr. Gengozian also discovered that radiation delivered over a period of a few minutes was more effective for immunosuppression than the same amount of radiation delivered over the course of an hour.

HELPED DEVELOP MODERN MEDICAL IMAGING

ORAU researchers contributed to advances in nuclear imaging technology, including early whole-body scanners and the Emission Computed Axial Tomography (ECAT) system, a precursor to today's PET scanners. The division also helped develop Gallium-67 as a scanning agent for detecting soft-tissue tumors.

ESTABLISHED INTERNAL RADIATION DOSE STANDARDS

As nuclear medicine expanded, ORAU helped physicians better understand radiation dosimetry — the measurement of radiation absorbed by the body. ORAU employees Roger Cloutier and Evelyn Watson helped establish the Medical Internal Radiation Dose (MIRD) Committee through the Society of Nuclear Medicine. This standardized the methods still used today to calculate radiation doses.

INCREASED AWARENESS OF FETAL RADIATION EXPOSURE

Evelyn Watson also became a leading voice in fetal dosimetry, the study of radiation exposure during pregnancy. Her research and advocacy raised awareness about protecting unborn children from unnecessary radiation.

CREATED REAC/TS

In 1976, ORAU established the Radiation Emergency Assistance Center/Training Site (REAC/TS), which remains a global leader in radiation emergency medicine and preparedness. Funded by the U.S. Department of Energy, REAC/TS provides around-the-clock expertise, emergency response support and specialized training for medical professionals and first responders worldwide.

Although the Medical Division itself no longer exists, its influence continues through technologies, treatment methods and safety standards still used in medicine today.



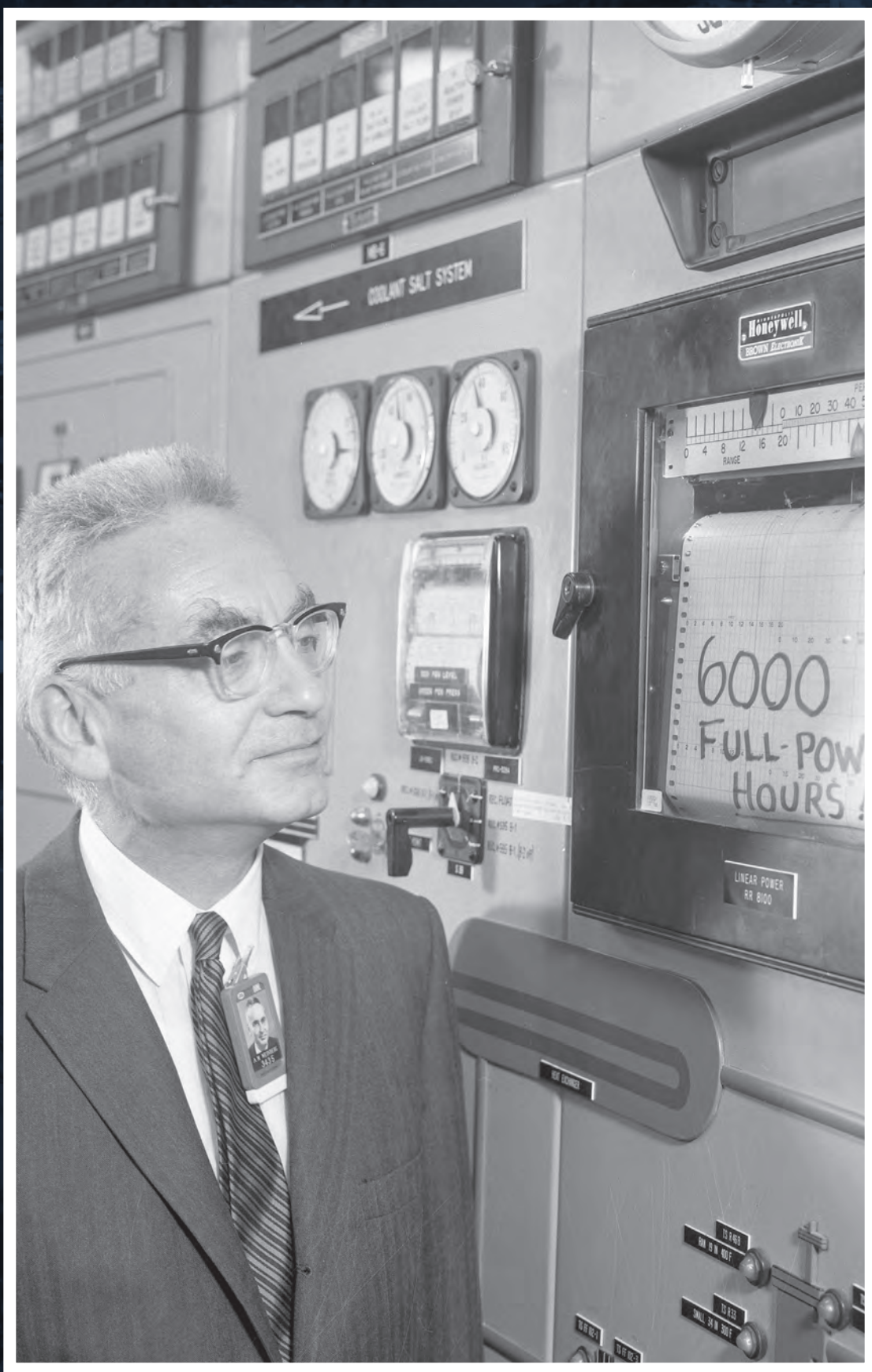
**More to the story.
Just scan here.**

SOURCES:

Pollard, William. *From the Beginning*
ORAU Annual Reports.



CHAPTER NINETEEN
ALVIN WEINBERG
and Big Science





Few scientists shaped Oak Ridge quite like Alvin Weinberg, Ph.D.

Nationally, he became known as one of the most influential nuclear physicists of the 20th century — a Manhattan Project researcher, director of Oak Ridge National Laboratory and a major voice in American energy policy.

At ORAU, however, Weinberg is remembered for something more specific: bringing his vision for long-range energy analysis and scientific problem-solving to the organization during a pivotal moment in U.S. energy history.

Weinberg was born in Chicago and earned both his bachelor's and master's degrees in physics from the University of Chicago before completing a doctorate in mathematical biophysics there in 1936.

Not long after graduating, he joined the Manhattan Project at the university's Metallurgical Laboratory, where scientists were working to understand how nuclear reactors could produce plutonium for wartime use.

During that period, Weinberg became part of physicist Eugene Wigner's theoretical research group, which focused on reactor development. The work would shape the rest of his career.

In 1945, Wigner accepted a position at Clinton Laboratories in Oak Ridge, later renamed Oak Ridge National Laboratory (ORNL), and brought several young scientists with him, including Weinberg.

The move placed Weinberg at the center of America's rapidly expanding nuclear research enterprise.

When Wigner later left Oak Ridge for Princeton University, Weinberg became ORNL's director of research in 1948 and eventually laboratory director in 1955.

Over the next 18 years, he helped transform ORNL into one of the nation's leading scientific institutions.

Under Weinberg's leadership, the laboratory pursued reactor development programs that shaped the future

of nuclear power, including work on aircraft nuclear propulsion and reactor designs that influenced commercial nuclear energy systems still in use today.

He also championed molten salt reactor technology, an alternative reactor design that attracted attention because of its potential safety advantages.

Beyond the laboratory itself, Weinberg became one of the country's most influential scientific thinkers on energy policy and the role of large-scale research.

He coined the term "Big Science" to describe massive government-supported scientific efforts like the Manhattan Project, where thousands of researchers, engineers and institutions collaborated on complex technological challenges.

Colleagues remembered him not only for his intellect, but also for his curiosity and presence as a leader.

According to accounts from ORNL, Weinberg regularly sat in the front row during division meetings, asking probing questions that pushed scientists to think more deeply about their work.

He also advised multiple presidential administrations.

President Dwight Eisenhower appointed Weinberg to the President's Science Advisory Committee, where he helped provide scientific guidance on national policy and defense issues. He later continued serving under President John F. Kennedy.

By the early 1970s, however, the nation's attention had shifted beyond nuclear research alone. The energy crisis forced policymakers to think more broadly about energy production, conservation and long-term sustainability.

In 1974, Weinberg briefly moved to Washington, D.C., to direct the U.S. Office of Energy Research and Development, helping coordinate federal responses to growing energy concerns.

That same year, he returned to Oak Ridge and began what would become his major contribution to ORAU.

Weinberg founded the Institute for Energy Analysis (IEA), serving as its first director.

The institute reflected Weinberg's belief that energy problems could not be solved through science alone. Technical research mattered, but so did economics, environmental impacts, public policy and social considerations.

According to early institute reports, the IEA was created to examine "broad questions of energy policy."

Researchers studied issues ranging from nuclear power and fossil fuels to solar energy, conservation, carbon dioxide and environmental risk. The institute also explored how global energy challenges could affect domestic policy decisions in the United States.

In many ways, the work anticipated conversations that would become far more prominent decades later.

The IEA brought together experts from multiple disciplines to examine energy systems as interconnected problems rather than isolated technologies. That interdisciplinary approach became one of Weinberg's defining contributions to ORAU.

He remained active at the institute until retiring in 1985, though retirement did little to slow his involvement in Oak Ridge civic and scientific life.

In the early 1990s, Weinberg chaired the International Friendship Bell Committee, which helped bring the Japanese Friendship Bell to Oak Ridge as a symbol of peace and reconciliation between the United States and Japan following World War II.

The bell, cast in Kyoto and installed in Oak Ridge in 1993, remains one of the city's most recognizable landmarks.

Over the course of his career, Weinberg received numerous honors recognizing both his scientific achievements and broader influence on public policy.

He received the Atoms for Peace Award in 1960 and later earned the Enrico Fermi Award, one of the federal government's highest honors in energy science. He was elected to the National Academy of Sciences, the National Academy of Engineering and the American Academy of Arts and Sciences, among many other organizations.

ORNL eventually named both an auditorium and lecture series in his honor.

Even years after his death in 2006, Weinberg's influence remains visible throughout Oak Ridge.

In 2024, the Children's Museum of Oak Ridge unveiled an exhibit dedicated to his life and work, featuring documents, photographs and archival materials from his career.

His legacy stretches from the Manhattan Project through the rise of nuclear energy and into modern conversations about energy policy and scientific responsibility.

At ORAU, that legacy lives on most clearly through the Institute for Energy Analysis and the idea that science works best when paired with thoughtful questions about how technology shapes society.

For Weinberg, those questions mattered just as much as the discoveries themselves.



**More to the story.
Just scan here.**

SOURCES:

National Museum of Nuclear Science and History. Accessed via nuclearmuseum.org.

Oak Ridge National Laboratory. Accessed via ornl.gov.

National Academy of Engineering. Accessed via nae.edu.

American Nuclear Society. Accessed via ans.org.

Children's Museum of Oak Ridge. Accessed via childrensmuseumofokridge.org.

Paul Frame & ORAU's Museum of Radiation and Radioactivity



For decades, ORAU's remarkable history collection remained hidden behind secure doors. Today, the Museum of Radiation and Radioactivity is finally open to the public, offering visitors a rare look at the history of radiation science, nuclear technology and society's changing relationship with radioactivity.

The museum traces its origins to the 1980s with retired ORAU health physicist Dr. Paul Frame, Ph.D. At the time, Frame worked as an instructor for ORAU's Professional Training Programs (PTP), which provides radiation safety and health physics education. He started collecting historical radiation instruments and artifacts to use as hands-on teaching tools during training courses. The small instructional collection steadily grew into a museum-quality archive.

Because the collection was housed inside a Department of Energy building, only students attending training programs could view it in person. Despite limited physical access, ORAU recognized the historical significance of the collection and launched an online version of the museum in 1999. Since then, hundreds of thousands of visitors from around the world have explored the artifacts digitally.

In 2025, PTP relocated to the Pollard Center on ORAU's main campus, creating the first opportunity to open the museum to the public. Planning and moving the collection took more than a year, but the result is a permanent community resource that preserves an important chapter in scientific and cultural history.

At the center of the museum is its founder and curator, Dr. Frame. Frame joined ORAU in 1981 as a certified health physicist and instructor after careers as a professor, biologist and visiting scientist at Brookhaven National Laboratory. Soon after arriving at ORAU, he began discovering forgotten scientific equipment stored in cabinets and work areas, including X-ray tubes dating back to the 1920s. Frame recognized that these objects

were more than outdated equipment. They told the story of how scientists, physicians and the public learned to use radiation — sometimes wisely and sometimes recklessly. His interest in both the science and the people behind it shaped the museum's mission from the beginning.

Over the years, the collection expanded to include atomic-age consumer products, civil defense materials and artifacts connected to major historical events. It contains more than 1,000 objects spanning roughly a century, from the late 1890s through the 1990s. The collection is especially strong in artifacts from the 1940s and 1950s, which Frame describes as the golden age of radiation detection and instrumentation.

Among the exhibits are vintage instruments, including the world's oldest direct-reading pocket dosimeter. Visitors can also see a shoe-fitting fluoroscope once used in shoe stores, radioactive “quack cure” products marketed as health remedies and civil defense items from the Cold War era. Some artifacts carry deeper historical weight, such as pieces recovered from Hiroshima, Japan, after the atomic bombing that ended World War II.

The museum's importance has been recognized nationally. The Health Physics Society designated ORAU's collection as the official repository for historical radiological instruments and devices. Visitors have a unique opportunity to explore scientific discoveries, cultural trends and historical events that shaped the Atomic Age. For the first time, visitors can now experience that history in person.



Accidents & Incidents

Off the Market

Hiroshima Roof Tile

Black Rain on Wall Plaster

Light Cover from the Chernobyl disaster of 1986

Contaminated Tea from Turkey

Caution

Caution

Caution

**More to the story.
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SOURCES:

Frame, Paul, Ph.D. Retired ORAU
Health Physicist interview.



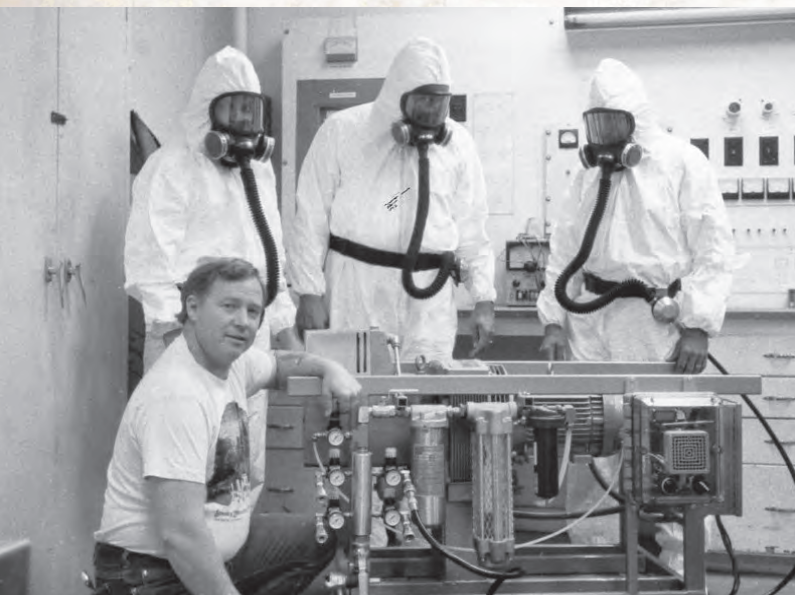
CHAPTER TWENTY-ONE

ORAU's Impact on the World



Since its founding in 1946, ORAU has focused on solving problems that matter to the public good. Here are some of the ways ORAU's work has made a lasting impact:

1. Training generations of health physicists: Since the 1940s, ORAU has trained radiation safety and health physics professionals responsible for protecting people from harmful radiation exposure. Through professional training programs and partnerships tied to the "Atoms for Peace" era and beyond, ORAU has educated all generations of scientists, engineers and medical professionals.



2. Supporting radiation emergency response: ORAU manages REAC/TS for the Department of Energy, which provides worldwide expertise and emergency response support for radiation accidents and nuclear incidents.

3. Strengthening national security: ORAU has long supported the nation's nuclear workforce by recruiting and training scientists and engineers connected to nuclear technology and national defense. That work continues today through workforce development initiatives.
4. Helping former energy workers receive compensation: Since 2002, ORAU has led radiation dose reconstruction efforts for the National Institute for Occupational Safety and Health under the Energy Employees Occupational Illness Compensation Program Act. The program helps determine compensation eligibility for workers who developed illnesses linked to occupational radiation exposure.





5. Protecting scientific integrity: Federal agencies rely on ORAU's peer review expertise to independently evaluate scientific research proposals and programs. ORAU manages rigorous review processes designed to prevent conflicts of interest, protect data integrity and ensure taxpayer-funded research meets high scientific standards.
6. Supporting counterterrorism efforts: Following the rise of improvised explosive devices during the Iraq War, ORAU forensic specialists helped improve methods for analyzing bomb-making materials, including developing techniques for recovering latent fingerprints from duct tape used in explosives.



7. Expanding STEM opportunities: ORAU works closely with Historically Black Colleges and Universities and other Minority Serving Institutions to strengthen pathways into science, technology, engineering and mathematics careers.

8. Improving services for veterans: ORAU developed tools such as the Performance Improvement Management System (PIMS), which helps the Department of Veterans Affairs coordinate supplies, volunteers and emergency resources across VA medical centers nationwide.
9. Advancing addiction research: ORAU researchers have supported studies focused on opioid addiction and public health communication, particularly in Appalachia, helping communities better understand addiction.
10. Informing climate research: Through partnerships with the National Oceanic and Atmospheric Administration, ORAU scientists help collect meteorological and atmospheric data used to study climate trends, air quality and environmental change.



11. Verifying environmental cleanup: ORAU independently verifies that former government research and nuclear sites meet safety standards before being released for public use.
12. Building the future STEM workforce: ORAU supports students and early-career researchers through K-12 STEM programs, internships, fellowships and workforce development partnerships with agencies such as NASA and the Department of Energy.
13. Supporting healthcare policy: Through technical assistance and research support for the Centers for Medicare & Medicaid Services, ORAU helps improve healthcare systems, billing processes and policy implementation.

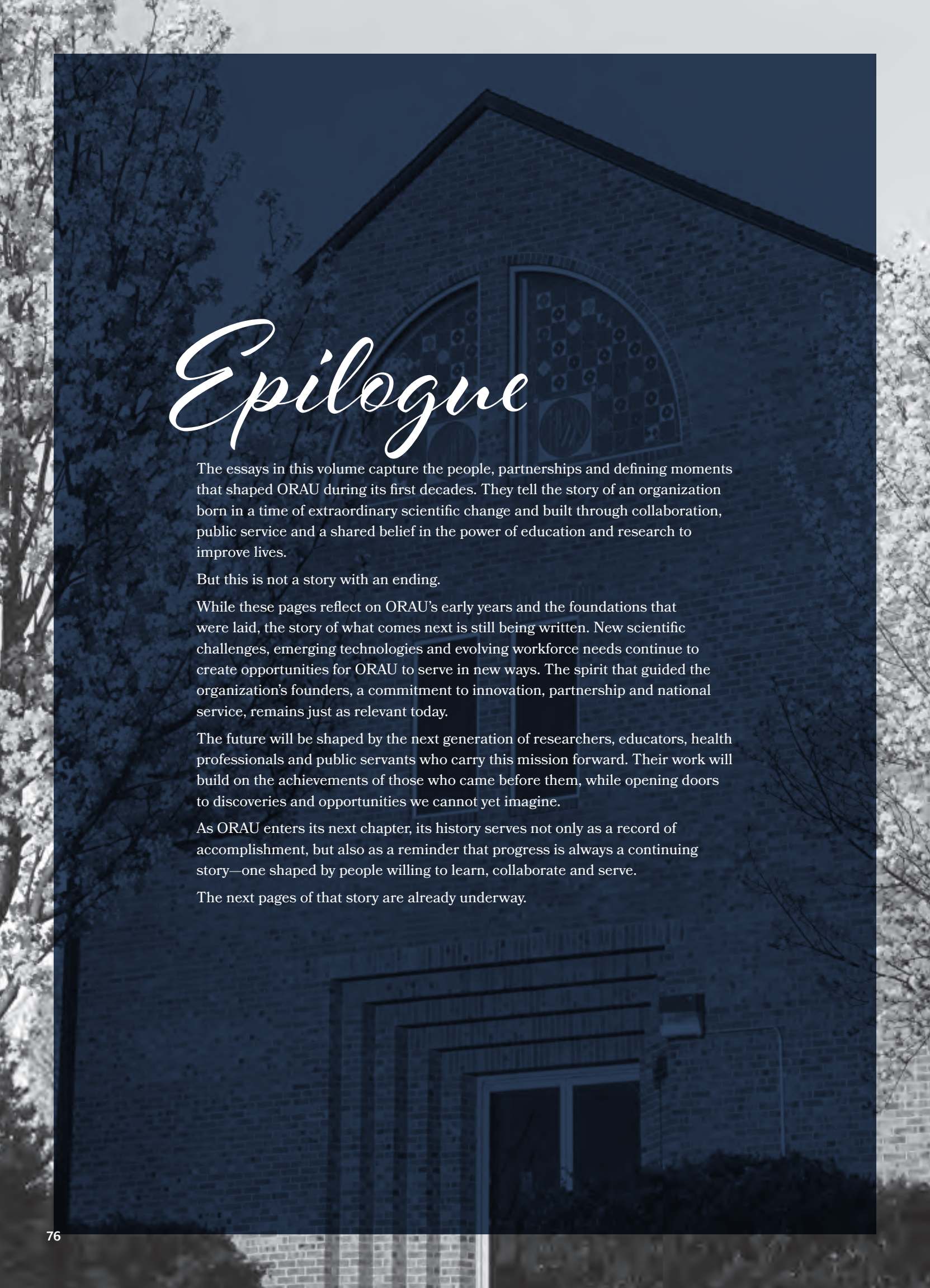


**More to the story.
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Taken together, these efforts reflect ORAU's broader mission: applying science, education and collaboration to solve real-world problems.

SOURCES:

Pollard, William. *From the Beginning*.
ORAU Annual Reports.



Epilogue

The essays in this volume capture the people, partnerships and defining moments that shaped ORAU during its first decades. They tell the story of an organization born in a time of extraordinary scientific change and built through collaboration, public service and a shared belief in the power of education and research to improve lives.

But this is not a story with an ending.

While these pages reflect on ORAU's early years and the foundations that were laid, the story of what comes next is still being written. New scientific challenges, emerging technologies and evolving workforce needs continue to create opportunities for ORAU to serve in new ways. The spirit that guided the organization's founders, a commitment to innovation, partnership and national service, remains just as relevant today.

The future will be shaped by the next generation of researchers, educators, health professionals and public servants who carry this mission forward. Their work will build on the achievements of those who came before them, while opening doors to discoveries and opportunities we cannot yet imagine.

As ORAU enters its next chapter, its history serves not only as a record of accomplishment, but also as a reminder that progress is always a continuing story—one shaped by people willing to learn, collaborate and serve.

The next pages of that story are already underway.

ORAU