

Studies in Intelligence
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R. V. Jones Award

Honoring the Founder of CIA's Directorate of Science and Technology

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Robert J. Kohler, R. James Woolsey, and [redacted]

Editor's Note: In a ceremony at CIA Headquarters on 13 December 1994, Director of Central Intelligence R. James Woolsey presented the R. V. Jones Intelligence Award to Dr. Albert D. "Bud" Wheelon. The DCI established this award in 1993 to honor individuals whose career accomplishments are in the best tradition of the renowned British physicist, Reginald Victor Jones—scientific acumen, applied with art, in the cause of freedom. The first award was presented to Professor Jones in October 1993.

As one of the nation's missile and space pioneers, Dr. Wheelon's contributions to science and technology and their applications to national security are legendary—from the creation of the Directorate of Science and Technology at CIA to the recognition of the application of space systems as the logical next step to collect intelligence from denied areas. He also served on numerous high-level boards, including the President's Foreign Intelligence Advisory Board. As a result of his work at the Agency and throughout his career, Dr. Wheelon has reshaped the world of modern intelligence.

Robert J. Kohler is Executive Vice President and General Manager, TRW Avionics and Surveillance Group. R. James Woolsey served as Director of Central Intelligence.

[redacted] is a senior scientist in the Directorate of Science and Technology.

Following are remarks made at the ceremony by Robert J. Kohler, R. James Woolsey, and [redacted].

Robert J. Kohler

DCI Woolsey, Dr. Jones, Dr. Wheelon:

I am very pleased to have the opportunity to offer some comments in honor of Dr. Albert D. "Bud" Wheelon as he receives the R. V. Jones Intelligence Award. I have known Bud Wheelon for many years as a professional colleague, as a sage adviser and confidant, and as a trusted friend. That long relationship has given me some unique and insightful perspectives into the character and accomplishments of this man to whom the Director Central Intelligence so fittingly pays tribute today.

When we hear the word "legend" used to characterize a person, or an accomplishment described as "legendary," it is often in a sports context, usually indicating feats and accomplishments that are so out-sized, so remarkable, and so unusual that they defy casual description. Lou Gehrig's record of consecutive baseball games played, Hank Aaron's home run tally, Jim Brown's rushing records, and so on. Those accomplishments were so noteworthy because they took place under rigorous and challenging circumstances and were very much in the public eye. But there are other legends, whose skills and achievements are

unparalleled, where the stakes are of the most vital significance, but who have played in arenas that are outside the public's view. Bud Wheelon, whose career has taken him within the most secret recesses of US intelligence, is one such legend, and bestowing the R. V. Jones Intelligence Award is an affirmation of the importance and significance of his life's work, not only to advance and improve our national intelligence endeavor through science but also through technology.

A review of Dr. Wheelon's background before he entered government service gives, as we used to say in the imagery business, a good "indication and warning" of the extraordinary career that was to follow. He received a bachelor's degree from Stanford University in 1949 and a Ph.D. from the Massachusetts Institute of Technology in 1952. He taught for a few years at MIT and in 1953 took a position with the Ramo-Wooldridge Corporation. For the next nine years, he served as one of the nation's space and missile pioneers, helping to develop guidance systems for long-range ballistic missiles and performing original research on radio-wave propagation and fluid flow. Thanks in large measure to his insights, the United States finally cracked some very tough problems of interpreting data from foreign missile systems.

His efforts in the private sector brought him to the government's attention, and, in 1962, Bud Wheelon

Science and Technology

was recruited by DCI John McCone to come to work for CIA. He arrived in time to play a significant role in the Cuban missile crisis, serving as the Chairman of the Guided Missile and Astronautics Intelligence Committee during that perilous period of Cold War history. The importance of his committee's work during the crisis is well illustrated in the recently declassified "CIA Documents on the Cuban Missile Crisis."

In 1963, in the aftermath of missile crisis, Director McCone decided to reorganize the CIA's separate and uncoordinated science and technology efforts. He decided to form those into a single unit called the Directorate of Science and Technology, and, to serve as the director of that organization, he chose Bud Wheelon. At the time, Dr. Wheelon was 34. His youth made him an enigma to many in the Agency, particularly the Deputy Director for Plans (what is now the Deputy Director for Operations). Invited to speak to the leadership of the DDP, the new Deputy Director of Science and Technology slipped into the crowded conference room unrecognized and went to the head of the table. The DDP, noticing the young "whipper-snapper" in the place of prominence, started to tell him to move off, only to realize at the last moment that this might be the new DDS&T!

I think it is worth taking note of the circumstances, both geopolitical and technological, under which Dr. Wheelon took command of the new directorate. The Cold War had just passed through one of its most threatening confrontations in the Cuban missile crisis, and the "long, twilight

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struggle" never seemed so gloomy or interminable. The Soviet landmass, even with several years of reconnaissance overflights by U-2 aircraft, was still largely a dark cipher, unknown and forbidding.

At the same time, years of research and development by the government and aerospace and other companies in the private sector into the new technologies of rocketry, satellites, and a host of related fields were beginning to bear tangible fruit. That extraordinary scientific cooperation, executed mostly under the most secretive conditions, had produced the technology to allow for the reliable collection of unique and vital satellite intelligence from the sanctuary of outer space. But the understanding and appreciation of that progress within the bureaucracy had not kept pace with the advance of science, and the full capabilities of the new technologies were not being exploited.

I can only imagine what was in the mind of the young Bud Wheelon, faced with the daunting task of organizing a system to exploit those

new and growing capabilities to address the challenges posed by the ominous Soviet threat. Perhaps his thoughts were akin to those expressed by the protagonist in Edgar Allen Poe's poem, *The Raven*:

*Deep into that darkness peering,
long I stood there, wandering, fearing,*

*Doubting, dreaming dreams no
mortal ever dared to dream before.*

Whether or not Bud Wheelon was a dreamer only he can say, but, at the very least, it is clear he had a vision of how the scientific and technical skills of the CIA should be organized and managed. Moreover, he was a man of action, and, at that moment in history, decisive action was required. He brought to the job of DDS&T the intelligence, energy, and drive needed to propel that directorate to the forefront of US Intelligence, establishing scientific data collection and analysis systems that were employed successfully throughout the Cold War era. This was truly a remarkable achievement. There was a tremendous breadth of technical disciplines involved in organizing the new directorate: the Office of Scientific Intelligence, a unit that had been part of the Directorate of Intelligence concerned with basic scientific research conducted by foreign countries; the Data Processing Staff, a computer services group; the Office of ELINT, an electronic intelligence unit that had been part of the Clandestine Service; the Development Projects Division, the Clandestine Service unit that had been responsible for developing the U-2, SR-71, and other overhead reconnaissance systems; the Office of Research and Development, a unit

charged with employing new technologies in the intelligence cycle; and the Foreign Missile and Space Analysis Center, a group established to monitor foreign missile and space programs.

From that cacophony of separate organizations and activities, Dr. Wheelon brought coherence and management discipline. Most important were the guiding principles he established for the organization. Those principles, to push the state of the art in technology and to instill institutionalized program management, are still the cornerstones of the DS&T. Some of his additional legacies included exacting technical qualifications for personnel, high standards of quality for technical programs and analysis and reporting, and rigorous scientific and technical integrity throughout the directorate. And he was a "hands-on" manager. Once, during a visit to where the follow-on aircraft to the U-2 was being developed (now known as the SR-71 Blackbird), he commandeered a ride in the back seat of a trainer prototype. DCI McCone, who was not keen on having top managers risk their lives, on hearing about the ride nearly fired him!

Dr. Wheelon did not merely shuffle the organization charts, however. The usefulness of the U-2 airborne reconnaissance program was reaching an end, and new solutions to the dilemma of intelligence gathering over denied areas were needed. He could see that there was a convergence of new and developing intelligence technologies and an urgent requirement for reliable and comprehensive intelligence collection. Thus, Dr. Wheelon

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became one of the earliest proponents of using outer space as the venue of the future for intelligence collection. He also strongly believed in and worked tirelessly to include CIA participation in space-based collection endeavors, a view that was not always universally shared. It was his persistence and vision that led to the creation of a joint Air Force, Navy, and CIA organization to manage the new collection programs, what we now call the National Reconnaissance Office.

We often take for granted the things to which we are accustomed, like being able to walk in almost any room, flick a switch, and expect instant illumination. We typically forget the vast infrastructure and technology which makes those capabilities possible, and we also sometimes forget that those capabilities were not predestined. Such is very much the case with the NRO—the incredibly responsive and productive collection systems of the past, present, and future are based on the structure that Bud Wheelon created 30 years ago, and, without his

leadership and tenacity, it would not have happened. Looking back, many in the Community now believe that it was this "odd" mixture of organizations, with no track record of cooperation or coordination, that was the vital ingredient in the successes of the NRO.

Bud Wheelon's tenure at CIA was only a prologue to a subsequent superlative record of scientific and technical leadership and accomplishment. In 1966 he began a career with the Hughes Aircraft Corporation, rising from Vice President of Engineering to become the Chairman of the Board and Chief Executive Officer in 1987. It is surely no coincidence that during his tenure Hughes became the preeminent supplier of communications satellites in the world. He also continued to give generously of his time and attention to the government arena, serving as a member of the Defense Science Board from 1968 to 1976, as a member of the President's Foreign Intelligence Advisory Board from 1983 to 1988, and as a member of the special Presidential Commission to investigate the space shuttle Challenger accident. He has continued to the present to give selflessly of his time and wisdom to NASA and elements of the national security community.

For all of these accomplishments, we honor Dr. Wheelon here today. But in doing so, I think we also honor something else: Bud Wheelon is one of those rare individuals that comes to serve as an archetype for the people and organizations of his generation. In honoring Dr. Wheelon for his achievements, we also pay tribute to the entire

scientific and technical intelligence community for which he is a model. That community has been the single-most vital, productive, and reliable component of US intelligence from the earliest stages of the Cold War, across the decades of global threat and challenge to our national security, to the present day and beyond:

Human intelligence (HUMINT) and covert action have received more attention, both good and ill, over the years in the media, the entertainment industry, and in the popular imagination than has technical intelligence collection. Can you see making a spy movie about signal processors, radio-wave propagation, or photo interpretation? Yet, those were some of the vital technical skills and capabilities which constituted the nervous system of the United States and the American military as we needed to flex our muscles around the world.

I think we should also remind ourselves that it was the United States, with preeminent technical intelligence capabilities, that won the Cold War, and not the Soviet Union, which many will argue was predominant in the field of HUMINT. The Soviets thoroughly penetrated the governments, militaries, businesses, and intelligence services in almost every Western nation they faced, including the United States. Yet even with all those HUMINT resources and successful penetrations, they lost the struggle. Certainly, we had our share of successful HUMINT operations during the Cold War, but our clear competitive advantage as an intelligence service was in the area of technical intelligence systems.

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And what was that advantage? Constellations of satellites and other intelligence collection systems with truly astonishing technical capabilities, far surpassing the best efforts of our Cold War opponents, and far beyond the technical grasp of any other nation. We used that advantage, and the prodigious amounts of information it provided, to leverage our political, economic, and military strategies and tactics to achieve a successful outcome to the greatest moral struggle of our age.

Bud Wheelon was an exemplar of the system that produced those extraordinary technical capabilities, a system composed of tens of thousands of dedicated and vigilant men and women, both inside and outside of government, who have served their country from the shadows of anonymity. As we pay tribute to Dr. Wheelon, we also acknowledge the debt we owe to the others who are part of that special endeavor. And as we look to the future and make decisions about how to apportion our intelligence resources and efforts, we must remember this recent history. There is and will continue to be a critical need for scientific and technical intelligence collection. If we ignore or neglect those historically vital intelligence capabilities, then we

invite the national security reverses and disasters that the Intelligence Community was formed to avoid.

Walter Lippmann once said that “the final test of a leader is that he leaves behind him in other men the conviction and the will to carry on. . . . The genius of a good leader is to leave behind him a situation which common sense, without the grace of genius, can deal with successfully.” Dr. Wheelon, you certainly left a legacy at CIA of “conviction and the will to carry on,” as the subsequent years of successful technology and programs will attest. As for the genius part, let us say that your departure left an intellectual vacuum that was never adequately filled, and those of us who followed you have striven to find the “common sense” to deal with the challenges we faced.

This recognition of your outstanding contributions to our nation’s security, the R. V. Jones Intelligence Award, could not be more deserved or appropriate. Your rock-solid integrity, rigorous intellectual discipline, and passion for excellence established the standards of performance by which subsequent generations of intelligence officers have been measured. The most eloquent testimony to your career achievements is in the award citation: “Scientific acumen, applied with art, in the cause of freedom.”

In closing, the most fitting epilogue I can think to offer is to echo the words of former DCI Judge William Webster used in speaking at another awards ceremony honoring Bud: “If there had been no Bud Wheelon ready and willing to serve, surely we would have had to invent one.”

Bud, on behalf of all of us, particularly those who served in the DS&T which you created, thank you for all you have done, and congratulations.

R. James Woolsey

Dr. Wheelon; Cicely (wife); Cynthia (daughter); Eric (grandson); Professor Jones; Congresswoman Seastrand; [redacted] whom I particularly thank for her excellent work putting all of this together; distinguished guests; friends.

A year ago I inaugurated the R. V. Jones Intelligence Award to honor individuals whose career accomplishments are in the best tradition of Reginald Jones. The R. V. Jones Award carries the inscription: "Scientific acumen, applied with art, in the cause of freedom"—a formulation on which I collaborated with Professor Jones. It is essentially shorthand for honoring those who—by their scientific and technical ingenuity and ability and leadership, and where called for frankly by their stubbornness and by their guile—have served greatly the cause of human freedom through intelligence.

I am delighted that Professor Jones can be here this year to participate in this award ceremony as well. The British Government recently awarded him the "Order of the Companions of Honour" for "Services to Science," one of the most prestigious awards in the United Kingdom, and further recognition of his extraordinary contributions.

Three great, global wars dominated this century. Two dominated the lives of many of us assembled in this

room today—World War II against Fascism, and the Cold War against Communism. Today, both have been relegated to the attention of historians.

Although our enemies in these last two wars came under different names, they shared one thing in common—an appetite for tyranny, and with it the conviction that man could be broken down and "scientifically" remade into a new image. Millions suffered and died because of Fascism and Communism. But these enemies of liberty eventually failed. They failed, not in the first instance because we had superior technology or military might. The totalitarians' technical and military prowess was initially substantial. They ultimately failed because they did not count on the resiliency of the human spirit, especially the creativity of free men and women defending free societies. They failed because they did not count on the ingenuity, persistence, and dedication of, for example, Reginald Jones, and of the man we are honoring

here today, Bud Wheelon. The totalitarians failed in using science to remake mankind; instead, free societies formed by the efforts of these two men and others who have followed them used science, applied with art, to defend freedom successfully.

Today, we honor a man whom I would call the Reginald Jones of his generation. Both Professor Jones and Dr. Wheelon were called on at a young age to develop and deepen the links between science and intelligence at critical periods in their nations' histories. Both struggled against entrenched and often unyielding bureaucracies, both built effective teams that brought about staggering innovations, and both had a major hand in winning a world war—one hot, one cold.

You have already heard Bob Kohler pay tribute to Dr. Wheelon and his work, so let me highlight a few of his accomplishments on behalf of a grateful nation.



Dr. Albert D. Wheelon, DCI R. James Woolsey, and Prof. Reginald V. Jones

When the Soviet Union launched Sputnik on 4 October 1957, the world of intelligence was introduced to Bud Wheelon. President Eisenhower wanted an impartial look at information gleaned from U-2 photography to determine the nature and extent of the threat posed by the Soviet launch. He asked Dr. George Kistiakowsky, his science adviser, to form a panel of experts. Dr. Wheelon played a key role in this "comparative evaluation" which showed the United States far ahead in weapons research and in deployment of strategic weapons. The "bomber gap," the "missile gap," the "science gap," and other public fears and anxieties raised by Sputnik, at least at that time, were myths. Kistiakowsky summed up the work of the panel best when he said: "We were looking for a body and only found a skeleton."

Yet Bud Wheelon and his colleagues knew that intelligence information often represents a snapshot in time, and the pictures that emerged in the decades to come were to tell the unfolding story of the buildup of Soviet military and strategic capabilities. The panel, which had been convened after Sputnik, had ended its work. The need to monitor the pace, the direction, and the magnitude of Soviet capabilities continued, as did the need for Dr. Wheelon and his work.

Five years after Sputnik alarmed the nation, the American people sat before their television sets and listened to President Kennedy announce the American quarantine of Cuba. Soviet missiles were en route. Dr. Wheelon, who joined the CIA in 1962, threw himself into the

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work of intelligence collection and evaluation as Director of the Office of Scientific Intelligence. He chaired the Guided Missiles and Astronautics Intelligence Committee, which provided CIA Director McCone with critical intelligence on the Cuban missile sites. He played a pivotal role in the analysis for President Kennedy and his advisers during those crucial "thirteen days."

A year after the Cuban missile crisis, Director John McCone asked Dr. Wheelon, then only 34, to lead a new directorate at the CIA dedicated to science and technology. He took that office, but only on the condition that all scientific endeavors at CIA had to be consolidated under his new directorate. Having secured that commitment from Director McCone, he then set out to do what all who know him expected of him—he infused the directorate with vision, scientific expertise, and leadership. And he propelled it into the forefront of collection and analysis against the Soviet Union.

Let no one underestimate the magnitude of the challenge that Bud Wheelon faced in those years. Assembling and running a directorate dedicated to the fusion of science

and technology with intelligence required a deep understanding of an enormous breadth of technical disciplines, and the ability to channel that expertise—from research and development to operations, and data collection to intelligence assessments. He established the principles for the new Directorate of Science and Technology that have guided our work to this day—to push state-of-the-art technology; to emphasize strong technical skills; and to maintain rigorous standards for scientific programs, for analysis, and for reporting.

The men and women whom Dr. Wheelon assembled had to know what technology was available, and how it could be harnessed. They had to know how, when, and where to tap into the nation's best scientific minds and resources. When called on to help penetrate the intentions or assess the capabilities of America's adversaries, these individuals accepted their tasks not only as challenges to overcome, but also as opportunities to explore.

Dr. Wheelon played a key role in creating this country's national reconnaissance programs. In addition to his early work on U-2 photography, he facilitated the development of the Mach-3 aircraft that led to the deployment of the SR-71. When the usefulness of the early airborne reconnaissance systems began to wane, Bud Wheelon was one of the first proponents of space as the venue for intelligence collection. He devised a number of satellite systems to provide critical intelligence, from early warning to monitoring arms control agreements and many other purposes. His vision, scientific expertise, and

creativity enabled him to lay the groundwork for the innovative systems that continue to allow the United States to retain the global scientific intelligence advantage that it has today. As Secretary of Defense Perry put it: "The national reconnaissance systems which the United States now has, which are truly jewels in our crown, all stem, in my judgment, from the creative work that Bud Wheelon did in the sixties."

Dr. Wheelon left CIA in 1966 to join Hughes Aircraft as Vice President of Engineering, and, by 1987, he was CEO and Chairman of the Board. But he continued providing us with his counsel and wisdom, including serving for five years on the President's Foreign Intelligence Advisory Board. In a letter to Dr. Wheelon last year, the President singled out his "visionary" work as exemplifying "the benefits that can be reaped from a true partnership between government and industry."

And what of the directorate that he left behind? Dr. Wheelon fashioned the nation's most successful intelligence, engineering, and scientific organization. Before the end of the sixties, the Agency's youngest directorate dreamed up, engineered, built, and deployed collection systems that are the envy of all other nations of the world. The value of his work, which began during the Cold War, has outlived that conflict. Long after the final pieces of the Berlin Wall are consigned to museum displays around the globe, the systems and programs that Bud Wheelon helped to establish will continue to do what they have been designed to do—provide continuing vigilance, early warning, and support to the

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President, to the military commanders, and to the diplomats, and they will continue to provide security for America and its friends.

Whenever our arms control negotiators sat down at the negotiating table, whenever our military forces were deployed to deter war or to fight, the systems that Bud Wheelon, his colleagues, and his successors developed have been there as silent and indispensable allies. Three years ago these systems combined to give our commanders in the Saudi desert the location of Iraqi forces with unprecedented accuracy. They all worked together with such systems as AWACS, J-Stars, airborne radars, global positioning satellites, and with our well-trained military forces to ensure victory. Just two months ago, some of these systems were instrumental in helping us identify the latest Iraqi provocation, Saddam's deployment of two elite Republican Guard Divisions along with their logistics and ammunition racing to the Kuwaiti border.

Dr. Wheelon has never forgotten that science is the tool, security is the objective—both for the nation and for our ideals. As Professor Jones did before him, Dr. Wheelon respected

the timeless principles of scientific intelligence—know and respect your enemy's abilities, be both intellectually audacious and a team player, and never forget that espionage and science are partners, not rivals.

First, know and respect your enemy's abilities, and the importance of avoiding both the pitfall of habitual anxiety and that of overconfidence. Bud Wheelon appreciated and respected the capabilities of Soviet technology, from Sputnik to the SS-18 missile. He understood both Soviet strengths and weaknesses. And he never failed to put himself in his adversaries' shoes—to understand better how they would handle technological challenges, whether it entailed missile guidance or space systems.

Second, be both audacious and a team player. Bud Wheelon lived by never fearing to stake out a position which may be unpopular or generate heated opposition. But, in so doing, he never gave up trying to bring others along so that the appropriate action could be taken. As Reginald Jones once put it: "The test of good intelligence service in war is not merely that you were right; it is that you persuaded an operational or research staff to take the correct countermeasures."

Third, the partnership of espionage and science. The most sophisticated technological breakthroughs will not obviate the need for classic espionage. Satellites can pinpoint hostile military moves, but spies can uncover hostile military intentions. Technology can uncover strategic capabilities, but human sources can uncover political machinations. Like

Reginald Jones, Bud Wheelon knew that intelligence officers are like archeologists—assembling chards or fragments of information from many different sources, including satellite photographs, signals intercepts, and spies, and drawing the appropriate conclusions. Unlike archeologists, however, time is often the enemy of analysis. In a world where it is no longer enough to anticipate what your adversary will do, but who your next adversary will be, the right call is cold comfort if it is made too late.

And, finally, a few words about Bud Wheelon, the man. His colleagues have viewed him as a leader of people, and as a master of systems. As one colleague put it: "No one before or after Bud paralleled his work."

But I must tell you that these kinds of accolades come with other descriptions—headstrong, determined, candid, not afraid to break crockery. Winston Churchill once told Reginald Jones that: "You don't have to be polite, you just have to be right." Bud Wheelon worked hard to be both, but he placed a premium on getting it right—and insisted that others do the same. It is only when people are willing to challenge conventional wisdom and get it right that the great strengths from our democracy—our inquisitiveness, our creativity, our imagination—can bear fruit. There was nothing preordained or automatic about the outcome of the Cold War. It took people who were not afraid to raise awkward questions and not afraid to take risks.

Dr. Wheelon exemplified these strengths in his life's work. Justice Louis Brandeis once said: "If we

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would guide by the light of reason, we must let our minds be bold." Bud Wheelon's mind was bold, his vision clear, and his courage resolute.

The second point about Bud Wheelon the man is related to the willingness to question, explore, and take risks. When we serve in these jobs, we all have to keep in mind not only what is expected of us as intelligence officers, but also as Americans. As Americans, we are not comfortable being a nation of informants, nor are we accustomed to being regimented bureaucratically or programmed "scientifically." We cherish our freedoms—indeed, if we did not, we could not possibly succeed in defending and advancing these ideals. In his landmark book, *Democracy in America*, de Tocqueville expressed skepticism that democracy would permit the necessary skills to conduct foreign policy. In spite of his overall superb batting average, on this point de Tocqueville was too pessimistic. Bud Wheelon, like Reginald Jones, has proven that intelligence can be conducted successfully while hewing to democratic principles and practices, to our commitment to freedom, and to our sense of fair play and trust. Men like Reginald Jones and Bud Wheelon

have shown that being clever in the use of technology and intelligence does not mean that we should elevate technology to the position of being our boss. Technology must remain the servant of man's free spirit, not his master.

Over the past six months, members of the CIA family have heard me lay out initiatives to strengthen management accountability, personnel security, and counterintelligence. I have done so because these steps were obviously needed. But I am equally determined to preserve an environment which fosters the free interplay of ideas. If we harbor suspicions every time a colleague shows an inquisitive mind, we will not be able to infuse our work with creativity and vision. We must not violate the rules of security, or fail in upholding the standards of accountability. But we must operate in and foster an environment of free, intellectual inquiry—as Reginald Jones did and Bud Wheelon did.

And, finally, intelligence now more than ever has a crucial role to play for the United States in this post-Cold War world. Indeed, the role of intelligence has never been more important in helping the President avoid and manage crises and in supporting today's smaller military forces. Last fall we worked around the clock to support the President and his advisers to help resolve three critical foreign policy issues that came to a head in October—providing critical intelligence to military commanders at the Pentagon, at sea, and on the ground in Haiti; supporting our negotiators grappling with North Korea's nuclear program; providing strategic and tactical warning

of Saddam's ambitions in his military deployments to the Kuwaiti border. The planning and restructuring of our intelligence capability to collect and analyze imagery, electronic signals, and human intelligence is paying off. The systems that we are buying and the people we are training are adapting quickly and flexibly to this potpourri of new and demanding post-Cold War challenges. And our response to the three crises in October is the model for how intelligence is contributing to the national security of the United States. I would add that the ideas, the principles, the approach to problems, and, in some cases, the systems themselves created by both Reginald Jones and Bud Wheelon were very much with us in October.

As we pay tribute to Bud Wheelon today, I am reminded of Edwin Land, eminent photo scientist and inventor of the Polaroid camera, whose personal credo was: "to select things that are manifestly important and nearly impossible." To Land, discoveries were often made by some individual "who has freed himself from a way of thinking that is held by friends and associates who may be more intelligent, better educated, better disciplined, but who may not have mastered the art of a fresh, clean look at the old, old knowledge." This credo exemplifies Bud Wheelon's career, his accomplishments, and his legacy to us. On behalf of the Intelligence Community and the members of the CIA family, I would urge all of us to help ensure that Dr. Wheelon's career will inspire us to keep several things always in mind. We must maintain the right kind of intellectual environment and the adequate resources to

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support it. The environment and the resources must allow the ideas to flourish to enable our officers and analysts to take a "fresh, clean look" at the world and at ourselves and at our work, and to continue to demonstrate to the world the best of what it means to be an intelligence officer working in the cause of liberty and freedom.

How appropriate that Bud Wheelon be the first recipient of the R.V. Jones Award following Jones himself. The world today mirrors in a sense what the world was like when Dr. Wheelon came to the Agency. The late 1950s and early 1960s were turbulent times in the world with the launch of Sputnik, the Bay of Pigs, and our questions about the Soviet strategic threat and even our own abilities to respond. It was an epoch of change, just as we are experiencing today, and it required unprecedented leadership in areas new and untested in intelligence: the application of science and technology and Bud Wheelon was the man with the clear vision and stubborn insistence to pull together an organization—founded on research—to strengthen the Agency's capabilities by creating,

organizing, and exploiting new resources of science and technology. He joined institutional, academic, and industrial research to our own mission-oriented research.

Naturally, the Agency was very focused on the Cold War and Soviet strategic threat. Our leaders, especially Dr. Wheelon, likely did not imagine the incredible legacy that they would leave behind as they pushed to develop breakthrough technologies to apply to intelligence efforts in fighting the Cold War.

Many of those accomplishments were successful in fighting the Cold War, but the untold story is that the organization created, motivated, and shaped by Bud Wheelon developed many other technologies, *not* used to fight a war, but to help mankind in many civilian applications, often in medical science. A few examples should illustrate how technology developed for national security purposes also can be applied to civilian problems. As taxpayers, it is rewarding to learn of cases where we get "two for the price of one."

We often become inured to breakthroughs in science and technology and yawn as another comes across the screen of the evening news. But, what if that headline on the 6 p.m. news read "Improved capabilities to diagnose breast cancer developed at CIA, details at 11?" Or, "New computer chip burning up information superhighway pioneered at CIA, following sports." Certainly, we would all stay tuned until 11. I would like to give you the "story at 11" in the next few minutes.

At this time, lot of attention is being paid to the Intelligence Community-sponsored research originally applied to image and signal processing for satellite imagery analysis being transferred to the medical community and applied to assist radiologists in detecting breast cancer. The techniques align digital imagery and then process results to detect automatically change in images taken over time. These results are particularly significant for diagnosis of cancer in women under 50, where diagnosis is much more difficult. One radiologist estimates that applying these techniques could reduce the number of deaths occurring from breast cancer by 30 percent.

Another "small highlight" transferred to the medical community was the R&D work in the 1960s which led to the patent on the lithium-iodide battery, the dominant chemistry used for heart pacemaker batteries in the 1970s and 1980s.

Results of successful S&T research also include efforts to predict medical problems, in addition to solving them. Under the auspices of the State Department we managed the development of a model for predicting the spread and demographic impact of the AIDS epidemic. This model's original algorithms were a core breakthrough which led to the development of a stand-alone population model. The same techniques can be applied to model any other disease. The AIDS model also has been used by the World Health Organization and the UN.

Leaving the medical domain, we find examples of S&T research contributing to the processing and analysis of

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Research in improved data extraction, automatic database generation, machine translation and information retrieval—in multiple languages—have been major efforts supported by interagency groups, often led by S&T officers, and, in several cases, have led to commercial products.

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vast amounts of information which the Agency collects daily. Research in improved data extraction, automatic database generation, machine translation and information retrieval—in multiple languages—have been major efforts supported by interagency groups, often led by S&T officers, and, in several cases, have led to commercial products. How else will the analyst or policymaker get the right amount of information in the form he wants on his desk when he needs it?

The forerunner of the Pentium chip came into being because of some visionary officers in the S&T who believed in a radical concept—the RISC processor—worked with industry in the early 1980s to see that it got a fair chance—and now look where we are.

There are many other examples of S&T accomplishments currently benefiting the civilian population. Some of them include tools used by urban planners and law enforcement agencies to visualize scenes on the ground in 3D and then insert buildings or plan routes for hostage

rescues. Another tool concerned with facial recognition recently led the Immigration and Naturalization Service to identify and arrest a convicted rapist. Other law enforcement agencies also are eager to use this technology.

No discussion of S&T achievements would be complete without mention of how our world will benefit from overhead reconnaissance systems. They have helped us map many regions of the world and can logically be envisioned as playing a role in relief support to natural and man-made disasters. They also will be important in helping us monitor and preserve our environment. All this is possible because of technology developed to fight the Cold War.

In founding the DS&T, Bud Wheelon did more than create an organization to build wizardry. He gave an ethos, principles, and methodology to guide the S&T in managing the technology being developed for intelligence requirements. He taught his officers and managers, and he demanded accountability. He introduced and insisted on sound program-management principles which are the cornerstone of the S&T today. The responsibilities given an officer, the accountability which he accepted, and the program-management principles he applied gave and still give any S&T officer the confidence to step up to almost any challenge of developing and managing technology that makes a difference in intelligence.

S&T research is applied and pays off in many ways. It is not just the scientist in the white lab coat; often, it is that off-the-wall idea which needs fertile ground to grow and be nurtured.

Science and Technology

In other cases, it is our operational requirements which force us to push the development of a technology which industry would not find commercially viable—but we need it sooner than they would develop it. In some instances, someone must take

the risk, and we support that. Even failure teaches us which road *not* to take.

With the Cold War behind us, the requirements for ground-breaking research, new approaches to prob-

lems, and the willingness to take chances and risk failure all endure.

Dr. Wheelon's vision, intelligence, creativity, innovation, and tenacity are characteristics we still need in our leaders and officers today.