

OBITUARIES

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**CHARLES HERBERT LOWE JR.
1920–2002**

CHARLES H. Lowe, Professor of

Ecology and Evolutionary Biology, who arrived at the University of Arizona in 1950 and retired in 1995, died in Tucson on 13 September 2002, at the age of 82. Chuck, as he was known by many who knew him best, was an intense and colorful herpetologist who for many years was a leading southwestern naturalist and ecologist. He directed the development of a herpetological collection, now totaling over 50,000 specimens (over 8500 of which he took as primary collector), that is, an indispensable resource for systematics, ecology, and conservation in Arizona and Sonora. In 1964, he edited "The Vertebrates of Arizona," a landmark book that also included, under his authorship, detailed descriptions of all of Arizona's natural environments. For many years, he taught a popular and well-regarded course on the natural history of the southwest at the University of Arizona. During the 1960s, he and his students helped resolve the difficult problem of the whiptail lizards, by demonstrating that many of the most perplexing species were in fact parthenogenetic and of hybrid origin, and several were doubly hybridized triploid all-female species. Although a herpetologist at heart, his ecological interests were exceedingly broad. From 1969–1983, with National Park Service Naturalist Scotty Steenberg, he published a series of books and papers on the natural history, population decline, and physiology of the saguaro cactus in the Tucson area and elsewhere in the Sonoran Desert, and in 1980 he coauthored (with David E. Brown) the still-authoritative map of the Biotic Communities of the southwest. In 1986, he published "The Venomous Reptiles of Arizona" with Cecil Schwalbe and Terry Johnson. His students have gone on to successful positions as curators at major museums from coast to coast, as professors, and as key conservation professionals in Arizona.

Born into a Mormon family in Los Angeles, California, on 16 April 1920, Charles developed a deep love of the desert when young and officially acknowledged the desert as his place of worship during his teenage years. During high school, he was constantly out in the deserts of southern California with fellow herpetology

club members, collecting snakes or food for his garage-full of *Crotalus*. He waded the marshes of the Gila River in Arizona with his older brother (1930s), hunted Western Diamondbacks on foot with S. H. Walker at Blythe (1941), cruised roads in southern California with Lawrence M. Klauber, and accompanied Charles M. Bogert into the Sierra de Alamos, Sonora (1942; Fig. 1). Over many years, Lowe was associated with a number of well-known people. He had a long friendship with the famous actor Marlon Brando, who called periodically to pay visits with Lowe to Native American communities in Arizona. He enjoyed a friendship with Theodosius Dobzhansky and assisted and collaborated with Robert H. Whittaker in classic studies of the vegetation of the Santa Catalina Mountains. In addition, Lowe was a supporter of scientific art and played a key role in films and books about the desert produced by the BBC, Disney, and Time-Life, although he studiously avoided the press and limelight.

His family had become poor during the Great Depression, his father having lost big in real estate and taken work as a night watchman. By his high school years, he already considered himself a "Herpetologist, Naturalist, Lecturer," according to his business card. Charles Lowe went to the University of California in Los Angeles on a basketball scholarship, and he carried throughout life an automatic identification of the relationship between student-athlete and "coach." After graduating from college, and marrying the lovely Arlene Patton in 1942, he served in World War II, reaching the rank of U.S. Navy Ensign, Lt. (jg) as a communications officer aboard ship in the Pacific, before resuming study at UCLA in 1946. His Ph.D. advisor was Raymond B. Cowles, who profoundly influenced Lowe's outlook on fieldwork and on what was important to desert organisms, in general, and amphibians and reptiles, in particular. His academic advisors also included eminent biologists whose imprint on Lowe remained clear for decades: physiologist George A. Bartholomew, ichthyologist Boyd W. Walker, and paleobotanist Daniel I. Axelrod. He also developed three long-term friendships then, including with his contemporary Robert C. Stebbins; with Richard G. Zweifel, then an undergraduate, with whom he initiated fieldwork; and with Kenneth S. Norris. Lowe was a consultant in ecology for the U.S. Atomic Energy Commission near the Trinity Site in New Mexico, where he and Zweifel saw, firsthand, the diversity of whiptail lizards in sympatry. The surprise confiscation

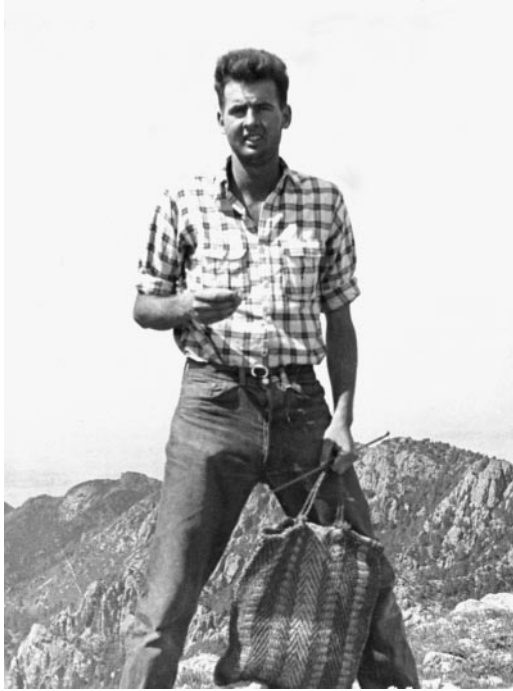


Fig. 1. Charles H. Lowe atop Sierra de Alamos, Sonora. Photo by C. M. Bogert, 1942.

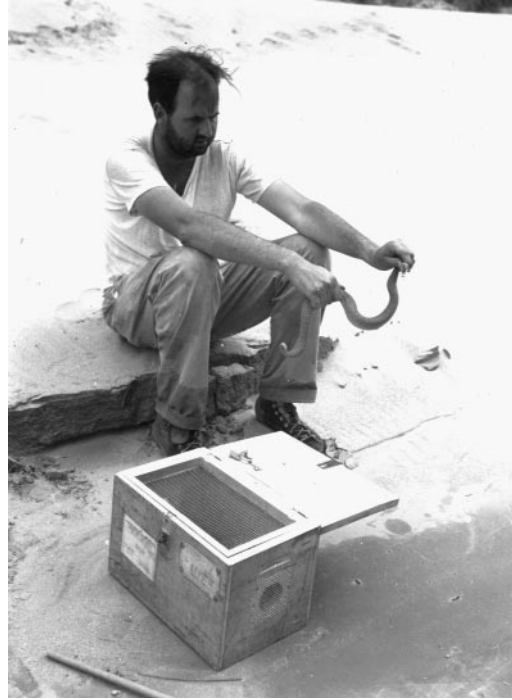


Fig. 2. CHL with *Crotalus abyssus* in Grand Canyon, 1951.

of his and other scientists' field notes at the end of the work made a disturbing impression on him. His dissertation (1950) was on West Coast plethodontid salamanders, which he worked on extensively with Stebbins.

After completing graduate studies, he was persuaded, in part by the famous ornithologist Joseph T. Marshall, to leave California for the wide-open fields of Arizona (Fig. 2). Lowe arrived in 1950 at Tucson, then a small city of 50,000 or so people, at a university not yet in the big leagues and lacking a significant herpetology collection. The university president's office had the only air conditioner, faculty members were required to show up in shirt and tie, and the student body was considered fit primarily for vigorous discipline. Over 45 years, Lowe helped build the Zoology Department into a world class Department of Ecology and Evolutionary Biology. In his first decade-plus, he taught basic and advanced aspects of zoology, ecology, physiology, and statistics, whereas later in life he taught advanced courses in herpetology and speciation and the enormously popular "Natural History of the Southwest" for beginning undergraduates. Tucson grew to over three-quarters of a million people, swallowing up Lowe's local stomping grounds; the floor of Avra Valley was developed for agriculture and,

more recently, as sprawling ex-urbs. In the 1950s, Lowe roamed Arizona and Sonora widely, establishing a major collection of southwestern amphibians and reptiles, and, eventually, describing no less than 20 new species and subspecies. Although Lowe claimed to have been fired by four department heads, two deans, and one university president, he retired willingly in 1995 from a modern institution with over 30,000 students and a national ranking in research.

During the 1950s through 1970s, Charles Lowe became legendary for his scientific and educational accomplishments, bizarre behavior, and dedication to natural history. "Lowe stories," most or all containing at least a grain of truth, circulated among herpetologists around the United States. These stories are a full subject in themselves, ranging from the astonishingly effective use of his intimidating (6 foot 5 inch) physical presence; to his colorful language; rough treatment (as well as salvation) of graduate students (of whom he supervised as many as 17 at once); and, mythically, tossing an inept seminar speaker out a third story window (actually ejecting a dishonest student from the ground floor lab through a window, according to his telling). He went on a world tour of deserts supported by the U.S. Army in 1965, de-



Fig. 3. Lowe in 1965, passport photo.

parting with little notice to anyone—family, students, or assistants.

Numerous graduate students from the 1960s, when Lowe (Fig. 3) was at the peak of his achievement, tell the same story—Lowe was phenomenally knowledgeable, deeply insightful on a breadth of biological research subjects, variously idiosyncratic in his work schedules and overbearing in demeanor, and dedicated to their and his success. Lowe's role became that of the driven, and driving, coach, as well as that of academic mentor and colleague; he grasped for credit in a decade when many of his students performed brilliantly. Yet through this, the laboratory retained its sense of love for what it was involved in—in the annals of natural history it was a remarkable place, with projects ranging from fish, toad, lizard, snake, roadrunner, woodpecker, and jackrabbit physiology; to studies of speciation and karyology of a wide array of taxa; through animal behavior and general herpetology; and to vegetation studies and plant ecology. Many students, however, departed under a cloud of one sort or another. Many owe their careers to him, sometimes to his Herculean efforts to rescue them from intense academic politics. Nearly all left with the desired degree, yet some of those most successful, most closely assisted, and most highly regarded by Lowe himself, left with resentment or even anger.

He wrote an ode to Ayn Rand, unpublished, entitled "All Is Selfish," in the late 1950s, which I discovered amidst his massive and disorganized paper trail. This philosophy may have been contributory to his contradictory existence: he loved his friends, colleagues, and stu-

dents unselfishly even as he demanded professional credit in shared work. It is difficult to avoid juxtaposing Lowe's insight and depth to his self-absorption; his brilliance to paranoia; loyalty to disregard for others; political savvy to being repeatedly fired (and denied raises); productivity to chaotic boxes of unfinished business and research. There are classic elements of genius, and near madness. Although Lowe had great depth and feeling, he was so dedicated and competitive that his life tended to become a battle, with knowledge and successful publication as victory. But as he aged, he became increasingly and explicitly self-critical over derivative failings.

Lowe spent a part of the 1970s in a tailspin—attributed by some to the breakup of his marriage, after son Charles A. (Cal, born 1956) and daughter Catherine (born 1958) matured and left home. Lowe himself attributed it to the ecological devastation sweeping the world at that time, when humanity's dominance reached deep into the far corners of the world—including its deserts, *his desert* (Howard Gloyd, Lowe's colleague who taught herpetology at the university, was similarly affected; see Clay, W. M., 1978, Howard Kay Gloyd [1902–1978]; *Copeia* 1979: 187–189). The death of a favorite graduate student, Wayne Howard, in a low-speed auto accident near campus, the unsolved disappearance of Paul Fugate, and other deaths—including Gloyd's, and Ike Russell's, who flew Lowe into the Sonoran hinterlands—took a heavy toll. Lowe was shocked by these deaths, and cried over Ike's grave (in the Russell's own back yard!) rather than participate in the less-than-somber funeral party. He also became embroiled in an academic tenure affair involving a colleague and former student, Ten Wei Yang, that has never been satisfactorily resolved. Lowe disappeared without notice from the university for over half a year, living on the California coast with friends from his youth, and he reportedly sought psychiatric counseling. Yet he apparently rebuilt himself, gradually, during this time.

Lowe was often late to class, leaving graduate teaching assistants with professor's duties, yet he was once reinstated by a dean who wrote that a day of Lowe's teaching might be worth a semester with a less brilliant professor. He was the kind of teacher whose flamboyant creativity is rarely seen in an academic setting. In class, he was a charismatic actor—unorthodox, entertaining, and highly motivating. Many students were "turned on," many became practicing herpetologists, ecologists, and conservationists, and

his professorial antics became known on campus as the "Chuck Lowe experience."

During the difficult decade of the 1970s, Lowe worked with David E. Brown to formally define and map the biotic communities of the southwest; he completed monographic studies of the saguaro cactus with Scotty Steenbergh; in almost all this work, he was junior author. The herpetology collection continued to grow, and although he had fallen victim to the fad of claiming to be an ecologist or evolutionary biologist, he returned to teaching herpetology after Gloyd died. When I met Lowe in 1985 at Quitobaquito in Organ Pipe Cactus National Monument, he went so far as to assert that we could easily camp there (illegally) because herpetologists would never rat each other out. Just as his speciation course rosters from the 1960s read like lists of successful evolutionary biologists, herpetology class rosters from the later 1970s and early 1980s contain lists of southwestern natural historians and conservation biologists. Cecil Schwalbe became Lowe's most successful hired gun, as collection manager, teaching assistant, photographer, and field biologist deployed to the far corners of Arizona and Sonora. After his departure (under the obligatory cloud) to become state herpetologist at Arizona Game and Fish Department, he became Lowe's colleague and returned to the university as a leading herpetological conservationist.

During the 1960s, graduate students Robert L. Bezy, Charles J. Cole, and John W. Wright went on to become curators at major museums. In the 1970s, Lowe drove away prospective students who went on to similarly outstanding careers, like Darrell Frost, who left after finding the chaos unbearable, and Laurie J. Vitt, who Lowe "sent to Arizona State University" because he arrived at the Herpetology Laboratory with long hair and a guitar. Lowe later recognized this as poor judgment, but he made other more consequential errors. As a result of paranoia about control of information, he removed locality indices, field notes, current manuscripts in progress, and certain photographic and perhaps other materials to his home, where in 1996 they were destroyed, and with them his motivation, in a house fire. The fire abruptly ended his career as a functioning biologist. Lowe created huge accumulations of paper, cardboard, and plant material in his inner sancta, and his self-imposed isolation therein circumvented the normal pressures that could have avoided the tragedy. The black smoke was visible across much of Tucson, and Lowe was seen on the evening news leaning, devastated and nearly cat-

atonic, against a fire truck. He suffered a series of small strokes beginning prior to his retirement, and these and other health problems combined with the psychological effects of the fire to make his last years those of an invalid. His son Cal reconstructed the house for him, and he was thereafter largely devoted primarily to watching sports, etc., on television and enjoying the company of his housekeeper Rosalie Peralta, and visits with students and colleagues, Cal, and Cathy and his grandchildren Griffen and Michael Corcoran.

During the 1980s and 1990s, Lowe's egotism waned, and he became philosophical about himself and changes in society and global ecology. In 1989, he was awarded the Haury Award for contribution to National Park Service, uncommon recognition for a man who antagonized many people. A new series of students, among whom I was one, repopulated the Herpetology Laboratory, and, with collection manager George L. Bradley, developed a feasible mode of managing Lowe's eccentricities. Lowe had, in the 1950s, assisted in the early development of the Arizona-Sonora Desert Museum, where we held a memorial gathering for him in October 2002. Not entirely somber in tone, it began with the current university department head giving thanks that Lowe was retired by the time of his headship. During more than three hours, there was considerable commentary, by a few of those who gathered from across the southwest and throughout the United States, about Lowe's achievements, friendships, and flamboyant, and sometimes unsavory behavior, leading into a set of more evocative, and finally, hilarious stories. The contradictory nature of the proceedings fit well with the personality of Charles H. Lowe.

The list of his graduate students and published work (below) will convince diverse readerships in herpetology and conservation biology of Lowe's importance as a mentor and colleague of successful professionals. His bibliography contains evidence of his success as a scientist and collaborator in diverse fields of inquiry and is a testament to his personal achievement and ability.

Among Lowe's first papers were reports on the mating (1942), the so-called courtship dance (1948), and aggressive behavior (1950) of rattlesnakes, papers that set a tone of insistence upon interpretation rather than voluminous data. Early on, his publications reflected an interest in technique, and he (1943, 1955, 1956) helped develop and publicize standard methods in herpetology. He bragged to me that he was fabulously advanced in his use of new methods

and technologies, and, indeed, his lab was jammed with the compact or hulking remains of everything from YSI and Beckman gadgets and homemade circuits to giant constant temperature and metabolism chambers (so jammed that, in 1993, I unearthed a dirt bike listed in university records as “stolen” decades earlier). Lowe’s dissertation work on salamanders (1949, 1950, 1951a,b) led him to the idea that many of the evolutionary products we see are extremely ancient, a view that may have contributed to his relative lack of interest in the mathematical modeling school of evolutionary ecology that focused on shorter term adaptive response.

Upon moving to Arizona, Lowe began a long period of field exploration of the Sonoran Desert region that became one of his chief passions. During the 1950s, he published primarily as a herpetologist, with at least 23 papers on the herpetofauna in the Sonoran Desert region, including descriptions of numerous new taxa (1952, 1953, 1954a–c, 1955a–c, 1965a,b). During that time, however, he also initiated work that would occupy much of the rest of his career, taking novel approaches to thermal ecology (1955), desert landscape ecology (1956), and the problem of speciation and evolution in whiptail lizards (1958). He ended the decade’s work, in a series of colloquia involving a generation of university luminaries in southwestern natural history, including Raymond M. Turner, James R. Hastings, and Paul S. Martin, by broadly defining problems in desert ecology (1959) in the tradition of Forrest Shreve (see J. E. Bowers, 1988, *A Sense of Place: The Life and Work of Forrest Shreve*, University of Arizona Press, Tucson), the precepts of H. A. Gleason, and the emerging community ecology of Robert H. Whittaker.

At the end of this decade, Zweifel informed Lowe by postcard that Darevsky, in Russia, had described parthenogenesis in the lizard genus *Lacerta*, setting the stage for a frenetic decade of research in Lowe’s lab during the 1960s. Also by post, Zweifel advised Lowe of a brilliant young whiptail biologist, John Wright, who arrived, by his own telling, as a star among servant-students, and who, with Jay Cole and others, helped lead the lab to a preeminent position (1964, 1965, 1966a–d, 1967a–c, 1968, 1969, 1970a,b) among researchers who exposed the remarkable and unexpected evolutionary history of Whiptail Lizards. Lowe’s paper with Wright (1968) is a classic example of the intellectual and synthetic strength brought together in the lab.

During the 1960s, with a succession of successful graduate students and other collabora-

tors, Lowe also produced a diversity of physiological ecology and reproductive studies. Physiological work on desert fishes (1967, 1969) included the (still) highest recorded temperature tolerance for a fish; he also coauthored novel studies on supercooling in reptiles and other organisms (1967, 1968, 1971). With Steve Goldberg and Ken Asplund, Lowe helped to initiate (1964, 1966, 1970, 1997) what has become one of the largest series of histological studies of reptile reproduction in North America.

At this time, Lowe also became involved with studies of the signature plant of the Arizona desert, the gigantic saguaro cactus, and here too his work was characterized by syntheses and conclusions based on broad views of biological processes and their interconnections. For example, he coauthored with Robert Whittaker and William Niering a classic paper (1963) on the saguaro that reflected a maturation of the field of ecology. He brought together high-powered lab and field studies of ecology and cold-temperature physiology of columnar cacti (1966, 1967, 1969, 1970) that pointed to cold as a key factor in what appeared to be a troubling decline of the saguaro in the Tucson region and was junior author with his colleague and former student, Scotty Steenbergh in a three-volume autecology of the saguaro (1976, 1977, 1983).

During work centered on the 1960s, Lowe and his laboratory associates initiated something unique—an intensive exploration of landscape ecology and autecology in the context of physical and physiological relationships and adaptations. There remains the question of why this work is not within the mainstream of modern ecology. Lowe frequently focused on the importance of substratum, temperature, and water balance. Although he acknowledged the multivariate nature of animal ecology, he tended, like Shreve (see J. E. Bowers, 1988, *A Sense of Place: The Life and Work of Forrest Shreve*, University of Arizona Press, Tucson), toward a dismissive attitude toward species interactions. Mainstream ecology, however, moved into a theoretical modeling mode, dominated by Robert MacArthur’s focus on species interactions, especially competition.

Lowe’s work, particularly on the saguaro, was notable for demonstrating connections from individual physiology to population processes and problems of species conservation. Although physiological ecology is usually done by expert physiologists interested in ecology, Lowe was, uniquely, a leading natural historian and animal ecologist who combined state-of-the-art physiology with biogeography, evolution, and field-observed natural history. Physiological work at this

level is so technically demanding, so expensive, and so divergent from the usual mindset of natural historians that few have had the capacity for it. Key ecological and conservation processes—which may be constrained within the connection between organismal performance and population dynamics—must usually be expressed, or translated, through the intermediate mechanisms of species interactions, a still-maturing discipline whose study requires its own unique skills and intensive resources. Thus, the connection Lowe sought between physiological ecology (or more broadly, performance physiology) and population and community ecology is still a developing field of enquiry calling for a broader synthesis than has yet been achieved.

Although the 1970s were a frustrating time for Lowe and many associated with him, he nonetheless managed to publish a few papers in herpetology and helped develop a firm, and still-standard, classification system for the vegetation and biotic communities of the southwest (1973, 1974a,b, 1977a,b, 1979, 1980a,b), a project brought to full fruition by David E. Brown (1982, *Biotic Communities of the Southwest*, *Desert Plants* 4:3–341) in a landmark publication.

During the nearly lost decade of the 1970s, Lowe also initiated a phase of his career that increasingly focused on herpetofaunas and their conservation, which revitalized the latter part of his career. This began with participation in and support for faunal survey work, such as that of Terry Johnson, now the central figure in conservation at Arizona Game and Fish Department, at Rosemont Junction in the Santa Rita Mountains; and with lasting collaborations with Tom Van Devender (1977), Cecil Schwalbe (1986, 2000), David Lazaroff, and Peter Holm (1986, 1987, 1991) and myself (1994, 1995a,b, 1996). Lowe had a long-standing love of the Gila Monster as a “heroic species” in the southwest, with more masses of unpublished data cached in the bowels of the lab than published results (1954, 1955, 1961, 1983, 1986), and in the 1970s and early 1980s this long-standing interest began to bear fruit. He helped Brent Martin initiate the longest running (though as yet unpublished) study of the Gila Monster, and collaborated with his student, Dan Beck, on an array of studies of beaded lizards (1991, 1994, 1995) that may culminate in a definitive book on the genus *Heloderma*. It is remarkable that during the 1990s, Lowe participated in more publications and major reports than during either of the previous two decades. He had reinvented himself (Fig. 4) as a participant and mentor in the emerging field of conservation biology, in tandem with the rekindled impor-



Fig. 4. Lowe in about 1993. Photo by Tom Wiewandt (www.wildhorizons.com).

tance of grasping fundamental natural history and the newfound need to apply that grasp to the accelerating problem of ecological loss.

In all, Charles Lowe's publication record is remarkable for its breadth, its depth, and the color of its syntheses. One might hope to appreciate, in a lifetime, some of what he managed to absorb, although few of us can aspire to such diverse creative originality. As we move forward into a decisive battle to preserve the planet's natural heritage for centuries to come, publications motivated by the conservation ethic will likely continue to emerge with Lowe's name justifiably attached.

This short essay on the life and times of Charles H. Lowe Jr. touches upon but leaves unanswered many questions we have about his life—the nature of, and the driving forces in the creative process of a highly successful natural history laboratory; the complexity of Lowe's motivations and intentions; the joys, love, pain, and sorrows in his relentless pursuits with students and collaborators; and certainly not least, the wealth of anecdotes, stories, and legends that enter the realm of herpetological history.

The Tucson Herpetological Society has established the Charles H. Lowe Jr., Herpetology Research Fund, which will accept contributions in his honor, and the Arizona-Sonora Desert Museum will also accept such contributions.

The following list of 24 masters and 23 doc-

torates (with degree achieved and date) may include all those for whom Lowe was officially committee chair. The dates are best available estimates, sometimes based only on date of thesis, which may precede the actual date of degree. Also included (marked with an *) are those for whom he made a primary contribution to completion of a successful degree program, without serving as committee chair: Joseph A. Beatty (MS 1961), Daniel D. Beck (Ph.D. 1991), Robert L. Bezy (Ph.D. 1970), R. A. Blake (MS 1970), Eldon J. Braun (Ph.D. 1969), Charles J. Cole (Ph.D. 1969), Dennis O. Cornejo (MS 1985), John K. Cross (Ph.D. 1979), Richard S. Felger (MS 1959, Ph.D. 1966), J. Homer Ferguson (Ph.D. 1964), Gerald O. Gates (Ph.D. 1963), Alfred L. Gardner (MS* 1965), Stephen R. Goldberg (MS 1965, Ph.D. 1970), Penelope A. Graf (MS 1965), David H. Greeger, E. Annette Halpern (MS 1966, Ph.D. 1970), Wallace G. Heath (Ph.D. 1962), David S. Hinds (MS* 1963, Ph.D. 1970), Peter A. Holm (MS 1988), C. Wayne Howard (Ph.D. †), Keith E. Justice (Ph.D.* 1960), Richard D. Krizman (MS 1964, Ph.D. 1972), Peter J. Lardner (Ph.D. 1969), Eric Larson (Ph.D. 1986), Larson, Mervin W. (MS 1957); Edward P. Lincoln (MS* 1965), Brent E. Martin (MS 1995), Robert D. McCord (Ph.D. 1997), Thomas W. Mulroy (MS 1971), James L. Patton (Ph.D.* 1969), John S. Phelps (MS 1971), Michael D. Robinson (Ph.D. 1972), Philip C. Rosen (Ph.D. 2000), Julia V. Salmon (MS 1989), Cecil R. Schwalbe (Ph.D.* 1981), Toby F. Shaman (MS 1962), Wade C. Sherbrooke (MS 1966), E. Linwood Smith (Ph.D.* 1971), Oscar H. Soule (MS 1964, Ph.D. 1969), Warren F. Steenbergh (MS 1967), Carl Tomoff (Ph.D.* 1971), John W. Tremor (Ph.D. 1962), Velma J. Vance (MS 1953), Peter L. Warren (MS 1979), Thomas A. Wiewandt (MS 1970), Elizabeth B. Wirt (MS 1995), John W. Wright (Ph.D. 1965), Tien Wei Yang (MS 1951, Ph.D. 1958), Frances Wimsatt Zweifel (MA*, 1956).

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