

SAGES and surgical education

Assuring that history does not repeat itself

N. J. Soper

Washington University School of Medicine, 660 South Euclid, Campus Box 8109, St. Louis, MO 63110, USA

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The Society of American Gastrointestinal Endoscopic Surgeons (SAGES) is a unique organization dedicated to research, education, the acquisition of surgical skills, and improved surgical care through the use of new technologies, all approached in a spirit of serious scientific endeavor combined with a refreshing sense of humor. As such, it has been both an honor and a pleasure to serve as your president. My personal involvement with SAGES began shortly after I started performing laparoscopic cholecystectomy and realized that laparoscopy undoubtedly represented the future of abdominal surgery. This new technology created a demand for the training of both resident surgeons and practicing general surgeons in the skills required to perform these procedures safely. I quickly became a laparoscopic convert, eager to proselytize among the nonbelievers whose ranks then included many leaders in academic surgery. Ten years ago, SAGES initiated standardized, hands-on teaching programs in laparoscopic cholecystectomy and I soon became a regular in these courses. Thus, my involvement with SAGES began in the educational milieu. However, while SAGES has continued to be strongly involved in surgical education, there are many roadblocks that may hinder effective surgical education in the near future. In this address, I hope to outline both the challenges and the potential responses to these challenges that fall within the purview of this unique surgical society.

A brief history of surgical education

Surgical education, as we know it today, is largely a product of the late 19th and early 20th centuries. Prior to that time, surgeons and barbers practiced little more than bloodletting and debridement. Upon the chartering of the Royal College of Surgeons in 1800, a member of the House of Lords declared, "There is no more science in surgery than in

butchering" [10]. With the development of anesthesia and antisepsis, surgery became established as a discipline and surgical education began thereafter. In Germany and Austria in the latter decades of the 19th century, the art of surgery was combined with scientific principles, and apprenticeships were established. William S. Halsted visited several European centers and based his concept of the American surgical residency as closely as possible on the German model.

At the beginning of the 20th century, medical and surgical education in the United States was generally in a state of disarray. Proprietary medical schools were the norm; the faculty at these institutions was paid directly by student fees and there were no education prerequisites for the students. Indeed, "the man who had settled his tuition bill was thus practically assured of his degree, whether he had regularly attended lectures or not" [9]. Most medical schools had no affiliation with hospitals, and clinical experience was hit and miss. The status of US medical schools came under severe criticism in a report prepared by Flexner and the Carnegie Foundation in 1910. The Flexner report recommended that hospitals be brought under an educational umbrella and employ teachers devoted to clinical science, that a 4-year graded curriculum be followed, and that only students with appropriate educational backgrounds be accepted [9]. In response to the Flexner report, proprietary medical schools were phased out and the stage was set for the development of modern surgical education for medical students. However, the nonelective exposure time of students to surgery has been shrinking over the past 50 years, from 18 weeks in the 1950s and 1960s down to 6–8 weeks at the dawn of the 21st century [4]. This is an unsettling trend that may steer students away from surgical disciplines.

Formal surgical residency programs are also largely based on models established during the past century. Halsted initiated the pyramidal residency by which eight interns were ultimately winnowed down to one house surgeon, with an indefinite term of training that averaged 8 years. There was no guarantee that any of the trainees would advance. Halsted's goal was to train surgeons who would go on to develop similar residencies at other leading medical

schools. In 1904, he declared that “the hospital, the operating room and the ward should be laboratories, laboratories of the highest order, and we know from experience that where this conception prevails not only is the cause of higher education and of medical science best served, but also the welfare of the patient is best promoted” [10]. Most American surgical residencies adopted this pyramidal training model, which persisted into the 1970s.

An alternative to the pyramidal residency, the rectangular program of surgical education, was proposed by Edward Churchill at Massachusetts General Hospital in 1939 [3]. This plan called for several surgical trainees to be brought along simultaneously in a graduated teaching program, thus allowing for the simultaneous training of a number of surgeons rather than concentrating on one or two individuals. Virtually all US surgical residencies have since adopted a rectangular program, which fosters a more collegial relationship among residents, since they are not competing for a single top spot.

In the United States, two federal governmental programs have had a marked influence on medical and surgical education—the National Institutes of Health (NIH), established in 1948, and the Medicare and Medicaid Programs introduced in the mid 1960s. The former stimulated biomedical research and placed a premium on the recruitment of faculty who could compete for federal research dollars. The latter established the elderly and poor as “paying patients,” leading to an infusion of income to clinical faculties. This, in turn, prompted a marked expansion of the teaching faculty and made medical schools, teaching hospitals, and surgery departments dependent on faculty practice income [11].

In recent years, surgical residency programs have successfully attracted the best and the brightest of medical students. Data from the 2000 National Residency Matching Program showed that general surgery and surgical subspecialties filled 97–99% of their slots, as opposed to a 73–95% fill rate in nonsurgical programs. The surgical profession therefore should be considered fortunate, particularly if Flexner’s 1925 comment is correct: “Though medicine can be learned, it cannot be taught” [11]. Whether this trend of attracting the most outstanding medical students to surgical fields will continue remains to be seen. In fact, preliminary results from the 2001 match are less encouraging, with more than twice as many unfilled categorical slots as in 2000.

Postresidency education is critical to the successful maintenance of an individual’s surgical career. As William Osler stated, “The whole art of medicine is an observation . . . but to educate the eye to see, the ear to hear, and the finger to feel take time . . . to start a man on the right path, is all we can do” [16]. During the 40 years or so between graduation from medical school and retirement from a surgical career, only 5–7 years (or 12–17% of that career) are spent in the surgical residency [24]. Thus, continuing surgical education, whether through deductive reasoning and self-education in response to clinical experience or by attending formal continuing education programs, must be a major touchstone throughout a surgeon’s career. This concept is of personal significance, in that the majority of my clinical practice consists of laparoscopic procedures that were not even in the surgical armamentarium when I finished residency training in 1986. I thought that the current

situation—new operations spawned by a technological “revolution”—was unique to the present, with the widespread adoption of laparoscopic and other minimally invasive surgical techniques. I was therefore pleasantly surprised to read Frank Spencer’s presidential address to the International Cardiovascular Society meeting 25 years ago in which he stated, “Clearly, a large part of education, especially in this age of rapid obsolescence of knowledge within a few years, should be in the postresidency years. This seems particularly significant to me, for over 90% of the operations I currently perform simply did not exist when I finished my residency.” [24].

Continuing education for surgeons has largely been comprised of didactic postgraduate courses, for which the participants receive certificates of attendance. Other than the Advanced Trauma and Life Support (ATLS) course offered by the American College of Surgeons (ACS), very few formal hands-on training initiatives have been available. Beginning with intestinal stapling courses in the 1970s, surgical instrument companies have sponsored training opportunities to allow surgeons to gain familiarity with new surgical instruments. Only in the last few years have surgical organizations begun initiatives to incorporate the assessment of the competence of the surgeons who participate in these educational programs. Most recently, the ACS program on ultrasound training has applied measures for competence assessment, and this practice is sure to be extended to other areas.

The lack of effective mechanisms for conducting postgraduate education in new surgical techniques and technologies became evident when organized medicine proved unable to train surgeons in laparoscopic techniques in the early 1990s. Traditional academic educational centers were bypassed; instead, industry and practicing surgeons held courses in a totally unregulated fashion. There was little if any oversight of this “educational” activity that at times seemed to be influenced more by considerations of financial gain for the faculty than the needs of the students—a 1990s version of the proprietary schools of a century earlier! Poor patient outcomes and a burgeoning literature documenting the deleterious consequences of the learning curve for laparoscopic procedures soon followed [22]. The major centers of academic surgery too often turned up their noses at laparoscopy and declined to participate in the early investigative phases of its adoption. The well-established surgical societies and journals likewise were skeptical of laparoscopic surgery. Indeed, this situation led S. Schwartz to comment that “the speed of change has resulted in a scenario where the more senior educators, usually those responsible for the structure and format of educational programs, are the least informed about modern elements” [21].

Certainly, it was the patients who suffered most from the unregulated free-for-all that characterized educational programs in laparoscopy a decade ago. Fiddling with lasers in a pig’s belly on a Saturday did not adequately prepare a surgeon to perform his or her first laparoscopic cholecystectomy the following Monday. Poor patient outcomes and negative publicity ultimately led to faltering attempts by governmental bodies to regulate laparoscopy [15]. The passage of time and the universal incorporation of basic laparoscopic procedures into surgical training programs has dulled the perceived need to implement systems that would

prevent the recurrence of such a situation. However, the teaching of advanced laparoscopic skills in many residency programs is not adequate. According to the American Board of Surgery, in 1999 the mean number of advanced laparoscopic procedures performed by graduating trainees was <10. In response to this perceived shortcoming, at least 50 laparoscopic fellowships have been established in the United States, although they are totally devoid of programmatic oversight or mechanisms to guide the trainees' educational agendas. As other new minimally invasive techniques are implemented, George Santayana's warning is apropos: "Those who cannot remember the past are condemned to repeat it."

The teaching of technical skills in surgery has been largely ignored on a programmatic basis. It was assumed that graded exposure and supervised operating would result in technical facility. In the United States, "see one, do one, teach one" has been the rule. Several objective systems for the teaching and assessment of technical skills have been developed, most notably the objective structured assessment of technical skills system [13]. Interestingly, the emergence of video laparoscopy, which requires a new set of technical skills (video-eye-hand coordination) and is viewed on a two-dimensional video screen, has led to a renewed quest for appropriate models for the teaching of technical skills. These include various simulators and virtual reality models. Although many of the virtual reality models are currently "cartoonish," additional computer power and concerted effort should ultimately resolve these limitations.

The role of SAGES in surgical education

SAGES began in 1980 as an exclamatory statement of the right of surgeons to perform flexible gastrointestinal endoscopy. The society was formally incorporated in 1981, but its first freestanding scientific session was not held until 1986, or only 15 years ago. A video library was established with the help of the Ciné-Med corporation in 1988. Since then, it has grown into a definitive video resource for endoscopic education, including both flexible and rigid endoscopic techniques. With the introduction of laparoscopic cholecystectomy, SAGES sponsored many hands-on training courses, known as the "Training the Trainers" series. This program was designed to introduce safe laparoscopic techniques to academic centers, which in turn could then teach them to the local community. In 1990 alone, 22 practical courses were held in 18 cities, and >300 surgeons were taught laparoscopic cholecystectomy using the porcine model. Realizing that one organization could not single-handedly handle the growing number of surgeons demanding to learn laparoscopic techniques, SAGES developed a process for course endorsement in 1991, mandating specific educational criteria to assure the highest level of teaching competence.

At the SAGES annual meeting in Monterey, CA, in 1991, a hands-on course was held to teach the basics of laparoscopic suturing; it was the first SAGES meeting I attended, and I served as an instructor for this course. In 1992, the SAGES organization teamed with Ethicon Endo-Surgery to offer a practical course for surgical residents in flexible endoscopy and basic laparoscopy. These courses

have been given annually since 1992 and by now have trained >1000 residents. Dr. Jeff Ponsky, a past president of SAGES, has served as the director of this very popular program.

The SAGES board of governors developed and issued the "Framework of Post Residency Training" in 1994, which served as the template for the American Medical Association's guidelines for postresidency training and credentialing. In the same year, SAGES became a CME-granting organization. At the annual meeting in 1995, a hands-on course was held in gastrointestinal flexible endoscopy for practicing surgeons. Since that time, applied courses have been offered at every annual meeting, including courses on ultrasound techniques, the laparoscopic management of common bile duct stones, mini-laparoscopy, solid organ surgery, and colorectal surgery. Each of these courses has been oversubscribed. In 1997, in cooperation with US Surgical Corporation and Ethicon Endo-Surgery, SAGES initiated biannual courses in advanced laparoscopic surgery for surgical residents and teaching faculty. The first nurses' seminar, designed to support and promote education for the entire operating room team, was incorporated into the 1997 annual meeting.

In 1998, SAGES published its first manual of laparoscopic surgery, which was written and edited by numerous SAGES members. A second manual is currently being developed for advanced laparoscopic procedures. In 1998, the SAGES Education and Research Foundation was established to support these activities into the future. In 1999, SAGES developed the Fundamentals of Laparoscopic Surgery (FLS) program, which is now nearing its final form. This is a CD ROM-based educational and testing program designed to assure competence in the basics of laparoscopic surgery. The program includes a validated laparoscopic skills training and testing portion [5]. The goals of the FLS program are to impart the basic knowledge of laparoscopic principles to surgeons and to promote the mastery of the basic technical skills necessary for the safe performance of laparoscopy. During the past year, SAGES has joined together with the Society for Surgery of the Alimentary Tract and the American Hepato-Pancreatic Biliary Association to forge a framework aimed at developing effective, responsible, and responsive postresidency fellowships in noncolorectal abdominal surgery. It is only through this combined effort that the American Board of Surgery can be persuaded that such fellowships are necessary to educate surgeons in the 21st century. SAGES has thus established itself as an organization that embraces and fosters educational programs, both for surgical trainees and practicing surgeons.

Current challenges to surgical education

Effective surgical education is currently being threatened on a number of fronts. The first concrete challenge is dealing with the recent cutbacks in financial support for medical education. The federal Balanced Budget Act of 1997 has had a profound negative financial impact on major academic health centers. This act aims to cut Medicare payments by \$110 billion dollars from 1998 to 2004. These cuts particularly affect teaching hospitals, in that funds to cover uncompensated care (40% of which is done by teaching

hospitals, which comprise only 6% of all hospitals) are being decreased by 3–4%, while funds to defray the direct and indirect costs of graduate medical education are being cut by 29% [7]. The real and anticipated financial crisis created by these cutbacks has led to budget deficits, layoffs, and merger dissolutions. As the fat has been trimmed from the delivery of medical care, all other indirect funding for education, including industrial contributions to medical and surgical societies, has also become increasingly lean.

In my view, the second major challenge facing surgical education is the lack of time in which to perform teaching activities. Onerous documentation guidelines have been enforced; these guidelines require significant time and effort to fulfill the necessary paperwork, under the threat of huge financial penalties for noncompliance. Mandated decreases in resident work hours will also diminish educational opportunities between teaching faculty and surgical trainees. As is true in all other disciplines, time equals money in the surgical world. The growing trend for managed care networks and insurance companies to lower reimbursement as a consequence of Medicare cutbacks has adversely affected the personal finances of all surgeons, both in private practice and the academic setting. In 1994, the mean gross collection percentage of fees for service business in general surgery was 65%; the corresponding figure for 2000, according to the Medical Group Management Association Cost Survey, was 48%. In academic practices, the median gross collection in 2000 was only 39%. In order to maintain personal and departmental revenue, case loads have been increased, with a corresponding diminution in time available for teaching activities. In the operating room in particular, where current charges at my institution are \$20–\$30 per minute, there is great pressure to complete cases rapidly. Naturally, this limits the time to teach and learn applied technical skills at a measured and deliberate pace in the operating room.

Given these financial pressures and the perceived need to generate income, there is less emphasis on educational activities among teaching faculty. This proprietary behavior serves poorly as role modeling and has weakened our professional standing and public esteem. Our very profession is at risk of being viewed as a commodity—“like cotton and pork bellies”—to be bought and sold on the open market [17]. A profession is characterized by its development of a socially valuable body of knowledge with member-defined standards of expertise [19]. In addition to its base of knowledge, a profession has a sense of community, a code of ethics, and an obligation to place service considerations over proprietary ones—features that can only be passed on to the next generation of surgeons by effective teaching and mentoring.

A third challenge to surgical education is the relative lack of rewards for teaching activities within departments of surgery. A recent survey of surgical chairpersons conducted by the Association for Surgical Education shows the seriousness of this problem. Of the respondents, 41% believed that tenure could be granted on the basis of educational activities alone, 29% believed there were financial disincentives to teaching activities, and only 10% confirmed that separate remuneration was received for educational activities [20]. As opposed to the financial rewards assigned to obtaining extramural research funding or generating clinical

income, “very few schools, if any, included educational ‘productivity’ as part of the [practice plan pay] formula” [11].

Finally, there are huge and unresolved challenges inherent in the teaching and learning of new technologies at both the resident and postgraduate level. These challenges include the cost-effective application of new technologies, choosing among multiple competing technologies for which one may be the “winner,” and the mechanism whereby effective skills can be mastered. New technologies demanding additional training for technical mastery prior to incorporation into surgical practice at the current time include, but are not limited to, the following: the intraluminal treatment of vascular and gastrointestinal disease, radio-guided surgery, concise parathyroid surgery, surgical applications for ultrasound, ablation techniques for solid organs, and robotics. Although surgical “cowboys” are needed to explore the limits of the envelope with emerging technologies, it is only through carefully developed and administered educational programs that new techniques can be disseminated widely without harming patients. Above and beyond the imperative to develop educational programs, it is necessary to develop and validate means by which technical competence can be assessed and assured.

Rational response to educational challenges

Given these substantial and critical limitations to the educational mission, surgeons must support educational endeavors. Although they have historically been negligent in this arena, surgeons must teach policy makers and the public about the importance of adequate funding for medical and surgical education. Modifications of the Balanced Budget Act are needed to preserve major teaching hospitals. Some form of universal health care coverage and a mechanism to allow funding for medical and surgical education are also imperative [18]. These goals are obviously lofty and involve national policy; surgeons need to step forward and make their voices heard.

Second, a means of rewarding teaching activities must be instituted at academic medical centers. In most medical schools and teaching departments, “only the scholarship of discovery, and not the scholarship of teaching, integration, and application, has been considered the appropriate standard for faculty advancement” [11]. A model for recognizing and rewarding educational activities within departments of surgery has recently been proposed by the Association for Surgical Education [20]. This system establishes criteria for the documentation and promotion of contributions for educational activities among surgical faculty. We, as general surgeons, need to focus our efforts even more strongly on attracting the high-caliber students that have chosen our speciality in the past.

Third, we must strive to establish mechanisms for the effective transfer of knowledge and skills to surgeons who want to incorporate new techniques and technologies into their practices. At the surgical training level, this requires the establishment of firm educational criteria for, and oversight of, fellowships in laparoscopic and minimally invasive surgery. Support of the current combined initiative of gastrointestinal surgical societies should help the American

Board of Surgery to recognize the wisdom of this approach. For practicing surgeons, the recent creation of the Committee on Emerging Surgical Technology and Education by the American College of Surgeons is a small first step in the process.

Fourth, surgeons must be involved in the development and application of realistic surgical simulators and virtual reality teaching systems. According to Moore's law, computing power has doubled each year for the last 35 years [12]. Therefore, it is likely that the hardware and software necessary for these tasks will be available in the relatively near future. This would allow technical skills to be learned outside of the operating room and facilitate skill acquisition in an organized fashion. Such simulators may also improve the ability to assess true competency of surgical technical skills [14].

SAGES is uniquely positioned and qualified to treat many of these challenges as opportunities. Given our recent track record of educational initiatives, we can leverage our position to effect positive change. This will require lobbying efforts, the creation of postresidency fellowships, roll-out of the FLS project, and continued input to graduate and postgraduate surgical education initiatives. We must also help to lead initiatives to assess and document competence among surgeons.

Finally, and on a more personal level, surgeons must work to be good teachers and mentors. Surgeons are doctors. The very term "doctor" (L. *docera*, 'to teach') implies that we are all teachers as physicians. We therefore don't choose to be teachers; as doctors, we *are* teachers. On an individual basis, then, one can either choose to be a good teacher or to ignore this covenant and simply do it badly. Here I will offer several quotations from individuals far more knowledgeable than I to emphasize the importance of teaching and being a teacher. Hava Felix: "To teach is to create a space in which obedience to truth is practiced." Henry Adams: "A teacher affects eternity; he can never tell where his influence stops." The Hippocratic oath, "I will look upon him who shall have taught me this Art even as one of my parents . . . I will impart this Art by precept, by lecture, and by every mode of teaching . . . to disciples bound by covenant and oath, according to the Law of Medicine." The goal of education is to teach others how to learn concepts, rather than simply to impart facts. In the words of Wilder Penfield, "What a great teacher does that is most important is to make it possible for students to share with him his own enthusiasm in the pursuit of knowledge. Learning can hardly be prevented after that."

Who, then, should surgeons educate? I am not simply referring to academic surgeons in formal teaching environments; fully half of the surgeons attending the annual SAGES meeting practice in a "nonteaching" environment. Rather, all surgeons have opportunities on a daily basis to educate those around them. Education and teaching should be imparted to other surgeons, trainees and medical students, surgical personnel, and our patients. Video laparoscopy has allowed the entire operating team—not just the surgeon and his assistant, but also the scrub nurse and circulator—to be intimately involved in the operation. The operating room environment must remain conducive to learning, because "to develop an effective teacher-student question-answer dialogue, there should be comfortable in-

formality, both in the classroom and in the hospital [and in the operating room]. This is the antithesis of the austere professor lecturing from a platform" [23]. Indeed, if I am remembered for anything at the institution where I have practiced surgery for the last 13 years, it will be for introducing music into the operating rooms in a marked departure from the previously tense atmosphere punctuated only by the sounds of the heart monitor and the electrocautery machine. It is amusing that there is even some science behind this practice. Recent studies suggest that the mental strain in surgeons performing laparoscopic procedures is decreased when music is added to the OR environment, while mathematical speed and accuracy improve . . . but only if the music is actually selected by the surgeon [1, 2]. Surgeons can also teach the lay public and legislators by formal and informal mechanisms. Finally, surgeons are responsible to teach themselves as they progress along the circuitous pathway of a surgical career.

An extension of the concept of teaching is that of being an effective mentor, inasmuch as that is how we influence others around us. The act of mentorship is critical to maintain the professional nature of our craft, and it is the most effective way to positively influence career choice. The eponymous term "mentor" is taken from the name of the trusted friend of Odysseus who raised and instructed Odysseus's son, Telemachus, during the prolonged travels portrayed by Homer in the *Iliad* and *The Odyssey*. A mentor is more than a teacher. "Mentors are guides. They lead us along the journey of our lives. We trust them because they have been there before" [6]. To be an effective mentor, one must be an exemplary role model who is skilled in questioning, recognizes students as individuals, ensures a supportive environment for learning, and is liberal with feedback yet patient [8]. The effective mentor also consistently assesses the learning needs of the mentee; without such an assessment, "we will teach facts that are already known, train for skills that have already been acquired, and inspire values that are already shared" [25]. It is only through active and positive mentoring that we will be able to attract the best and the brightest medical students into surgical careers. If what we teach by example is simply proprietary in nature, we will weaken the very foundation of our profession.

I have been very fortunate to have had several key mentors to help guide my career. Frank G. Moody recruited me to the surgical residency he chaired at the University of Utah. Frank exuded enthusiasm for everything that he did and stressed the importance of maintaining a sense of ongoing scientific curiosity. Midway through my surgical residency, I spent a year performing research under the tutelage of Layton F. ("Bing") Rikkens. I will never forget submitting my first attempt at an abstract to Bing and having it returned with red marks obliterating 99% of what had been written. Bing communicates his passion for his work and is living proof that good guys *can* finish first. It was this year in the laboratory that stimulated me to pursue an academic career. After my surgical residency, I spent 2 years performing NIH-funded research at the Digestive Disease Center at the Mayo Clinic under Keith A. Kelly. Keith is a quiet perfectionist and the living embodiment of the gentleman-scholar. Finally, I was recruited to my present position at the Washington University School of Medicine by Samuel A. Wells, Jr. Dr. Wells's persona is larger than life, and he

always stressed the importance of absolute integrity and the value of hard work. These individuals have been true mentors. I am indeed fortunate to have been influenced by each of them.

Summary and conclusions

My message, therefore, is simple. Surgical education is at a critical juncture today, threatened by diminished funding, competing service obligations, mounting paper work, and the need to do more in less time with less support. However, it is only by maintaining effective teaching and mentoring of surgical skills, concepts, and precepts that our profession will remain strong. SAGES is in a unique position to have a positive impact on surgical education in the foreseeable future. Being a doctor mandates that we teach, and we may choose whether to be a good teacher or bad teacher. I urge you therefore to support the concept of education through appropriate legislative action and strive to be a good teacher and effective mentor in your personal life. The act of teaching itself is free, but it requires personal input. "The only thing we have to offer our students is ourselves. Everything else they can read in a book" [26].

SAGES struck a resonant chord with me because of its emphasis on education. What has kept me working actively in the organization is the wonderful individuals involved in its membership and administration. It is important to find those groups and activities that reinforce one's interests and values and become involved with them. Such is my relationship with SAGES, and I will continue to be involved with the organization after this presidential term has finished. Through our continued efforts to advance the science of minimally invasive procedures while also advocating for competence in the techniques required to perform them, we can assure our patients that the educational debacle that characterized the introduction of laparoscopic cholecystectomy will not be repeated. I want to thank you all for the opportunity to serve as your president. It has been a true honor and privilege, and I have gained far more personally than I could ever contribute in return.

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