

# *Sandstone & Tile*

WINTER 2019   STANFORD HISTORICAL SOCIETY   VOLUME 43, NUMBER 1

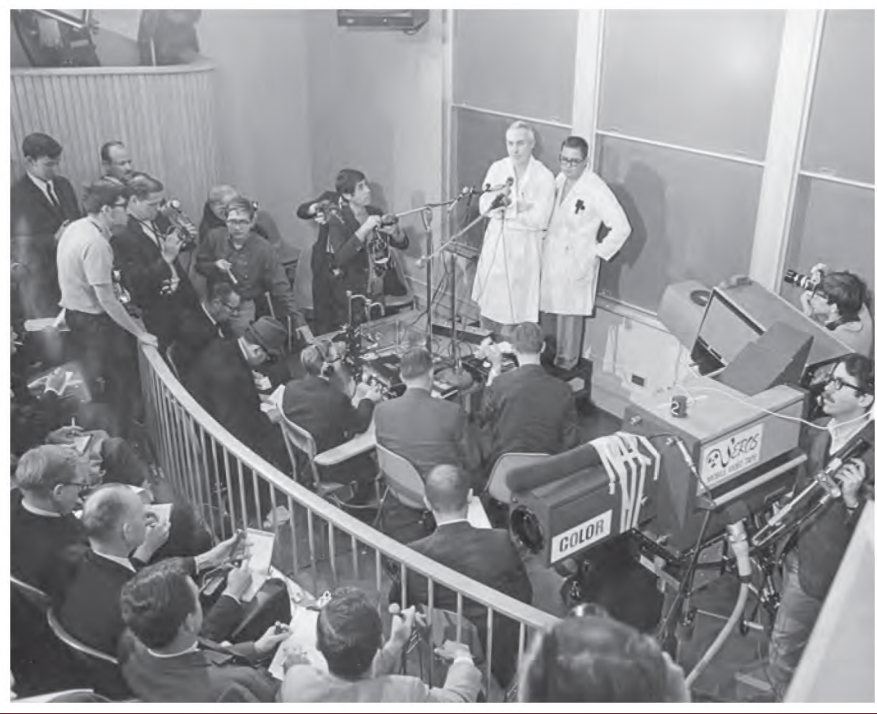


*Memorial Church's Venetian Mosaics*



*Heart Transplants at Stanford*





On January 6, 1968, Drs. Norman Shumway, left, and Donald C. Harrison met the press after they performed the first adult heart transplant in the United States.

**IN THIS ISSUE**

Beneath the Façade: Memorial Church's Venetian Mosaics . . . . . 3

Fifty Years of Transforming Lives:  
The History and Future of Heart Transplants at Stanford . . . . . 15

Stanford in the Last 125 Years . . . . . 22

Sound Bites from the Oral History Program . . . . . 25

Upcoming Society Activities . . . . . Back Cover

**Cover:** Memorial Church and its mosaic façade before the 1906 earthquake.

# Beneath the Façade: Memorial Church’s Venetian Mosaics

SAPNA MARFATIA

*Winner of the society’s 2018 graduate Beyers’ Prize for Excellence in Historical Writing, Sapna Marfatia is the university’s director of architecture.*

The mosaics that embellish Stanford’s Memorial Church façade recall Basilica di San Marco in Venice. Through this artwork, Jane Lathrop Stanford transposed a piece of Venice to California and memorialized dual tragedies—the loss of a son and husband—that shaped her and the university thereafter. The mosaics narrate a story of another struggle—the survival of an ancient craft, creatively adapted by Venetian artisans—and they encourage students to cultivate an elevated conscience.

Like San Marco Basilica, with its commanding position on the Piazza San Marco and in the cultural and civic life of Venice, Memorial Church dominates

the Main Quadrangle and serves, for many, as the conscience, heart, and pulse of the university. While Leland Stanford was aware that the centrality of a church would create tension “with the secular temper of the coming age,” according to author Gail Stockholm, he advocated a multi-faith spiritual foundation that grounded individual scholarly pursuits in true humanitarian values, arguing that it was important to “uphold religion in the face of growing scientific skepticism.” He envisioned the church as a spiritual and communal respite that welcomed the entire community regardless of faith; the first chaplain, Rev. D. Gardner called this

CREATIVE COMMONS



The Basilica di San Marco in Venice inspired Jane Stanford to adorn the façade of Stanford’s Memorial Church with Italian mosaics.

The original Memorial Church was dedicated in 1903.



multi-faith concept a “unique experiment” at the inauguration speech on January 25, 1903.<sup>2</sup> Gracing the occasion, he spoke about the “tremendous possibilities for the cause of religion in its relation to education.”<sup>3</sup>

The significance and novelty of this experiment was unprecedented and had many skeptics, including the university’s faculty members, who opposed the prominence of a church rather than a library. The chaplain explicitly explained that “built in love,” the church was “not to teach a theological system, not to develop a sectarian principle, but to minister to the higher life of man.”<sup>4</sup> Leland Stanford’s vision for his university mandated that a church, instead of a library, be strategically located at the terminus of the main ceremonial entrance. After her husband’s death, through the church’s Venetian mosaics, Jane Stanford played a crucial role in creating a spiritual and cultural message for the university that was filled with personal meaning.

The mosaic façade was the largest installation of its time in America. The glass mosaics not only cover the façade of Memorial Church but also form an integral part of the church’s interior decoration. The work was designed by Antonio Paoletti, the chief artist for the Antonio Salviati Company—a firm renowned for artistic glasswork and restoring the original glass mosaics of the San Marco Basilica, an integral part of Venetian history.<sup>5</sup> Paoletti was 66 years old and at the zenith of his career when the Memorial Church project began. A renowned artist, he created oil paintings that decorated many cathedrals across Europe, and his work was exhibited in Milan, Turin, and Rome. He was commissioned by the Salviati Co. to replicate art for San Marco, which inspired Jane Stanford to commission mosaics for Memorial Church.

## **A MOMENT THAT INSPIRED A CAMPUS AND CHURCH**

The glass mosaics at Stanford are not only a transplanted piece of Veneto-Byzantine culture; they also exemplify a bond linking an American patron, a Venetian artisan-merchant, and an ancient craft. In 1883, during their second grand European tour, the Stanford family visited Basilica di San Marco in Venice, as well as Byzantine churches in Constantinople. Awed by the splendor of the glass mosaics, the family became acquainted with Maurizio Camerino, the English-speaking manager of the Antonio Salviati Company in Venice. They continued to Florence, where, on March 5, 1884, their only son, Leland Jr., died at age fifteen. He had succumbed to typhoid fever, which he had contracted three weeks earlier in Constantinople. His parents were devastated, and Camerino rushed to Florence, making himself available to them as an interpreter. The Stanfords never forgot his kindness and friendship in a desperate time of need and vulnerability.

In memory of their son, the grief-stricken parents founded Stanford University, which opened on October 1, 1891, after six years of planning and building. At the heart of the campus, they envisioned a nonsectarian church where every student—“Jew, Mahometan, a disciple of Confucius or of any other denomination”—would feel comfortable, so that the “religious and moral side of the human character should be thoroughly developed as the intellectual.”<sup>6</sup> The Inner Quadrangle was completed by 1891, but the church had not yet been constructed. Two years later, Leland Stanford died, plunging the university into financial and legal difficulties for six years.

When his estate was released from probate, Jane Stanford immersed herself in the task of completing the university. On May 17, 1900, she returned to Venice to see Camerino, now the proprietor of Salviati & Co. She hired him to embellish the façade of Memorial Church and immortalize the memory of her deceased husband. A collaborative

process of design and implementation evolved between Jane Stanford, the patron, and Maurizio Camerino, the artist-merchant. During her studio visit and afterwards, Camerino once again acted as an interpreter and conveyed Mrs. Stanford’s ideas to Antonio Paoletti, the artist, who converted them into watercolor sketches for her approval.<sup>7</sup>

## **A SPIRITUAL MESSAGE**

Despite Leland Stanford’s intention to create a nonsectarian church, the iconography of the glass mosaics is unmistakably Judeo-Christian. Jane Stanford aimed “to make the edifice sacred by beautifying it...with mosaic pictures relating to the life of our precious Saviour and stories told in the old Bible.”<sup>8</sup> She described the church to President Benjamin Ide Wheeler of the University of California as the “Kohinoor,” a spectacular jewel at the center of campus.<sup>9</sup> Echoing her husband, she added, “I cannot but feel that the education which the students are receiving is secondary, if a religious or spiritual influence is not exerted over them.”<sup>10</sup>

Inspired by a Biblical scene called “The Judgment of Nations,” the façade’s mosaics interpret the twenty-fifth chapter of the Gospel of Matthew. They are 84 feet across and 30 feet high and show Jesus

---

*The mosaic façade by the Antonio Salviati Co. was the largest installation of its time in America. The glass mosaics cover the façade of Memorial Church and form an integral part of the church’s interior decoration.*

---

The first sketch for the mosaic façade, based on the Last Judgment, depicted Christ sorting saved and damned souls. Jane Stanford rejected this version.



Christ welcoming the righteous into the Kingdom of Heaven at the end of the world.<sup>11</sup> Paoletti's initial design presented an interpretation of "The Last Judgment" in a circular pattern of movement. Christ, in the center, sorted the saved souls to his right, and they ascended toward heaven, while the damned move to the left and descend into hell. Jane Stanford rejected this version. She preferred an Eastern Orthodox approach to the Last Judgment, where hell occupies minimal visual space. At her request, Paoletti recomposed the original painting to include forty-seven figures in paradise. Christ, at the center, welcomes them all with open arms.

An inscription in the church's interior west arcade, in a sandstone wall, provides an insight into Jane Stanford's philosophy about life and humanity. It reads, "We must not desire to begin by

perfection. It matters little how we begin provided we be resolved to go on well and end well."<sup>12</sup> She promoted three fundamental ideas through this inscription. First, it suggests that all humanity is equal regardless of religion, race, and economic status. Second, it emphasizes how individuals must resolve to "go on well" by cultivating a conscience, through education, to recognize good from bad. If those correct principles are followed ardently, life will "end well." The mosaics convey a positive message for those who follow the righteous path. Christ does not raise his hand in judgment, as in Paoletti's first painting, but welcomes all by extending both his arms, as Jane Stanford requested. Despite the Judeo-Christian iconography, the art imparts a progressive, radical message that portrays Christ as a savior who belongs to the entire human race.



Antonio Paoletti, chief artist for the Antonio Salviati Co.—the firm that restored the glass mosaics of the San Marco Basilica—recomposed the painting to locate Christ in the center, welcoming all to heaven.

### FROM VENICE TO CALIFORNIA

The glass mosaics that adorn the Memorial Church façade represent a historic westward journey of this art from Constantinople to America. Viewed as the ultimate achievement of Byzantine culture, this ancient mosaic art spread across the Mediterranean from the sixth to the thirteenth century. It attained its zenith in Byzantine Constantinople before reaching the Venetian shores around the twelfth century, when Greek glass mosaicists of Constantinople sought refuge in Venice and brought with them the expertise that led to the art’s rediscovery and transformation.<sup>13</sup> Venice became the foremost center for innovation in *tesserae* production and mosaic art during the Renaissance. Although some of the *tesserae* for San Marco’s early mosaics were probably imported from Constantinople, glass mosaic manufacturing started in Venice during the twelfth century. Art historian Liz James notes that the glass production and trade were a matter of

“great civic pride, reflecting the city’s sense of self and value, an industry that made Venice distinctive and respected.”<sup>14</sup> Gold was the most commonly used color, achieved by fusing a thin leaf of gold between two layers of glass.

---

*Antonio Salviati used groundbreaking workshop-based mosaic production rather than on-site installation techniques. His innovation made Venetian art transportable over vast distances and led to the resurrection of mosaic art in the Victorian era.*

---

Venetian glass artisans work on Memorial Church's mosaics at the Salviati Studios in Venice.



When Antonio Salviati undertook the restoration work at Basilica di San Marco, he used groundbreaking workshop-based mosaic assembly methodology rather than on-site installation techniques. Traditional *tesserae* production and installation was labor-intensive, with each *tessera* laid by hand in a pre-prepared wet mortar bed. Despite having existed for thousands of years, with the growth of automation in the nineteenth century, traditional mosaic art was struggling for survival due to high costs, limited expertise, and competition from other art forms.

Salviati's innovation made Venetian art transportable over vast distances and led to the resurrection of mosaic art in the Victorian era. Instead of the traditional method of drawing scenes directly on a mortared surface, the Salviati Company produced large-scale drawings on paper that were reverse-traced on a backing paper. Once completed, the backing was subdivided into smaller two foot sections and distributed. An individual mosaicist then proceeded to paste *tesserae* pieces face down on the assigned section. Collectively, these sections were

carefully numbered and shipped to locations across the world. On site, mosaicists prepared the façade with permanent mortar, transferred the numbered sheets onto the wet mortar bed, and wiped off the backing paper, exposing the *tesserae*. To convey a hand-laid quality and enhance the play of light, each piece was tilted slightly by hand, creating deliberate imperfections before the mortar bed hardened. This innovative technique enabled mosaic art to travel from Venice to America's Western shore and meet Jane Stanford's challenging schedule to inaugurate the church within three years.

San Marco's original Byzantine glass mosaics, completed around the thirteenth century, are renowned for their simplicity and abstraction, but Renaissance Italy's mosaic art favored a realist technique made popular by Renaissance masters. Memorial Church's nineteenth-century glass mosaic façade exemplifies Renaissance realism rather than the abstract Byzantine style and epitomizes the transfer of the art from Venice to America. Grand tourists of the nineteenth century, like Mrs. Stanford,



created a market across the world that transformed the traditional mosaic craft into a transportable commodity. Still, while nineteenth-century methods saved time and money, it took 12 men from Salviati Co. two years to complete the church's façade, at a cost of \$21,000.

Unmistakably, however, the automated method of production reduced the quality. Otto Demus, a twentieth-century critic and foremost scholar of Venetian mosaics, has vilified the Salviati Company and its Venetian contemporaries for depreciating the quality and value of mosaic art. When compared to Byzantine and Renaissance mosaics, he condemns nineteenth-century mosaic art—particularly Salviati's work—as inferior.<sup>15</sup> Nevertheless, the modern technique enabled mosaic art to survive and made it possible to complete projects in a fraction of the time it would have taken using traditional methods.

STANFORD UNIVERSITY ARCHIVES



Venetian mosaicists prepare the façade of Stanford's Memorial Church.

---

*While nineteenth-century methods saved time and money, it took 12 men from the Salviati Co. two years to complete the church's façade at a cost of \$21,000.*

---

### AN OPTIMISTIC MESSAGE

For the Venetians, Piazza San Marco and Basilica di San Marco together symbolized civic and religious sentiments. Piazza San Marco was “the living center of the city, and the church the place where Venice defines itself.”<sup>16</sup> As an Italian city-state, Venice had successfully “instilled among its citizens a commitment to place common good above private interest,” according to art historian Henry Maguire.<sup>17</sup> Its mosaic art reflected this tradition. The narrative of the city's origin and its association with divinity is embellished across the façade of the basilica in glass mosaics that, he says, “illustrated for Venetians their corporate identity as part of a Christian history focused on the patron saint Mark.”<sup>18</sup> Making the site and the church the “showpiece of the city,” the mosaics symbolically portray a divine plan for success.<sup>19</sup> Maguire and Robert S. Nelson, the authors of *San Marco, Byzantium, and the Myths of Venice*, call the basilica a “state church” elevated to a “position of unequivocal prominence.”<sup>20</sup>

Stanford's Memorial Church and Quadrangle imported and adapted the cultural and rhetorical ideas portrayed by the mosaics of Venice's Basilica at Piazza San Marco. Venice had a “stunning cityscape” that, according to historian Edward Muir, “gave proof of a well-arranged political and social order.”<sup>21</sup> Its “natural beauty ... always a point of civic pride,” was enhanced through “striking architecture, imposing public



Salviatti's specialists work on large-scale art for the installation.

monuments, and the vast Piazza San Marco.”<sup>22</sup> The architecture of Basilica di San Marco, in conjunction with Piazza San Marco, expresses perfectly civic and religious identities. Based on the neoplatonic belief that “outward beauty was a sign of inward virtue,” at San Marco, “the cardinal virtues—Faith, Hope and

---

*Stanford's Memorial Church and Quadrangle imported and adapted the cultural and rhetorical ideas portrayed by the mosaics of Venice's Basilica at Piazza San Marco.*

---

Charity—underlay republican virtues.”<sup>23</sup> Despite their Christian iconography, the glass mosaics of Memorial Church, like those of San Marco, evoke a moral ethos through spirituality rather than religion.

An ornamental vine motif, representing the tree of life from the Old Testament, stretches across the three original arches of Memorial Church. While the arches represent the Holy Trinity, the mosaic figures of Faith, Hope, Charity, and Love, placed between them, evoke civic values. It is possible to interpret the mission of the university embedded within the millions of *tesserae* covering the walls of Memorial Church. As each *tesserae* contributes towards the formation of the art piece, each university member would contribute individually, and collectively they would strive to uplift humanity.



The church's steeple collapsed during the 1906 earthquake, causing significant damage to the interior.

## RESURRECTING THE MOSAICS

Maurizio Camerino's last visit to Stanford, in early 1913, was to reconstruct the mosaics that the 1906 earthquake had destroyed. Camerino once again faithfully reproduced the façade and chancel mosaics from the original Paoletti drawings, safely preserved at the Salviati Company studio in Venice. Because Jane Stanford had died in 1905, she was spared the agony of witnessing the earthquake damage.<sup>24</sup> In the

years after the quake, the Stanford community joined hands and contributed funds and volunteer work to resurrect Memorial Church, the symbol of their institutional pride. The church reopened on October 5, 1913, with the new mosaic work almost completed; further changes in the façade were finalized by the end of December 1916. Once again, Camerino and the Salviati Company mosaicists had stepped up to soften the blow of a Stanford tragedy.

The quake also destroyed the façade's original mosaics.



## BIBLIOGRAPHY

### Primary sources:

Rev. David Charles Gardner Collection, SCo640. Special Collections and University Archives, Stanford University Libraries. Typescript of his address at the dedication of Memorial Church.

Salviati and Company Publications, SCM0247. Special Collections and University Archives, Stanford University Libraries.

Jane Lathrop Stanford Papers, SCo033B. Special Collections and University Archives, Stanford University Libraries.

Stanford University Print Collection, SC1039. Special Collections and University Archives, Stanford University Libraries. Collection of mosaic designs, watercolor paintings, prints, and photographs. Search for "Salviati." Memorial Church items are numbered in the Po42 group.

Stockholm, Gail. Stanford Memorial Church Research Materials, SCo272, boxes 1 and 2. Special Collections and University Archives, Stanford University Libraries

Stockholm, Gail. History of Memorial Church. Stanford Digital Repository. Research notes and typescript "Church Poses Debate with Progress" in *The Stanfords' Personal Charity: Their Vision for Stanford Memorial Church, 1982* [condensed, edited, and published as *Stanford Memorial Church: An Appreciative Guide for the Not-so-casual Visitor*].



In 1913, the Salviati Co. returned to campus to reconstruct the mosaics, which were completed in December 1916 with a reconceived arrangement of windows and mosaic.

### Secondary Sources:

Chatzidakis, Nano. *Byzantine Mosaics*. (Athens, Greece: Ekdotike Athenon, 1994).

Demus, Otto, and Herbert L. Kessler. *The mosaic decoration of San Marco, Venice*. (Chicago: University of Chicago Press, 1988).

Demus, Otto. *The Mosaics of San Marco in Venice*. (Chicago: University of Chicago Press, 1984). (4 volumes)

Demus, Otto, and Ferdinando Forlati. *The Church of San Marco in Venice: History, Architecture, Sculpture*. (Washington: Dumbarton Oaks Research Library and Collection, Trustees for Harvard University, 1960).

Hall, Willis L. *Stanford Memorial Church: the Mosaics, the Windows, the Inscriptions: With Illustrations—Four in Color*. (Palo Alto, 1928).

Maguire, Henry, and Robert S. Nelson. *San Marco, Byzantium, and the Myths of Venice*. (Washington, D.C: Dumbarton Oaks Research Library and Collection, 2010).

Muir, Edward. *Civic Ritual in Renaissance Venice*. (Princeton, N.J: Princeton University Press, 1981).

*Stanford Memorial Church*. (Stanford: Stanford University Publications Service, 1968).

Stockholm, Gail, and Donald T. Carlson. *Stanford Memorial Church: An Appreciative Guide for the Not-so-casual Visitor*. (Stanford: Memorial Church and Office of Public Affairs, Stanford University, 1980).

## ENDNOTES

- 1 Gail Stockholm. Stanford Memorial Church Research Materials, SCo272, Box 1 and Box 2. Research notes and typescript "Church Poses Debate with Progress" in The Stanfords' Personal Charity: Their Vision for Stanford Memorial Church, 1982, [condensed, edited, and published as *Stanford Memorial Church: An Appreciative Guide for the Not-so-casual Visitor*].
- 2 "Rev. D. Charles Gardner Discusses the Policy and Purposes in Establishment of Memorial Church," *Daily Palo Alto* [*Stanford Daily*], January 25, 1903 [text of remarks].
- 3 Rev. David Charles Gardner Collection (SCo640). Dept. of Special Collections and University Archives, Stanford University Libraries, Stanford, California. Address delivered at the Memorial Church dedication Service on Sunday Afternoon, January 25, 1903. He discussed the Policy and Purpose in Establishment of Memorial Church as reported by *The Daily Palo Alto*.
- 4 Rev. David Charles Gardner Collection (SCo640). Dept. of Special Collections and University Archives, Stanford University Libraries, Stanford, California. Address delivered at the Memorial Church dedication Service on Sunday Afternoon, January 25, 1903. He discussed the Policy and Purpose in Establishment of Memorial Church as reported by *The Daily Palo Alto*.
- 5 In 1883, when the Stanford Family visited the San Marco Basilica, Salviati & Co was commissioned by the City of Venice for the restoration of the original glass mosaics. They had been working on these mosaics for 15 years. Seventeen years later, in 1900, Jane Stanford hired the company and artist to create the mosaics for Memorial Church in California. But, Salviati Co., became famous due to four innovations in Blown Glass: fiamma glass – a frost like glass in all colors, trellised vases, opaline glass and the reproduction of classical glasses from Etruscan, Greek and Roman. Gail Stockholm research papers, P 20 of the article "The Glass industry of Venice" claims that Salviati Co, was honored at exhibitions in Paris (1867), Venice (1868), Murano (1860), Rome (1870), London (1870), Naples, Milano, Torino, Vicenza, Triest (1871).
- 6 Leland Stanford to Andrew White of Cornell, May 5, 1890, in Leland Stanford Papers, SCo033A, Box 6, Folder 8. Special Collections and University Archives.
- 7 Weldon Gibson. "The Stanford Mosaics" in *Stanford Review* (March 1953) 11. According to the article, Camerino visited the university in February of 1903 and again June of 1904 for Mrs. Stanford's approvals.
- 8 Mrs. Stanford to Reverend Dr. Gardner, from Cairo, Feb 26, 1904, in Rev. David Charles Gardner Collection SCo640.
- 9 Jane Stanford to President Benjamin Ide Wheeler. Jane Lathrop Stanford Papers, SCo03B, Box 2, Folder 7.
- 10 Jane Stanford to President Benjamin Ide Wheeler. Jane Lathrop Stanford Papers, SCo03B, Box 2, Folder 7.
- 11 Jane Lathrop Stanford Papers, SCo03B, Box 2, Folder 73. It documents that Mrs. Stanford rejected the first sketch by Paoletti, preferring the "welcoming back to the heavenly Home of the Son of God." From Matthew 25:34, "Come ye blessed of My Father; inherit the kingdom prepared for you from the foundation of the world: for I was hungry, and you gave me meat: I was thirsty and you gave me drink: I was a stranger, and you took me in naked and you clothed me: I was sick and you visited me: I was in prison and you came to me." The Memorial Church façade mosaics have been erroneously labeled as the Sermon on the Mount.
- 12 Hall, Willis L. *Stanford Memorial Church: the Mosaics, the Windows, the Inscriptions: With Illustrations—Four in Color*. (Palo Alto, 1928) 62.
- 13 Nano Chatzidakis. *Byzantine Mosaics*. (Athens, Greece: Ekdotike Athenon, 1994) 11, 13. Mosaic art has 4 distinct periods: Hellenic and Roman, Byzantine, Renaissance, and Victorian. During the Hellenic and Roman times, *Opus tessellatum* floors were regularly used as a substitute for expensive marble floors. Mosaic glass became an alternative for these floors. Constantinople was the undisputed center during the Byzantine period. 1071–1084 AD marks the start of the original mosaic decoration of San Marco, commissioned by Doge Domenico Selvo. As a successor to Constantinople's golden age, Venice became the foremost center for innovation in *tesserae* production and mosaic art during the Renaissance. In the thirteenth century, we have a record that Apollonios of Venice trained mosaicists responsible for decorating the Florence Baptistery. After the Renaissance, the art diminished in popularity only to revive in the Victorian Era.
- 14 Henry Maguire and Robert S. Nelson. *San Marco, Byzantium, and the Myths of Venice*. Washington, D.C: Dumbarton Oaks Research Library and Collection, 2010. Print. 234. *Tesserae* (pl.) is defined as small square (usually cubical) pieces of marble, tile, or glass, utilized to compose mosaic. During antiquity, Romans used marble. Glass *tesserae* became prevalent during the Byzantine period. While the Salviati company brochure stated that glassmaking existed in Venice from the fifth century, Liz James states in her essay *Mosaic Matters* that glass manufacturing started in Venice in the twelfth century. A team of British Museum analysts tested the mosaic *tesserae* of San Marco from the eleventh and thirteenth centuries. They have concluded that some of the glass was Western European in origin based on its high potash, lime, and silica content as opposed to the soda-lime-silica glass of Eastern Mediterranean. Therefore, the team combining this information with other evidence was able to posit that glass manufacturing started in the twelfth century, and by the fourteenth century, Venice was one of the leaders.
- 15 Otto Demus. *The Mosaics of San Marco in Venice*. VI, 16; V2, 185. See discussion in Otto Demus, *The Church of San Marco in Venice: History, Architecture, Sculpture*. 197.
- 16 Maguire 255.
- 17 Maguire 135.
- 18 Maguire 255.
- 19 Maguire 255.
- 20 Otto Demus qtd., Maguire 255.
- 21 Muir, Edward. *Civic Ritual in Renaissance Venice*. (Princeton, N.J: Princeton University Press, 1981). 15.
- 22 Muir 15.
- 23 Muir 16.
- 24 The 1906 earthquake caused major damage to the Church structure toppling its tower and collapsing many of its decorative walls. The church underwent extensive seismic retrofit and rebuilding and while most of the building was rebuilt in a manner faithful to the original, the tower was never replaced.

# Fifty Years of Transforming Lives: The History and Future of Heart Transplants at Stanford

---

STANFORD NEWS SERVICE

**I**n 1968, the very concept of transplanting a beating heart from one human to another seemed like science fiction. A visionary Stanford cardiothoracic surgeon named Dr. Norman E. Shumway set about to change that. In the process, he created the standard by which nearly 2,000 life-saving surgeries are performed annually today. Shumway's pioneering three-hour heart-transplant surgery, in January 1968, cemented his legacy. So did his team's decades-long commitment to further transforming transplant protocols and translational science to lower patient rejection and increase survival rates.

At the society's May 2018 annual meeting, a panel led by **Dr. Joseph Woo**—the Norman E. Shumway Professor and current chair of Cardiothoracic Surgery at Stanford—featured insights from several groundbreaking leaders in the field who were trainees on Dr. Shumway's team:

- **Sharon Hunt, MD**, professor of cardiovascular medicine, emerita, and one of the first women in cardiovascular medicine;
- **Philip Oyer, MD, Ph.D.**, Roy B. Cohn-Theodore A. Falasco Professor in Cardiothoracic Surgery, former chair of the Department of Cardiothoracic Surgery, and inventor of the first mechanical heart device;



Norman Shumway, MD, Ph.D., and the Frances and Charles Field Professor of Cardiovascular Surgery, is shown here in 1968, the year he performed the first adult heart transplant in the U.S.

---

- **Bruce Reitz, MD**, Norman E. Shumway Professor, emeritus; former chair of the Department of Cardiothoracic Surgery; and Shumway's partner in the first successful heart-lung transplant.

The panel explored the impact of Stanford's historic innovation on human health and the new directions in cardiovascular medicine that Stanford is leading today—including heart transplantation, heart-lung transplantation, and artificial heart devices. This article is adapted from their remarks.

**Dr. Joseph Woo:** In 1968, at the Stanford Medical Center, Norman Shumway and his transplant team performed the first adult heart transplant in the United States. Afterwards, Shumway said, “This is only the first step. Now the real work and concern begin....to get the project going and to do it properly thereafter.”

Sharon Hunt was on campus when that first heart transplant occurred and will tell us a little bit about what she saw and the excitement around it.

**Dr. Sharon Hunt:** I was here on that day and in the days after. I was a medical student at the time, so I was very peripheral to Shumway’s achievement. And yet I was working in the division and knew all the characters involved. I remember the palpable excitement, especially with the press coverage. There was so much interest in the patient and how this was done. One journalist scaled the hospital wall to our second-floor ICU with a camera and took a photograph of the patient while he was still intubated there.

**Dr. Bruce Reitz:** Stanford in the 1960s and ’70s was really, in cardiac surgery, such an unusual place, with Dr. Shumway as the leader. He established a culture within the department that was friendly to learning, as he liked to say. The concept was that everybody was thinking about how to solve problems, going to the lab, and trying things. Heart transplantation grew out of that. Shumway and Dr. Richard Rowland Lower were looking in the lab at preservation of the heart. One time, they decided to take it out and put it back, and that sparked Shumway’s interest in transplantation.

**Dr. Philip Oyer:** I arrived at Stanford a couple of years after Shumway’s first heart transplant. Between 1968 and 1973, or so, heart transplant donors had to be transported to Stanford Hospital. Donors and recipients would be in adjoining operating rooms. The donor team would take the heart out, and the recipient team would sew it in.

Joseph Woo, MD, Norman E. Shumway Professor and chair of Cardiothoracic Surgery.



Things could be done pretty quickly that way—it took less than an hour from the time blood flow stopped in the donor until it was reestablished in the recipient. Hearts were kept alive by putting them a basin of ice cold saline solution.

Of course, many families didn’t want to go through the trouble of having their loved one’s body transported to Stanford, so we lost a lot of donors because of that. Then, in 1973, somebody had the idea that we could go somewhere else, take the heart out, put in cold saline, and bring it back. We did that for the first time late that year. I happened to be chief resident in training at that time, on the transplant service. The donor happened to be in Oakland, not too far away. My junior resident, Jack Greene Copeland, flew there in a helicopter, while Shumway drove. The heart came back to Stanford, no problem. We put it in, and it worked fine. We’ve now gone as far as Denver and North Dakota in the last few years for so-called distant donor procurement.

Between 1968 and 1971, about 150 heart transplants were done at 50 or 60 centers around the country and maybe the world. There was a great upsurge in 1969, 1970, and 1971. But that curve went down in the early 1970s as quickly as it went up, because hardly anybody survived. The operation itself is straightforward, so any cardiac surgeon can do it. A lot of them tried it, without very good results.



**Woo:** The real explosion in adoption of heart transplantation had a lot to do with the ability to avoid rejection of the organ very effectively. After the introduction of a very critical agent called cyclosporin, there was a marked difference in patient survival rates. This really changed the entire face of transplantation, in heart and other organ systems.

Sharon can tell us a little bit about cyclosporin and the impact that it had on the entire field of transplantation.

**Hunt:** The introduction of that immunosuppression drug had an absolutely huge impact, increasing survival rates from about 40 percent up to 60 to 70 percent. Phil Oyer was actually the guy who managed to get hold of the drug and get us involved in its first clinical trial. Cyclosporin had been used in kidney transplants during the previous decade. We were the first ones to introduce it in heart transplantation, and we published a paper that documented the improvement in survival rates. We did the first heart transplant with cyclosporin at the end of December 1980, and the recipient went on to live about seven years after that.

Cyclosporin is still available and used. It's been succeeded by another drug called tacrolimus, which we use much more routinely these days. It has very similar toxicities to cyclosporin. It's toxic to the kidneys and can promote diabetes, et cetera. We're in crucial need of more, different, and better things. They are coming. Regenerative therapies may be part of it. The Holy Grail will be immune tolerance—where we very specifically suppress immune reaction to a specific donor instead of carpet bombing the immune system. We're a ways from doing that. Currently, immunosuppression is a lifelong commitment for patients.

**Woo:** We talked about cyclosporin and rejection, but we should also talk about how Stanford was really instrumental in developing means to monitor patients for rejection.

---

*The introduction of cyclosporin led to a major difference in survival rates and changed the entire face of transplants in heart and other organ systems.*

---

**Oyer:** In the early days, detecting a rejection was quite a problem. Every patient used to have an EKG twice a day, seven days a week. That was very laborious and not terribly accurate. In those days, nobody left the hospital without rejecting at least once or twice. Usually within the first week or two, almost everybody rejected, whereas today, with advancements, I think maybe 10 or 15 percent of patients have any rejection in the first year.

**Hunt:** In the decade after 1969, there was an unofficial international moratorium on heart transplants, because the initial results were pretty terrible. During that time, Stanford was the only very active program. One of the major improvements during that decade was the introduction of the heart biopsy. It was introduced by a Scottish surgeon who was in training with us at the time, Philip Kennedy Caves. He took an old Japanese biotome, an

STANFORD MEDICAL SCHOOL



Sharon Hunt, MD, professor of cardiovascular medicine, emerita, was one of the first women in cardiovascular medicine.



Bruce Reitz, MD, Norman E. Shumway Professor, emeritus, and former chair of the Department of Cardiothoracic Surgery, was Shumway's partner in the first successful heart-lung transplant.

instrument for taking heart biopsies, and modified it so we could put it in through the jugular vein and guide it, under fluoroscopy, to the inside of the heart and snip off small pieces that we could look at under the microscope. Then, since we needed to know what the heck we were looking at, Dr. Shumway recruited a pathology resident, Margaret Billingham. She ran away with it and created a biopsy grading scale that helped us interpret what we were seeing when we biopsied the heart. That has stood the test of time and has been codified into what is now an internationally accepted grading scale that goes from zero to three, indicating how bad the rejection is. Even though we're working on ways to diagnose rejection noninvasively, this still remains our standard of care.

**Woo:** In 1981, at Stanford, Dr. Bruce Reitz was the first person in the entire world to do a successful heart-lung transplant. Because of that precedent, we, to this day, continue to be the busiest heart-lung transplant center in the country. Bruce can tell us about how we pioneered that surgery.

**Reitz:** In those years, every resident fellow would usually have a project. In the late 1970s, I remember meeting with Dr. Shumway in the hallway, which was usual at the time, because I needed a research project. He suggested looking at *en bloc* heart-lung surgery—where the heart and lungs are attached to each other during transplant—because it was

something that he and Dr. Lower had also wondered about. They had even done it in some early dog transplants. So I got started on that and, long story short, moved from the dog as a laboratory model to small primates and monkeys.

Then, in 1981, after cyclosporin became available, we did a heart-lung transplant on our very first patient, a woman from Mesa, Arizona, named Mary Gohlke. She had seen an article in a newspaper about heart-lung transplants in monkeys, based on a paper that we had presented at a surgical meeting that year. At the time, Mary had been told that her primary pulmonary hypertension had damaged her lungs as well as her heart. There was really no treatment at the time, but if one could magically replace her heart and lungs, it could make a big difference. So, after reading about our monkey experiments, she called Stanford Medical Center and wanted to talk to me. One thing led to another, and we accepted her as a patient.

At that time, patients would stay in the hospital for a long time. Mary was in for six months altogether before she went home to Arizona. Sharon who, by that time, was a transplant cardiologist extraordinaire, became Mary's primary transplant follow-up here at Stanford. Mary then went on to return to work and lived for five more years of good health. Having been a successful lung transplant recipient, she was inundated with letters and cards from people all over

---

*Organ perfusion systems will be the next greatest thing—allowing us to extend the time after we harvest the heart by hooking it up to a machine that pumps blood into it and keeps it alive and beating.*

---

the country. I remember one picture of her sitting in her living room with cards and letters piled about a foot tall. She eventually responded to every one of them—not promising anything, but sharing what her experience had been. It was at least a beacon of hope for a lot of people at the time.

Mary died, not from a transplant-related issue, but from a traumatic injury, when she tripped and fell in her home and may have ruptured her spleen. She had no rejection in her autopsy, and her heart and lungs were free of any disease.

**Woo:** Over the last two decades, the lion's share of heart transplantation has been done in North America. Europe totals up to a little less, and the rest of the world has a very small fraction. That is partly because of donor limitation. There are many, many more patients waiting for heart transplants than there are donors. But we've been doing some things to try to increase the number of available donors. For example, a heart might have been working fine in the donor but had a significant defect in one of its major valves, causing it to be turned down by all of the transplant centers. At Stanford, we can take this heart and repair the valve so that it works fine, then transplant it into a patient.

What else are we doing that's interesting? Dr. Reitz helped pioneer a combined heart and liver transplantation as a block. The heart is attached to the liver, and everything is implanted all at once. It's something unique and different from the way other centers in the United States perform liver and heart transplants. Before surgeries, we're also using 3-D printing technology to, in advance, physically model patients' internal thoracic anatomy so that we can actually see the inside of their chests and help us plan the operations.

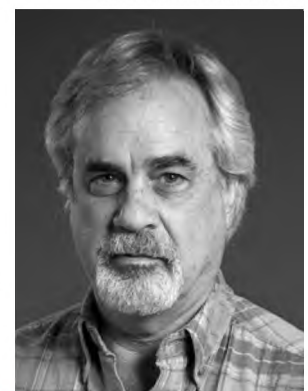
Organ perfusion systems will be the next greatest thing. They will allow us to extend the time after we harvest the heart by hooking it up to a machine that pumps blood into it and keeps it alive and beating. These systems have been used in

a variety of clinical trials and, most interestingly, in the Australian outback, where transplant teams have to travel quite some distance before they can reach a medical center. This technology will revolutionize heart transplantation.

Another unique development is the concept of domino donor transplant surgery. For example, if a patient with lung disease needs new lungs, but for some anatomic reason has to undergo a heart-lung transplant, we dispose of the diseased lungs, but, if that patient's heart is okay, we can transplant it into another human being. Dr. Reitz invented this approach in 1989. Fortunately, lung transplantation improved significantly in the late 1980s and early '90s, and the last domino heart surgery in the U.S. was performed in 1996.

Then, in 2016, Stanford revived the first heart-lung domino operation in the country in 20 years. The two patients, whom we kept separated, said, "We really want to know how the other one's doing." We thought about it and said, "Well why don't you both get healed, go home, be with your families, and then we'll bring you back together when you're healthy and have you meet. And if you're okay with it, we'd like to do this with the media so that we can make people aware of how rare donor organs are—so rare that you, a living person, had to give your heart to someone else." We did that with the press on March 18, 2016. The donor and recipient met each other for

STANFORD MEDICAL SCHOOL



Philip Oyer, MD, Ph.D., Roy B. Cohn-Theodore A. Falasco Professor in Cardiothoracic Surgery and former chair of the Department of Cardiothoracic Surgery, invented the first mechanical heart device.



In March 1981, Dr. Bruce Reitz (left) and Dr. Norman Shumway performed the first combined heart-lung transplant at Stanford Medical Center.

the very first time, and it was a very heartwarming event. There's something else that is very unique about this situation. If you donate your heart to another person, you can actually hear your heart beating in another human being. The donor and recipient have stayed friends and have been very involved with us in our efforts to make the public aware of the scarcity of donors.

We are also pioneering mechanical circulatory support. In 1984, we had a patient with heart failure, and Dr. Oyer, for the first time ever in the world, implanted an artificial heart to allow that patient to survive long enough to get a heart transplant. Since then, those devices have changed quite a bit. The first one sat outside the body. Over time,

we've moved those devices inside the body. The first internal artificial heart was about the size of a dinner plate and sat inside the abdomen. The second generation could sit underneath the ribs. The third generation can fit inside the palm of your hand and sits inside the sac of your heart. The fourth generation is the size of a thumb and can sit inside the heart. The fifth generation, coming soon, is the size of a AA battery and doesn't need to go near the heart. It can sit in a pacemaker pocket. It's smaller than a pacemaker and can take over the function of your heart.

We've also developed technology that can put a charging pad inside a patient, making it possible to charge a device right through the skin. That's

available, but it will be very exciting when super-efficient charging coils can be scattered around your home and other locations, so you can just walk around and charge your devices from ambient wireless energy. That's the future.

We're also looking at the potential for heart regeneration. Stanford was the national center for a trial of patients who were given an artificial heart and then—in a prospective, randomized, placebo-controlled, double-blinded manner—received either stem cells or culture medium. Over the course of a year, the patients were brought back. We essentially turned off their artificial hearts and watched to see how long they could tolerate that. Patients who had received stem cells were more able to tolerate it than patients who had received culture medium. The NIH has now funded a phase II trial, with Stanford as the national center.

**Oyer:** Since 1968, Stanford has been the leading U.S. research center in heart transplantation. Throughout the 1970s, several hundred visitors would come to campus every year to look at our program and see how we were doing things. Dr. Shumway and our cardiologists eventually organized a three-day course once or twice a year.

**Hunt:** Ultimately, it all gelled into training programs where people come out and spend a year or two at Stanford to learn how to do transplants. That's where we are now.

---

*Stanford is also pioneering mechanical circulatory support; the fifth generation is the size of an AA battery and can take over the function of your heart.*

---

**Woo:** Since Shumway and his team performed the first heart transplant in 1968, Stanford medical teams have performed more than 2,000 transplants. Shumway set his all-time transplant record of 65 hearts in 1986, and it took us 29 years to finally match his record. In 2015, under Phil Oyer's leadership, we did 67 heart transplants, and then in 2017, we did 70. That made us one of the highest-volume heart transplant centers in the country. We have the largest continuously active heart transplant program in the world, and, after celebrating our fiftieth anniversary in 2018, we're continuing to research, experiment, and innovate to improve transplant protocols and our patients' health and outcomes.

---

# Stanford in the Last 125 Years 1894–2019

## 125 YEARS AGO (1894)

Nine months after the death of Sen. Leland Stanford, the **first Founders' Day** was celebrated on March 9, the anniversary of his birth in 1824. Jane Stanford was greeted with prolonged applause as she took her place near the platform at one end of the gymnasium. President David Starr Jordan led the event, which included music, a memorial ode, and excerpts from tributes to Leland Stanford delivered at the U.S. Senate. Two of his good friends, former U.S. President Benjamin Harrison and Horace Davis, university trustee and former UC president, were among the speakers. The annual ceremony was expanded in 1905, after the death of Mrs. Stanford, to include the laying of a floral wreath by the graduating class at the Stanford Family Mausoleum.

In 1905, Stanford replaced American rules football with rugby. Then, in 1919, the university's new Board of Athletic Control reinstated football, allowing Stanford to again play the University of California in the Big Game.

In April, the nearby town of **Palo Alto was incorporated**. It was located across the Southern Pacific railroad tracks from campus, and it also was bounded by the established communities of Menlo Park and Mayfield (now the California Avenue area of Palo Alto). A driving force behind incorporation was the community's interest in water and other services. Stanford engineering Professor Charles D. (Daddy) Marx, who lived in Palo Alto, played a major role in developing town utilities, serving the town for 33 years in a variety of roles. Five of Palo Alto's first 12 mayors were Stanford faculty members.

Juniors of the class of '95 began the annual tradition of publishing a student yearbook, the *Stanford Quad*. They selected the name to mark the Quadrangle's importance as the focal point of campus life. Until 1927, it was produced by the junior class. After that, it was compiled by an editorial board open to all students. For lack of interest, the *Quad* died in 2015. Two years later, a new publisher—the *Stanford Daily*—reintroduced it.

STANFORD UNIVERSITY ARCHIVES





In January 1969, a Students for a Democratic Society (SDS) rally in the Old Union Courtyard was disrupted by 50 students organized by the Young Republicans and Young Americans for Freedom, who loudly heckled and waved signs comparing the SDS to Hitler.

### 50 YEARS AGO (1969)

The Program in **African and Afro-American Studies** (later African American Studies) launched in January as the first ethnic studies program at Stanford and the first African & African American program at a major private institution in the United States. Fifteen faculty members were involved, and eight black and five white sophomores and juniors became the first undergraduate majors.

Approximately 40 students organized by **Students for a Democratic Society (SDS)** broke into a January Board of Trustees' meeting at the Faculty Club, calling on trustees to have open meetings and also demanding that Stanford "halt all economic and military operations and projects concerned with Southeast Asia." Eventually, 29 students were penalized with probation and fines; more than 1,200 students signed petitions criticizing the disruption. Two weeks after the scuffle, an SDS rally in the Old Union Courtyard was disrupted by 50 students organized by the Young Republicans and Young Americans for Freedom, who loudly heckled and waved signs comparing SDS to Hitler.

### 100 YEARS AGO (1919)

The Board of Athletic Control restored Stanford to **American rules football**, which had been replaced by rugby in 1905. With this change, Stanford could once again play California in the Big Game. (Rugby would be revived in 1946.) In December 1916, Stanford had accepted an invitation to join the new Pacific Coast Conference (PCC), started in 1915 by Cal, Oregon, and Oregon Agricultural College, for spring sports. But Stanford had no football team, limiting participation to basketball, baseball, track, and crew. Soon after, Washington and Washington State joined the PCC. USC, considered weak in athletics, did not receive an invitation until 1922, along with Idaho. Newly established UCLA joined in 1928. The Pacific Coast Conference was disbanded in 1958–59 over mutual accusations of rules infringement in recruiting and compensating players. Soon after, Stanford joined the American Association of Western Universities, which, in 1964, became

the Pacific-8 Conference (precursor of today's Pac-12).

### 75 YEARS AGO (1944)

Trustees in April voted to **abolish sororities** and use their buildings for much needed general women's housing. Female students earlier had advocated for the change following student and staff complaints that sorority rush was elitist. After a year of committee study, interviews, and debate provoked by a 1943 student petition, President Donald Tresidder and the trustees concluded that excessive competition between sorority women and "hall" women had led to "serious disunity." In future years, many would repeat an often-published story—which is untrue—that sororities were dropped because two women who were rejected committed suicide. In 1977, trustees reversed the ban. Among other conditions, membership would have to be locally controlled to gain recognition. In 1998, sororities were again granted on-campus housing.

---

The **April Third Movement (A3M)** was born at an April 3 mass meeting in Dinkelspiel Auditorium, where students drew up demands to end classified- and war-related research on campus, stop chemical-biological warfare and counter-insurgency studies at the Stanford Research Institute (SRI), and bring SRI under closer university control. On April 9, several hundred A3M protesters took over the Applied Electronics Laboratory, the site of most classified research on campus. The occupation ended just before an April 18 deadline imposed by the Stanford Judicial Council. Student body President Denis Hayes called a meeting of the student body that afternoon in Frost Amphitheater. There, some 8,000 students, faculty, and community members attended an open-campus meeting about classified- and war-related research at Stanford and SRI and about future actions.

At 1 a.m. on May 1, A3M members, determined to **occupy the administrative nerve center Encina Hall**, scuffled with 30 conservative students blocking the front door. About 200 broke in through other entrances. University payroll records were ransacked, and faculty observers reported numerous incidents of students removing files from the building. Provost Lyman summoned sheriff's deputies and, under threat of arrest, the remaining students left just before 7:30 a.m. on May 1. Fourteen students later were suspended and 48 more placed on probation and fined.

Starting a tradition that lasted 27 years, students elected a four-member **Council of Presidents** to run student government. The first team included Patrick A. Shea, John Grube, Barry Askins, and Joyce Kobayashi.

## 25 YEARS AGO (1994)

The **Dalai Lama**, winner of the 1989 Nobel Peace Prize, spoke to a capacity audience at Memorial Church, emphasizing the need for a “global community and universal responsibility.” His two-day visit included two long discussions with faculty groups—one representing the physical and biological sciences and the other humanities and social sciences.

The Faculty Senate approved a **tougher grading policy**, the most significant overhaul in 24 years. The new policy, to be effective in the fall, shifted the add-course and drop-course deadlines to earlier dates; it reinstated the “F”; and it limited students’ ability to repeat classes for higher grades.

—KAREN BARTHOLOMEW  
AND ROXANNE NILAN

## SHS Hosts Workshop for Museums and Historical Societies

On February 25, representatives from historical associations and museums in Pacifica, Morgan Hill, San Jose, and other local areas gathered at the Frances C. Arrillaga Alumni Center for a new Non-Profits Membership and Engagement Workshop hosted by SHS. Society President Laura Jones, Stanford’s director of Heritage Services, gave a keynote speech on maximizing the impact and network of regional historical associations. The 42 attendees, from 24 local organizations, then took part in breakout sessions on membership, mission, publicity, and collaborative programs.

According to SHS Vice President Rick Yuen, the workshop was the brainchild of board member Victor Madrigal, who recognized the strong need to share best practices among local historical associations. “Participants came away from the event with new ideas for organizing programs and recruiting members,” Yuen said, “and there was considerable interest in follow-up programs. SHS was pleased to host this first-ever event, and it’s likely that we will host another engagement workshop in the future.”



# Sound Bites from the Oral History Program

NATALIE MARINE-STREET, ORAL HISTORY PROGRAM MANAGER

## 500 INTERVIEWS AND COUNTING

In March 2019, the Oral History Program achieved an important milestone—the completion of its 500th oral history interview. “Stanford’s oral histories are a true university treasure,” said Oral History Committee co-chair Andy DiPaolo. “Thanks to the collective efforts of generations of society volunteers and the support of the University Archives, the stories of hundreds of Stanford faculty, staff, trustees, and alumni are now preserved for posterity.” The oral histories, he noted, provide not only exciting tales of research discoveries and important university events but also more personal memories of everyday happenings. “These recordings and transcripts,” he added, “will surely be of interest and value to scholars and members of the Stanford community in the future.”

The program’s earliest interviews, collected in the late 1970s, include memories of the university in the 1910s and 1920s. For example, in a 1978 oral history, David S. Jacobson, AB ’28, LLB ’34, provided a fascinating account of student life at Stanford during the 1920s and early 1930s. He covered topics including freshman traditions and tensions between fraternities and residence halls. A longtime staff member, Jacobson also offered recollections of university administrators; described his involvement in fundraising efforts for the university; and recalled the discontinuance of sororities at Stanford in the 1940s.

The 500th interview was with Kathy Ku, the former director of the Stanford Office of Technology Licensing. Ku joined the office in 1981 as a licensing associate, then assumed its leadership in 1991. She retired in 2018 after nearly 40 years of helping Stanford researchers move their inventions into use in the wider world.



SHARI HAUN

Natalie Marine-Street, manager of the society’s Oral History Program

Iris Brest, former associate general counsel and a member of the society’s Oral History Committee, conducted the interview. “You learn so much doing an interview,” Brest said. “Although I have known and worked with Kathy forever, I never realized the full scope and impact of her contributions to the field of university technology licensing, which even earned commendation from the director of the U.S. Patent Office.”

## RECENT ADDITIONS TO THE COLLECTION

*Robert Lesh Baldwin*, Biochemistry

*Paul Berg*, Biochemistry

*Albert Camarillo*, History

*Jane Collier*, Anthropology

*Andy Geiger*, Athletics

*Dudley Kenworthy*, Development

*Donald Knuth*, Computer Science

*Ronald Levy*, Oncology

*William Northway*, Radiology

*John Pencavel*, Economics

*David Prince*, Neurology

*Condoleezza Rice*, Provost / Political Science

*Barbara Tversky*, Psychology

CONTINUED ON NEXT PAGE

**GEMS FROM THE ORAL HISTORY COLLECTION:  
EDWARD RUBENSTEIN BLENDS SYNCHROTRON RADIATION AND BIOMEDICAL IMAGING**

**W**hile Norm Shumway and his team were making pioneering advances in cardiovascular medicine and cardiothoracic surgery, other Stanford scientists were collaborating to bring the heart into better focus. In a 2016 oral history, Edward Rubenstein, MD, professor emeritus of primary care and population health at the Stanford's School of Medicine, talked about his innovative, collaborative, interdisciplinary effort to apply synchrotron radiation to biomedical imaging, especially the challenge of making the heart's blood vessels visible. Oral History Program volunteer Jon Gifford conducted the interview with Rubenstein, who died in March 2019 at age 94.

To read or listen to this and other interviews, visit <https://historicalsociety.stanford.edu/discover-history/oral-history>.

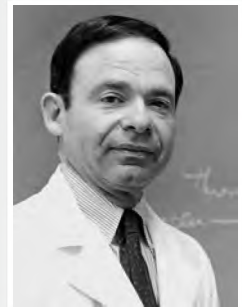
**Edward Rubenstein:** I would say the most important research contribution that I made has to do with synchrotron radiation. This is a very sophisticated area of physics....It has to do with the fact that photons are emitted by particles that bear a charge. When the particle that's bearing charge like an electron gets excited, in a very brief period of time its excitement dies down and it releases energy as a photon. That's where all light comes from: charged particles losing energy....

I realized one day that you could use synchrotron radiation to look at certain atoms, [including]..iodine, which is needed to image blood vessels. All the soft tissues in the body look the same with an x-ray. You can't see a blood vessel as such. You have to fill it with a contrast agent. The typical contrast agent that we use is a molecule containing a lot of iodine. We put a catheter directly in the opening of the coronary artery, squirt the iodine solution directly in the coronary artery, take a picture, and then we can see the iodine and visualize the vessel. That's a very invasive procedure that carries risks....I realized that you could use synchrotron radiation to see iodine at a very low concentration without having to squirt it directly in the artery. You just put a small amount in a vein, wait ten seconds till it gets to the coronary arteries, and take two

pictures with a sophisticated method, which was devised by me and Barrie Hughes.

It's a very complicated bit of physics involving a storage ring, synchrotron radiation, two sets of crystals that select specific energies, and moving the patient with a motorized device vertically through the beam. You can see the coronary arteries beautifully in this way.

Barrie and I used to meet once a week and talk physics. He was wanting to go into medicine, and I wanted to learn more physics. Anyway, one day we decided we'd brainstorm and we came up with this. It took us about an hour and a half to do the whole thing—calculating the iodine thickness, the concentrations, et cetera—and the fact that we needed another device at SLAC [the SLAC National Accelerator Laboratory], called the wiggler. They were just installing one in a beamline, so it worked. It really has changed imaging in a very fundamental way because...we can make synchrotron radiation inexpensively....



Edward Rubenstein, the late professor emeritus of primary care and population health at Stanford's School of Medicine.

## IN MEMORIAM

---

### Former SHS Board Member David Mitchell, '57

On December 19, David Mitchell, a society board member from 2005 to 2011, died at age 83 after battling lymphoma. A graduate of Harvard Law School and a founding member of Palo Alto's Hopkins & Carley law firm, he had worked, since 1993, in nonprofit law, estate planning, and family business succession with Hoge, Fenton, Jones & Appel in San Jose. Mitchell was also a 23-year board member of the Peninsula Open Space Trust.

As a board member of SHS, he chaired the society's Governance Committee from 2007 to 2010 and co-chaired the Oral History Committee from 2010 to 2011, conducting several oral history interviews and actively encouraging the growth of the revived program in its early years.

"Dave was devoted to his community and unfailingly generous with his time and legal wisdom during his service on many local nonprofit boards," recalled former SHS board member Anne Dauer. "He was a man of total integrity and a wise and witty friend." He is survived by his wife, Lynn; their daughters Sarah Mitchell and Betsey Kinney; and three grandchildren.

CHARLOTTE GLASSER



David Mitchell (right) with former society board member Boyce Nute.



Susan Wels, *Editor*  
Stuart Chan, *Designer*

## STANFORD HISTORICAL SOCIETY

### BOARD OF DIRECTORS, 2019-2020

Laura Jones, *President*  
Rick Yuen, *Vice President*  
Pamela Moreland, *Secretary*  
Steve Dunatov, *Treasurer*

Jennifer Cauble  
Katherine Chesley  
Larry Cuban  
Megan W. Davis  
Andy DiPaolo  
Steve Dunatov  
Marie Earl  
David Freyberg  
Daniel Hartwig  
Larry Horton  
Janna Zou Huang  
Laura Jones  
Leslie Kim  
Victor Madrigal  
Susan Maher  
Michele Marinovich  
Pamela Moreland  
Sandra Pearson  
Olivia Popp  
Serena Rao  
Susan Schofield  
Rich Shavelson  
Gail Woolley  
Rick Yuen

### STAFF

Charlotte Kwok Glasser,  
*Administrative Officer*  
Natalie Marine-Street,  
*Oral History Program Manager*  
Emily Frothingham,  
*Oral History Program Assistant*  
P.O. Box 20028  
Stanford, CA 94309  
(650) 725-3332

E-mail:  
historicalsociety@stanford.edu

Office: 351 E, Green Library

### WEB SITE

historicalsociety.stanford.edu



Stanford University  
P.O. Box 20028  
Stanford, CA 94309

Non-Profit Org.  
U.S. Postage  
PAID  
Palo Alto, CA  
Permit No. 28

## STANFORD HISTORICAL SOCIETY MEMBERSHIP

Membership is open to all who are interested in Stanford history and includes the following benefits:

- Exclusive access to members-only events, and to the annual meeting and reception
- Invitations to all SHS programs
- Three mailed copies of *Sandstone & Tile* each year
- Recognition as a donor to SHS and Stanford University

### Membership Categories

- Current Stanford Student \$10
- Society Member \$60
- Contributing Member \$150
- Supporting Member \$250
- Sustaining Member \$500
- Benefactor Circle \$1,000
- Historian Circle \$5,000

Membership is for one year and is tax-deductible to the extent permitted by law. Membership dues are payable by credit card or by check.

To join or renew by credit card, visit our Web site at <https://historicalsociety.stanford.edu/join>. Click on the "Make a gift" link to the Stanford University gift services Web site. You may also make out a check to the Stanford Historical Society and mail it to the society office (see lower left on this page for address). Please use the enclosed envelope for additional donation or gift membership only.

### UPCOMING SOCIETY ACTIVITIES

**April 22** (Film series) *Union Pacific* (1939) 135 min

**April 29** (Film series) *Iron Road* (2009) 90 min

**May 6** (Film series) *American Experience: Transcontinental Railroad* (2007) 105 min

**May 7** 43rd SHS Annual Meeting and featured program: Building the Transcontinental Railroad

**May 13** (Film series) *Once Upon A Time in the West* (1968) 158 min

**May 18** The 150th Gold Spike Celebration at Stanford Mansion

**May 20** (Film series) *The Railroad* (1868) segment of *How the West Was Won* (1963) 20 min; *Hell on Wheels* (2013) 42 min; *This Is America, Charlie Brown: The Transcontinental Railroad* (1988) 24 min