A History of

DUKE PLASTIC AND RECONSTRUCTIVE SURGERY

1934

RANDOLPH JONES, JR.

Prior to the formal development of plastic surgery as a subspecialty, plastic and reconstructive procedures at Duke University were performed by both Dr. Deryl Hart and Dr. Clarence Gardner. In 1934, Dr. Randolph Jones was appointed as the first chief of the division of Plastic Surgery after completing his general surgery residency at Duke.

He served in this position until he was tragically gunned down by a paranoid schizophrenic patient in 1941 who believed he had been mistreated. A total of six bullets entered the surgeon's body before the assailant was overpowered by several other physicians. Dr. Jones' widow, Virginia Jones, who remarried Duke's football coach Wallace Wade, donated money for Duke Plastic Surgery Research in the name of her late husband in 1986 under the stipulation that the donation remain anonymous until her death.

Excellence in
LEADERSHIP

Every chief of Plastic Surgery has contributed in a unique way to building what is now recognized as a top academic, clinical, and educational program.

1944

KENNETH PICKRELL

Dr. Kenneth Pickrell was recruited to join the staff at Duke in 1944 and assumed the role of head of the Division of Plastic Surgery. Dr. Pickrell completed a surgery residency at Johns Hopkins, which included training in all specialties of surgery. He developed an interest in plastic surgery and trained under pioneering plastic surgeon Dr. John Staige Davis in Baltimore. Dr. Pickrell was recruited to Duke and served as chief of Plastic Surgery for 30 years. He also served as chief of neurosurgery for a short time until Dr. Barnes Woodall returned from WWII.

In 1946, he initiated the Duke Plastic Surgery residency training program, one of the first in the country and the only three-year program. Dr. Pickrell trained over 50 residents during his time as chief and was known for his compassion and "little acts of kindness and love." His dedication to the division helped establish Duke Plastic Surgery as a national leader.

1975

NICHOLAS GEORGIADE

In 1975, Dr. Nicholas Georgiade earned the position of chief of the division. Dr. Georgiade held degrees in both dentistry and medicine and completed his residency at Duke in 1954.

During his tenure at Duke, Dr. Georgiade became a highly accomplished and renowned academic plastic surgeon with specific expertise in cleft lip and palate repair, as well as breast surgery. He routinely sought out innovators in all fields of plastic surgery and was known to visit them in order to learn their techniques and incorporate them into his practice at Duke. He rose to leadership positions in nearly every plastic surgery society in the United States. The impact of Dr. Georgiade's work and leadership in Duke Plastic Surgery is still present today.

1985

DONALD SERAFIN

From 1985 to 1995, the chief of the division was Dr. Donald Serafin. It was during this time that microsurgery became a mainstay of plastic surgery at Duke. Dr. Serafin was a global pioneer in reconstructive microsurgery and hosted the prestigious Plastic Surgery Research Council at Duke in 1983. He offered a microsurgical training course that trained over 100 surgeons from all over the world in the microsurgery technique. He published a compendium of flaps for reconstruction that included a video library of flap dissections.

In 1985, Serafin recruited microvascular physiologist Bruce Klitzman to direct the research lab. Among other research, Serafin and Klitzman pioneered several techniques for post-op monitoring of free flaps, including continuous oxygen measurement, laser Doppler flowmetry, and fluorescent tracer appearance in flaps following intravascular injection.

1995

L. SCOTT LEVIN

In 1995, Dr. L. Scott Levin became the chief of Plastic Surgery at the age of 40. Dr. Levin completed an Orthopedic Surgery residency and Plastic Surgery residency at Duke and brought a unique perspective to the division.

Known for his charisma and inspiring speeches, Dr. Levin rapidly ascended to become a world-recognized leader in reconstructive microsurgery, particularly in the field of orthopedic reconstruction, a type of work he often referred to as “orthoplastic” surgery. He served as chief of the division until 2009, at which time he relocated to the University of Pennsylvania to become chair of the Department of Orthopedics.

2009

GREGORY GEORGIADE

Following Dr. Levin's departure, Dr. Greg Georgiade became chief of the division. The son of Nick Georgiade, Dr. Georgiade completed his MD, General Surgery residency, and Plastic Surgery residency at Duke.

Under Dr. Georgiade's leadership, the division grew to 10 full-time faculty performing every aspect of plastic surgery. Dr. Georgiade also piloted a transition in the residency program, from the "independent" track to the "integrated" program which started in 2013. Dr. Georgiade brought Scott Hollenbeck, Suhail Mithani, David Powers, and Alexander Allori to the Duke faculty.

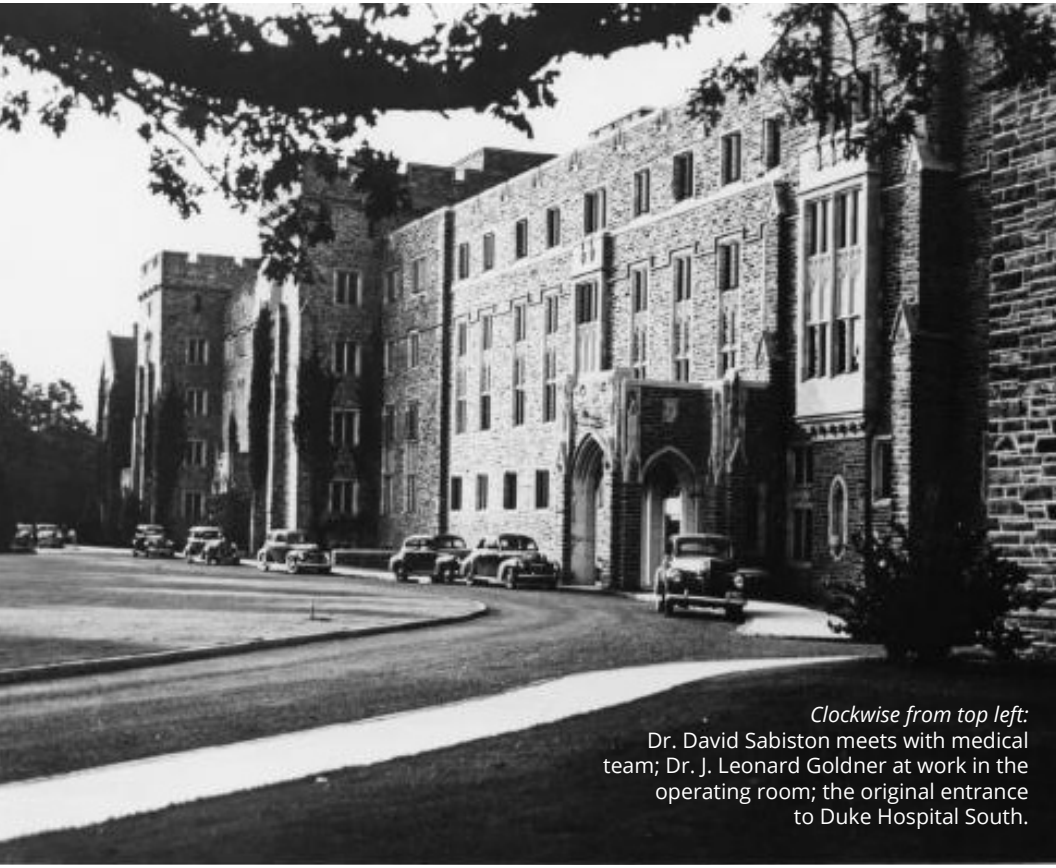
2017

JEFFREY MARCUS

Our current chief is Dr. Jeffrey Marcus, who assumed the position in 2017 after Dr. Georgiade resigned. Dr. Marcus is the first chief of Plastic Surgery to have trained under the integrated plastic surgery paradigm, finishing his training at Northwestern in 2001. He completed both pediatric and craniofacial fellowships at Toronto Sick Kids Hospital. During this time, he was recruited to Duke by Dr. Levin during his fellowship training and traveled between Toronto and Durham to see patients and build a facial reanimation program.

During his nearly 15 years as an attending, he was an innovator, inventing a hybrid MMF device, an excellent educator, and a hospital administrator. As chief of surgery for DUke Children's Hospital (2015–2017), he organized efforts in receiving level 1 designation from the American College of Surgeons in 2016, with Duke being one of only 5 hospitals in the country to receive this status. As chief, his mission statement is "top 5 in 5," and he is committed to making Duke the best plastic surgery program in the country.

Programs AT DUKE



Clockwise from top left:
Dr. David Sabiston meets with medical team; Dr. J. Leonard Goldner at work in the operating room; the original entrance to Duke Hospital South.

Microsurgical RECONSTRUCTION

Within Duke's Department of Surgery, the combined efforts of the Divisions of Orthopaedics, Plastic Surgery, and Neurosurgery established and contributed to Duke's reputation as one of the world's leading institutions for microsurgery.

During the late 1960s, as advances in microscopes and instruments came about, the reconstructive microsurgery program at Duke began. At that time, Dr. J. Leonard Goldner, professor and chief of Duke Orthopaedics, encouraged Dr. James Urbaniak to study the circulation of the flexor pollicis longus tendon. Dr. Urbaniak used the operating microscope to dissect the vincula of the tendon, and subsequently discovered the merits of operative microscopy for surgical procedures.

In 1968, Dr. Susumu Tamai, a Japanese orthopaedic surgeon, described the first thumb replantation. Following this landmark case, the field of operative microsurgery in orthopaedics and plastic surgery began to become a reality. Dr. Urbaniak established Duke's replantation team in the early 1970s, which included Dr. Donald Bright, Dr. Lee Whitehurst, and Dr. Panayotis Soucacos. The Duke replantation team shared their early clinical experience with other replant centers, such as the Buncke Clinic in San Francisco, the Kleinert Kutz Hand Care Center in Louisville, Kentucky, and the Indiana Hand Center in Indianapolis.

At the same time that hand and digital replantation was developing, Dr. Blaine Nashold and his neurosurgical colleagues were already using the operating microscope on a routine basis for spinal and cranial surgery at Duke. Dr. Urbaniak followed the mission of Duke University Medical Center, translating basic science research from bench to bedside. Following Dr. Urbaniak's lead, Dr. Richard Goldner, Dr. Andrew Koman, Dr. James Nunley, and Dr. Scott Levin participated in microsurgical efforts, and the replant service grew. At the time the microsurgical program was developing, the Duke Hand Fellowship Program was established. The program trained plastic and orthopaedic microsurgeons from the United States and abroad—surgeons who were and have remained in positions of leadership in hand surgery and microvascular surgery.

Dr. David Sabiston, the legendary chair of Duke Surgery from 1964 to 1994, set up a dual service line of microsurgery, with Orthopaedics performing the majority of the replantations and Plastic Surgery performing free-tissue transfer. Reconstructive microsurgery as we know it today evolved from the experience with replantation and subsequently with techniques of autologous tissue transplantation. This technique was popularized at Duke by Dr. Donald Serafin and the late Dr. Bill Barwick in the 1970s and early 1980s.

Perhaps the greatest contribution that Dr. Levin made to Duke Plastic Surgery was establishing the Duke Human Tissue Laboratory. This began as a single room in what was the Bell Building that contained a single dissection table and a few instruments for anatomic teaching. Working collaboratively with the Department of Anatomy and with the support of Ralph Snyderman and Robert

Anderson, $300,000 was invested into space that added additional dissection tables and a cold storage facility to store cadavers. The anatomic dissection facilities were modeled after those of Dr. Levin's mentor and teacher, the late Robert Acland of Louisville, Kentucky.

Because of Dr. Levin's interest in anatomic teaching as it relates to reconstructive surgery, the first Duke Flap Course was established in 2001 and evolved to attracting students, residents, and attending surgeons from around the world. This group comes to Durham for 48 hours every August to learn from the best and most prominent reconstructive microsurgeons in the world. Each year, the Marko Godina Traveling fellow attends the course and over the last decade an honorary distinguished Professor has attended as well. Dr. Levin handed the reins of this course to his friend and colleague Michael Zenn, who has expanded the Duke flap experience.

> "The magic of the microsurgical experience at Duke began with conquering the one-millimeter vessel. Subsequently, our ability to reliably execute free-tissue transfer has led to an entire spectrum of microvascular and microneural reconstructive surgeries. The future is bright with the Duke microsurgery team."
>
> Dr. Scott Levin,
> Division Chief 1995–2009

Over the last 50 years, Duke's plastic surgery service has assumed the responsibility of major flaps and microvascular tissue reconstruction. Its diversity of microsurgical procedures leads the country with extensive experience in extremity treatment of trauma, oncologic reconstruction, and the treatment of congenital deformities using microsurgical techniques. Today, the entire armamentarium of microsurgical free tissue transfer is performed at Duke.

Breast surgery and reconstruction has become a field rich in microsurgical techniques. For many years, Duke has been a national leader in breast surgery. Through pioneering work, Dr. N. Georgiade and his general surgeon colleague Dr. Siegler demonstrated the feasibility of preserving breast skin, including the nipple, during a mastectomy. What has now become routine was at one time considered outlandish.

In addition, the technique of using perforator flaps for breast reconstruction was brought to Duke by Dr. Michael Zenn in the early 2000s. In 2010, Duke Plastic Surgery graduate Dr. Scott Hollenbeck joined Dr. Zenn in performing microsurgical breast reconstruction. Dr. Hollenbeck also currently serves as the Director of Microsurgery Training, and has worked to develop simulator models and video training for the current residents. The extremity reconstruction service at Duke includes tumor reconstruction for soft tissue and bone sarcomas, foot and ankle microvascular reconstruction, and limb salvage, for which it is internationally recognized.

The team of extremity surgeons includes Dr. Detlev Erdmann, Dr. Howard Levinson, and Dr. Scott Hollenbeck. Dr. Suhail Mithani joined the Duke Plastic Surgery division in 2012 after completing a Hand Fellowship at Duke. He adds expertise in upper and lower extremity reconstruction and vascularized lymph node transfer for treatment of lymphedema.

The microsurgery program continues to evolve, not only in teaching but with allotransplantation research. The program is currently involved in the development of vascularized composite allotransplantation (VCA), the next step in microsurgery's evolution.

In 2014, Dr. Linda Cendales joined the Duke Plastic Surgery faculty to establish a comprehensive research program in VCA from the bench to the bedside. Dr. Cendales' position as principal investigator is funded by the U.S. Department of Defense to support limb transplantation, a procedure that may help benefit soldiers wounded during combat. She and her team designed and established a VCA model in nonhuman primates and were the first to show that the newest medication approved by the Food and Drug Administration (FDA) for kidney transplantation prevents rejection in VCA in both nonhuman primates and in human hand transplantation. The clinical research program became a reality in 2016, when Dr. Cendales' team successfully performed the first hand transplant in the state of North Carolina.

To quote Dr. Levin: "The magic of the microsurgical experience at Duke began with conquering the one-millimeter vessel. Subsequently, our ability to reliably execute free-tissue transfer has led to an entire spectrum of microvascular and microneural reconstructive surgeries. The future is bright with the Duke microsurgery team."

Left: Dr. Pickrell examines an x-ray (1959).

Above: Drs. Ken Pickrell and Nicholas Georgiade having breakfast with residents and secretaries in 1958.

Programs AT DUKE | CRANIOFACIAL

PEDIATRIC

The Duke Cleft and Craniofacial team was formed in the 1940s, one of the oldest in the country. At that time, new referrals were in the single digits and did not begin to rise substantially until the 1980s and 1990s. In 1996, a team coordinator was added and at that point the team consisted of an audiologist, a speech pathologist, an orthodontist, and three plastic surgeons. Feeding consultation was added in 1997 along with a formalized relationship with perinatology for in-utero referrals in 1999. Dr. Marcus was recruited by Dr. Levin after the two met in Chicago, when Dr. Levin was a visiting professor. Due to Dr. Levin's close relationship with Fu Chan Wei and Samuel Nordoff, the residents in training spent time at Chang Gung Memorial Hospital to gain experience in lip and palate surgery. With the arrival of Dr. Marcus in 2000, the cleft and craniofacial team began to take off. A craniofacial clinic was established for patients to see the entire team in one location; new referrals continued to increase and new relationships were formed between neurosurgery, genetics, pediatric dentistry, and oral surgery.

In 2010, Dr. Santiago, an internationally recognized craniofacial orthodontist, joined the team and brought with him his expertise in nasoalveolar molding (NAM). Dr Santiago was the first Craniofacial Orthodontic fellow at NYU and one of the original developers of the NAM technique. The division began doing NAM impressions in clinic and now routinely performs NAM on the majority

Left: In 1959, Research Associate Maria Matton conducts viability studies on preserved tissues (skin and corneas) in vitro in 1959. Right: Group photo of plastic surgery team in 1961.

of eligible patients. The Cleft/Craniofacial team received Commission on Approval of Teams (CAT) from the ACPA in 2012, which involves the evaluation of the team on six different standards designed to address a patient's medical, psychological, and social needs. In 2013, Dr. Alexander Allori joined the Duke Plastic Surgery faculty and brought his expertise in outcomes research. Dr. Allori's important research seeks to understand how cleft lip and palate deformities affect social integration and educational performance.

ADULT

At Duke, adult craniofacial surgery has been a partnership between plastic surgeons and maxillofacial surgeons. This concept, originally fostered by Nick Georgiade, was further developed by Tom McGraw, DDS, in his work on jaw repositioning and facial trauma. In 2002, Dr. Marcus was designated the Director of the Craniomaxillofacial (CMF) Trauma program, which he formalized and organized into a process/protocol-driven unit. Using an integrated clinic model with Otolaryngology, a set of clinical care processes and guidelines was formalized. Working collectively with the residents in Plastic Surgery and Otolaryngology at both Duke and Johns Hopkins University, the CMF guidelines were transformed to create a published handbook, *Essentials of Craniomaxillofacial Trauma*. This book, edited by Dr. Marcus, Dr. Detlev Erdmann, and Johns Hopkins professor (now Chairman of Plastic Surgery at NYU) Dr. Ed Rodriguez, is in practical use in residency programs throughout the country.

In 2012, Dr. David Powers joined the Duke faculty as a maxillofacial surgeon charged with developing the care of adult facial trauma. He used his experience in the military as an expert in high-energy facial wounds to organize and standardize adult facial trauma care at Duke. Dr. Powers is the Director of CMF Trauma for Duke, bringing further cohesion to the interdisciplinary unit and optimizing care for these patients through his tremendous experience.

SMILE SURGERY

In 2002, Dr. Jeff Marcus and Dr. Michael Zenn began the facial reanimation program at Duke. Dr. Marcus completed a fellowship in Pediatric Plastic Surgery and Craniofacial Surgery at Toronto Hospital for Sick Children, and brought his expertise in smile surgery to Duke. Together with Dr. Zenn, they began seeing patients with all forms of facial paralysis: both congenital and acquired from across the region, country, and even overseas.

To meet the critical need for rehabilitation following surgery, physical therapists Lisa Massa and Kathryn Walker joined the program and tailor therapy for each individual patient.

Innovation in RESEARCH

Over the past 80 years, the Duke Plastic and Reconstructive Surgery division has been a leader in basic and translational research. In part through the leadership of Bruce Klitzman, PhD, the division has made scientific contributions in areas, including flap physiology, ischemia reperfusion, adipose stem cell therapy, and nanotechnology delivery. In line with Dr. Sabiston's philosophy, the great majority of faculty members and resident trainees have taken part in scientific research while at Duke. Listed here are a number of groundbreaking devices and landmark papers from Plastic and Reconstructive Surgery.

GEORGIADE / LATHAM DEVICE

Before the establishment of NAM, another technology developed at Duke addressed the protruding premaxillary segment in a bilateral cleft lip and palate. This stainless steel device was attached by pins and utilized traction in order to shape the premaxillary segment and expand the maxillary arch. The response was quite divided amongst leaders in the field. Dr. Ralph Millard was supportive of the treatment, but others were not so convinced. In a letter to Dr. Bosma, Chief of Oral and Pharyngeal Development Section of the National Institute of Dental Research, NIH, Dr. S. Pruzansky wrote, "In my view Latham is an irresponsible, dangerous, unethical, and dishonest damn fool." Over time, the device was replaced with other more modern approaches. It stands as a successful innovation in care of cleft lip and palate deformities.

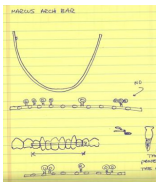
TALON

Troubled by the problem of sternal non-union following sternotomy, Dr. Levin used his orthopedic and plastic surgery talents to develop the Talon device. This novel technology, based on principles of stable fixation for bony healing, is a titanium construct in the shape of a bird's talon used for primary and secondary sternal closure. Using a ratchet mechanism, it pulls the sides of sternum together and is removable. The prototype was developed in 1991, and approval from the Food and Drug Administration came in 2006. The device is mass produced by KLS Martin Co.

QUILL

The quill, a barbed suture, was developed by Dr. Greg Ruff in the early 1990s. Dr. Ruff, a Michigan native, drew inspiration from nature and described his concept as initially coming from a porcupine. Before mass production, he carved barbs by hand in suture with a scalpel and his loupes. He patented this idea in 1994, which became the first FDA-approved barbed suture. The device is now mass-produced by Angiotech. Dr. Ruff continues to use a similar device that he developed called the contour thread for minimally invasive face lifts. Seen here is a copy of his original sketch of the idea.

MAXILLARY – MANDIBULAR FIXATION SYSTEM



Inter-maxillary fixation (IMF) is the most important maneuver to establish the proper relationship between the maxillary and mandibular teeth in trauma and elective jaw surgery operations. Since the early 1900s, the gold standard for applying IMF in such cases was the use of Erich arch bars. This time-consuming method, known for its discomfort to patients and challenges to surgeons, was universally employed until 2013. While traveling to a conference, Dr. Marcus drew up a method on an airline napkin to address the problems with arch bars. The idea was eventually patented, and licensed to the Stryker Corporation who launched the product, named "Hybrid MMF." Rather than wiring arch bars to the teeth, Hybrid MMF fixates arch bars to the maxilla and mandible with screws, simplifying application and removal, saving time, and preserving comfort. The device is currently used in over a dozen countries.

IMPLANTABLE BIOSENSORS

In the mid 1990s, Dr. Klitzman developed implantable devices for continuously sensing key physiologic molecules. In collaboration with faculty in Biomedical Engineering and Chemistry, the biocompatibility of wired glucose sensors has been improved. Further, implantable biosensors for oxygen and pH that can be non-invasively queried are moving toward commercialization in cooperation with corporate partners.

ERASABLE TATTOOS

Dr. Klitzman and Plastic Surgery resident Dr. Kim Koger received the first patent on tattoo inks in 2000. Their invention of an erasable ink was developed initially to facilitate relocation of the nipple-areola complex on a reconstructed breast and for tattooed radiotherapy targets on cancer patients, although the ink was also applicable to decorative tattoos. When publicized in 2007, the ink received *Time* magazine's "Invention of the Year" award in the fashion category, but lost the overall invention of the year designation to the newly introduced iPhone. Dr. Klitzman was an invited keynote speaker at the First International Conference on Tattoo Safety in Berlin, and co-authored a landmark paper in 2016 published in *Lancet*.

Landmark ARTICLES

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2. Georgiade, N. G., & Latham, R. A. (1975). Maxillary arch alignment in the bilateral cleft lip and palate infant, using pinned coaxial screw appliance. Plast Reconstr Surg, 56(1), 52-60.

4. Serafin, D., Georgiade, N. G., & Smith, D. H. (1977). Comparison of free flaps with pedicled flaps for coverage of defects of the leg or foot. Plast Reconstr Surg, 59(4), 492-499.

5. Georgiade, N. G., Serafin, D., Morris, R., & Georgiade, G. (1979). Reduction mammaplasty utilizing an inferior pedicle nipple-areolar flap. Ann Plast Surg, 3(3), 211-218.

6. Chin, G. S., Kim, W. J., Lee, T. Y., Liu, W., Saadeh, P. B., Lee, S., . . . Longaker, M. T. (2000). Differential expression of receptor tyrosine kinases and Shc in fetal and adult rat fibroblasts: toward defining scarless versus scarring fibroblast phenotypes. Plast Reconstr Surg, 105(3), 972-979.

7. Erdmann, D., Drye, C., Heller, L., Wong, M. S., & Levin, S. L. (2001). Abdominal wall defect and enterocutaneous fistula treatment with the Vacuum-Assisted Closure (V.A.C.) system. Plast Reconstr Surg, 108(7), 2066-2068.

8. Heller, L., & Levin, L. S. (2001). Lower extremity microsurgical reconstruction. Plast Reconstr Surg, 108(4), 1029-1041; quiz 1042.

9. Baumeister, S. P., Spierer, R., Erdmann, D., Sweis, R., Levin, L. S., & Germann, G. K. (2003). A realistic complication analysis of 70 sural artery flaps in a multimorbid patient group. Plast Reconstr Surg, 112(1), 129-140; discussion 141-122.

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11. Pestana, I. A., Coan, B., Erdmann, D., Marcus, J., Levin, L. S., & Zenn, M. R. (2009). Early experience with fluorescent angiography in free-tissue transfer reconstruction. Plast Reconstr Surg, 123(4), 1239-1244.

12. Hollenbeck, S. T., Woo, S., Komatsu, I., Erdmann, D., Zenn, M. R., & Levin, L. S. (2010). Longitudinal outcomes and application of the subunit principle to 165 foot and ankle free tissue transfers. Plast Reconstr Surg, 125(3), 924-934.

13. Laux, P., Tralau, T., Tentschert, J., Blume, A., Al Dahouk, S., Baumler, W., . . . Luch, A. (2016). A medical-toxicological view of tattooing. Lancet, 387(10016), 395-402.

Retirement Party for Kenneth L. Pickrell, MD
Hope Valley Country Club, Durham, NC
April 1977

Former Residents in Attendance (40):

Front Row (L to R): Frank Thorne, Francis Morris, Jerry Adamson, Edward Pound, Bob Wolff, Fred Miller, Fred Von Kessel

Second Row: Charles Horton, Frank Altany, Ray Broadbent, Ben Edwards, James Kelly, Kenneth L. Pickrell, John Wilde, Carter Maguire, Hugh Crawford, William Douglas

Third Row: Shattuck Hartwell, Latane Ware, Dale Armstrong, William Huger, William Pitts, John Royer, Norman Cole, Fred Richard, Richard Giblin, Joseph Still, Lin Puckett, William Hoffman, Lawrence Thompson

Back Row: Lisle Wayne, Patrick Hogan, Noel Ruggerio, David Smith, Kenna Given, Carl Quillen, Alex Stratoudakis, Donald Serafin, Thomas Nichol, Morton Kasdan, Richard Mladick

Plastic, Maxillofacial, and Oral Surgery

The Duke Division of Plastic, Maxillofacial, and Oral Surgery has a threefold mission:

We aim to provide compassionate, cost-effective, and high-quality patient care to all patients who enter our doors. This commitment extends to the families and loved ones of those who entrust us with the privilege of their health care.

We immerse plastic surgeons in training in an environment that challenges and subsequently educates them across a spectrum of disciplines, including patient care, research, and academic pursuit.

We perform cutting-edge research that translates into improved patient care at Duke and around the world.

Prepared by Rachel Anolik, MD, and Scott Hollenbeck, MD, of the Duke Plastic Surgery program, with contributions from current and past faculty.

Photos from Duke University Archives.

Designed by Scott Behm, Duke Surgery Publications & Communications.

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Duke University School of Medicine