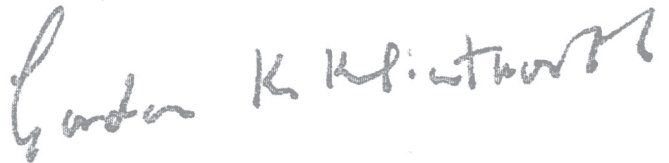

Gordon K. Klintworth, MD, PhD

The Luck of Being in the Right Place at the Right Time

A handwritten signature in black ink that reads "Gordon K. Klintworth". The signature is written in a cursive, slightly slanted style.

To understand why I came to Duke and remained here for almost half a century, it is necessary to summarize my humble background and my introduction into science and the medical profession. My story emphasizes that I have been extremely lucky throughout life and that I have frequently been in the right place at the right time.

I was born in a small town called Fort Victoria, which started as a white settlement in 1890 in Southern Rhodesia, when the world was still recovering from the Great Depression. That place was renamed Masvingo in 1980, when Southern Rhodesia became Zimbabwe after the country gained independence. Masvingo is located 17 miles from the mysterious largest stone-constructed ruins in Africa, south of the Sahara Desert known as the Greater Zimbabwe. Remnants of this ancient Shona city date back to the Iron Age. Fortunately I was not born in the era when the tyrant Robert Mugabe came

in power as president and ruined the country, while hyperinflation rose to unbelievable levels, officially reaching above 11,000 percent by 2007. He allowed genocide whilst the rest of the world stood by doing nothing meaningful.

Soon after the beginning of the Second World War when I was seven years old, my parents moved from Johannesburg to a small rural community called Jammersdrift in the Orange Free State (now called the Free State). Its population peaked during the Anglo-Boer War, when a British garrison of 2,000 men settled there. The Boers attacked it and the siege lasted 17 days, only ending on April 25, 1900, in favor of the British after reinforcements arrived. A book titled *The Great Boer War* by Arthur Conan Doyle, the creator of Sherlock Holmes, describes the siege of Jammersdrift and how the Boers were kept in front of the nearby village of Wepener.

Life was not very exciting in Jammersdrift for any child growing up. I spent much of my time roaming the countryside alone, collecting bullets that remained from the Anglo-Boer War. While living in Jammersdrift, I attended primary school in Wepener near the Lesotho border for two years, and there were only two students in my class. The educational standard was extremely mediocre; one teacher taught all subjects to all children in three different grades.

Because of the pathetic education, my parents sent me to boarding school in Johannesburg when I was nine years old. This was a cultural shock; reaching school required me to take a train journey of about 300 miles, with a train change in Bloemfontein. I took these trips on my own because my parents could not afford to accompany me or to transport me in another way. In Johannesburg I attended Jeppe High Preparatory School, one of the oldest co-educational schools (founded in 1890), during the day. Nights and weekends were spent at the boarding school (Mpiti). The school standard was much higher than in Wepener, and my performance during the first year was not at the required level. I received a failing grade and had to repeat the year.

The following year my class ranking improved considerably, and when I was 12 years old, I graduated to Jeppe Boys High School and my parents moved back to Johannesburg. During the first year at high school, a major epidemic of poliomyelitis caused all schools in Johannesburg to be closed for several months as part of a public health response to control the epidemic, and all children were required to stay at home. This was before Jonas Salk developed the first successful polio vaccine. Being under house arrest, my options for passing time were limited, so I studied my textbooks extensively. Soon after classes were restored, I emerged as the top student in my class, retaining that position until I graduated from high school.

For as long as I can remember, I had always wanted to be a doctor, and after graduating from high school I pursued this goal. The selection of a medical school was simple in South Africa. One applied to the closest one, and if admitted, one slept at home at night. For me this meant the University of the Witwatersrand. Normally admission was automatic if one performed at the appropriate level in a national examination and scored in the top 100 of all applicants. I achieved this standard without difficulty, but for the specific year that I was admitted to medical school, the administrators wanted to provide an opportunity for a wider range of students. The university decided to admit 350 students into the first year (almost all males) and stated that only 100 students with the highest grades would be allowed to pass into the second year of medical school. Thus competition was harsh, and that year was without doubt the worst in my life. Determined students studied extensively and learnt all that they could to reach the high bar that had been set. Unfortunately when someone missed a class because of illness, other students would usually not help their classmates catch up because of the fear that this could affect the final ranking and their own admission into second year. At the end of the year, the overall standard of the group was higher than it had ever been, and to the best of my knowledge, no class has performed as well since then. Thirteen of us

obtained first-class honors in every subject!

Towards the end of the second year in my six-year medical course, the professor and head of the Department of Physiology, Joseph Gillman, contacted my father, without my knowledge, and suggested that I deviate from the regular medical curriculum and spend an additional year in an undergraduate medical course in physiology or biochemistry and anatomy. In those days a proposition by a university professor carried considerable weight. My father agreed, and who was I to question the recommendation of the professor and my father? My generation did not question the advice of parents and authoritative figures.

This exposure to research hooked me for life. Sydney Brenner, the internationally renowned biologist who received the Nobel Prize in Physiology or Medicine in 2002, was a graduate of my alma mater, and unbeknownst to him, he set the gold standard to which I and all other science students aimed. We all heard about this brilliant student and what he could accomplish. While I was being introduced to science in the same department where Sydney Brenner started, he was completing his PhD at Oxford in England.

As a medical student, I had been fascinated by the complexity of the brain and set my goals on becoming a neurologist. I graduated from medical school in December 13, 1957, and was married the following day. My first year of marriage was spent as an intern in medicine and surgery in the professorial units of Johannesburg General Hospital, and my bride and I lived in special quarters adjacent to the hospital where house staff was required to live.

In January 1959, Dr. L.A. Hurst was appointed professor of psychological medicine and chief psychiatrist at the University of the Witwatersrand, making him the first full-time chair of psychiatry in South Africa. Hence a new position of senior house physician in psychological medicine (psychiatry) was created at the same hospital, and I was appointed to this position for 18 months while waiting for a vacancy in the premier neurology training program in Johannesburg. At that time, all individuals who were brought to the emergency

room after attempting suicide had to be hospitalized, and it was my responsibility to take care of them. In 1958, 358 individuals were admitted to the Johannesburg General Hospital for attempted suicide, and another 141 successfully ended their lives in the same year.

After completing my stint in psychiatry, I reviewed the large series of patients who had been hospitalized for attempted suicide and compared them to individuals who had actually died from suicide in Johannesburg during the same period. I found striking differences between the two populations. A report published in the *South African Medical Journal* on this study attracted considerable publicity as the public was surprised and shocked to learn that so many people attempted to end their lives.

One young man in the study had attempted to take his life because he realized that he was a homosexual. When I was a medical student, Hurst had drawn my attention to the fact that Dr. Franz Joseph Kallman, a German American geneticist who approved of Nazi eugenic politics, had performed a major study on male homosexual twins. Kallman found that if the twins were derived from different eggs (dizygotic twins), a certain percentage of both twins was homosexual. On the other hand, if the twins arose from a splitting of the same egg (monozygotic twins) both twins were always homosexual, even if they were separated early in life and grew up in different environments.

Because the gay individual who tried to take his life thought that his twin brother was not homosexual, I investigated what type of twins they were and whether the patient's brother was indeed not a homosexual, with informed consent from both twins. Despite the twins being monozygotic, the identical twin was not gay, and the childhood of the two individuals differed considerably. The gay twin had bonded better with his mother than his father, and his interests during childhood were more typical of girls rather than boys. The study anteceded the current molecular genetic analyses of DNA, and proof of monozygosity was based predominantly on the nonimmunological rejection of a skin graft from

one twin to the other.

During ward rounds one morning while examining a patient with Huntington disease, a statement was made that this disease was extremely rare. I immediately started gathering the patient's family tree, and over the next three years I found 16 different families in South Africa containing 161 affected individuals (56 living and 105 deceased). After coming to the USA, I maintained my interest in Huntington disease, and at one of the state institutions in Maryland, I studied Richard Lindenberg's collection of tissue sections of numerous brains of persons who died with this disease. I found an extensive iron accumulation in the basal ganglia, and subsequently when radiological imaging techniques became established, I was told that this iron deposition could be detected by magnetic resonance imaging (MRI) and was of diagnostic importance.

While performing the required duties in psychiatry, I studied neuroanatomy and neurophysiology in my spare time and obtained a degree higher than the BSc known as BSc (Hons) with first-class honors, and this allowed me to start research towards a PhD. During these formative years, I was fortunate to come under the wing of Philip Tobias, the famous anatomist and paleoanthropologist who is best known for his work at the hominid fossil sites in South Africa. Later Tobias was a mentor for my PhD, which I received in 1966 after completing the research at Duke and submitting a thesis titled, "An Anatomical and Clinicopathological Study of the Notch Area of the Tentorium Cerebelli in Relation to the Problems of Transtentorial Herniation." The thesis embraced observations on the anatomy of the notch within the tentorium cerebelli, clinicopathologic observations on individuals with expanding intracranial masses, and the first experimental studies creating fatal secondary brainstem hemorrhages.

When I lived in Africa, a Caucasian had distinct advantages over persons with pigmented skin, and Bantu-speaking people were controlled even though they outnumbered the whites considerably. Living in a country where discrimination

was a way of life was uncomfortable, but something that most accepted and dared not challenge. For many years, the black Africans accepted the domination by the whites because of their economic and political power. Towards the end of the 1950s, it became apparent that a younger generation of blacks was not going to accept the status quo. On March 21, 1960, a large numbers of black African demonstrators protested the Pass Laws for the first time. The Pass Laws were the most hated regulations created by the South African government during the apartheid era to control the movement of blacks and persons of mixed descent (referred to as "coloureds"). They demonstrated at a township called Sharpeville by marching upon a police station. The police panicked and opened fire on the crowd, killing 69 persons and injuring at least 180—perhaps 300, according to some reports. A few months later, my wife, Felicity, gave birth to our eldest daughter, Susan. After the Sharpeville Massacre and the worldwide condemnation of South Africa's apartheid policies, many of my colleagues and I were convinced that the writing was on the wall and the time had come to exodus South Africa.

Having made this decision, I wondered, where could I take a wife and an infant? Britain, Australia, New Zealand, Canada, and the USA were the only countries seriously considered. As a child I had always admired the USA and had a burning desire to come to this country. So during a residency in neurology and neurosurgery following my position in psychiatry, I decided to immigrate to the USA.

I then needed to make a decision regarding my career goals. Initially I contacted the American Board of Psychiatry and Neurology and to determine if I could receive some credit for my training and experience in South Africa. I was told that I would receive none as the board was unable to evaluate training programs throughout the world. Because I would need to start from scratch, I re-evaluated my options. By this time I was familiar with all diseases that affect the nervous system and realized that several groups of patients were mainly referred to neurologists: individuals with headache or epilepsy, individuals

with stroke, those who required treatment by neurosurgeons, and persons with degenerative, untreatable diseases. I reasoned that if I must start again at square one, I was not sure that I wanted to devote the rest of my life to the diagnosis and care of such patients.

During the pathology course in my third year at medical school, Neville Proctor, professor of anatomical pathology at the University of the Witwatersrand and head of the School of Pathology at the South African Institute of Medical Research, had impressed me immensely with his lectures on diseases of the nervous system. Subsequently when I was employed as a senior house physician in psychiatry and as a resident in neurology and neurosurgery, I learnt much more neuropathology from him while attending clinicopathologic conferences and sessions when the brains of recently deceased individuals were cut. This brilliant and undisputed number-one neuropathologist in Africa inspired me to move my career towards neuropathology rather than to neurology, because neuropathologists actually see the lesions caused by the disease rather than the effects of the disease and I could perform research on the diseases.

Luckily for me, the Department of Pathology at Duke had just recruited Dr. Thomas DeArman Kinney Sr. from Case Western Reserve University in Cleveland as the new chairman in 1960. Kinney replaced Wiley Forbus, who retired in 1959 after founding an extremely successful department that served as the training ground for numerous chairs of other pathology departments as well as deans. Kinney brought outstanding pathologists with him (Nathan Kaufman, Don Hackel, and Janis V. Klavins) and recruited F. Stephen Vogel from Cornell University to head neuropathology in the new pathology department, which strongly emphasized research. Professor Neville Proctor also accepted a position after deciding to join the brain drain from South Africa of prominent members of the medical profession.

Upon learning about this, I asked Proctor if he could find a position for me in the same department. Fortunately he convinced Vogel and Kinney to accept me as a fellow in

neuropathology and to sponsor my immigration to the USA. I was also lucky that Proctor, who was expected to come to Duke a few months after me, changed his mind and remained in South Africa, enabling me to remain in the Department of Pathology as an additional faculty member in neuropathology. Remaining in South Africa, Proctor later gained considerable publicity as a forensic witness in the inquest of the tragic death of Stephen Biko, probably the most important black leader in South Africa since apartheid, who was tortured and killed while in the custody of the South African Security Police in 1977. As the pathologist who examined Biko's brain, Proctor testified that the brain showed several areas of hemorrhage and necrosis indicative of severe contusions and contusional necrosis. He drew attention to the fact that the main lesion in the brain was directly opposite the site of impact to the head (a contracoup injury) and that the principal injury was probably on the left forehead. Proctor expressed the opinion that the brain injuries were not caused by a single blow, but by at least three blows. Four years later, Proctor died suddenly, at the age of 59 years.

My place of birth influenced my life immensely. Luckily my mother gave birth to me while living in Southern Rhodesia, now known as Zimbabwe, rather than in South Africa. This enabled me to obtain an immigrant visa to the USA, because in 1961 the USA issued visas on a quota system based on the composition of the USA at the time of the Revolutionary War. At that time, Southern Rhodesia was still part of the British Commonwealth, and more immigrant visa slots were available for British-born citizens than the number of persons desiring to immigrate to the USA from Britain and the British colonies. The place of my birth permitted me to obtain a visa under the British quota. If I had been born in South Africa rather than in Southern Rhodesia, the option of immigrating to the USA would have been out of the question. Only about 25 South African families were receiving immigrant visas in 1961, and they were generally for well-established senior individuals and their families; the waiting list was reported to be

about five years. Other temporary available visas required the recipient to leave the country at the end of an educational experience for two years before returning. I could clearly not afford this and wanted to remain in the USA as I liked the country and the professional opportunities.

Before my departure for the USA, I tried to find out something about Duke University since friends and relatives wanted to know where we were going. After searching all available records, I discovered that Duke University was famous for two things—and one was not basketball. Duke had an international reputation for the research on parapsychology performed by Dr. Joseph Banks Rhine and his wife, Louisa E. Rhine. The other person who put Duke on the world map was Dr. Walter Kempner, who had established an international reputation for getting people to lose weight with his famous low-salt Rice Diet. In my search for information about Duke University and neighboring parts of North Carolina, I learned that in 1959 the Research Triangle Park (RTP) had been created in a piece of land bounded by Durham, Chapel Hill, and Raleigh, where three of the major universities of North Carolina are located. Soon after my arrival, I was surprised to find RTP consisted mostly of undeveloped land.

Dr. Rhine, a pioneer in parapsychology, the science of the study of psychic experiences and extrasensory perception, moved to Duke University from the Boston Society of Psychical Research in 1928 to work with the unorthodox head of the Duke Psychology Department, Professor William McDougall, whose research also included the study of parapsychology. Louisa Rhine, whose papers are available for research with those of many other past members of the Duke faculty in the university's Rare Book, Manuscript, and Special Collections Library, became active in parapsychology research in 1948. Despite all of my other enquires (before the Internet and the Google search engine), Duke University did not seem to have an international reputation—at least in Southern Africa—for anything else.

I was personally familiar with some the

work of Rhine and owned one of his books. While a medical student, I attended a couple of public demonstrations in which individuals demonstrated the curing of human diseases after going into trances. I was not convinced that the people were cured of the alleged disorders but challenged the healers to repeat their miracles on subjects whose disease status before and after the cure could be documented by the medical profession. Alas, the challenge was not accepted, and I was told that the healers did not care whether others believed the evidence or not.

On arriving here, I discovered that some members of the local academic community frowned upon the endeavors of both Rhine and Kempner. Indeed, the Rhines had moved the Parapsychology Laboratory off campus. It is now known as the Rhine Research Center and Institute for Parapsychology. The groundbreaking work on extrasensory perception that the Rhines pioneered and which generated international recognition still goes on and has ample opportunities for raising funds.

Stimulated by the Rockefeller Foundation's program to relocate refugee scholars from Europe, Frederic M. Hanes, the first chairman of the Department of Medicine at Duke, recruited Dr. Kempner, a German Jew, from Germany because of Kempner's international reputation. Kempner was a true clinician-scientist who had performed outstanding research at the Kaiser Wilhelm Institute for Cellular Physiology in Berlin-Dahlem while he was an associate of Dr. Otto Warburg, the 1931 Nobel laureate in Physiology or Medicine. Hanes wanted to establish a research base at Duke, where real research was performed. Kempner attracted many patients to his Rice Diet, which, prior to the advent of antihypertensive medications, was a leading treatment for hypertension. Despite his notable academic reputation, Kempner had many critics. Nevertheless, upon his retirement in 1972, his friends and colleagues established an endowed professorship in his recognition. The dietary aspects of Kempner's program were subsequently modified in Durham to include not only principles of nutrition, but also exercise

and psychology in the treatment of overweight individuals by the clinical psychologist Dr. Gerald J. Musante in 1977, in a program known as Structure House.

My wife and I decided to remain in South Africa until after the end of 1961 so that we could spend Christmas and New Year's Day with our families. We departed South Africa on Pan American World Airways, commonly known as Pan Am, on January 4, 1962. There were no direct flights to the USA from Johannesburg when we immigrated. The distance was beyond the range expected of the Douglas DC-8, the important plane used by Pan Am in 1962. Moreover, the number of persons traveling to and from Johannesburg and New York was insufficient to support the passenger service economically. The airline survived by taxiing passengers from neighboring country to neighboring country. Each segment lasted for about an hour, and approximately the same amount of time was spent at each airport. At each stop, everyone was required to leave the plane so that it could be sprayed with an insecticide to kill the insects that might enter the plane and inoculate the passengers with pathogens that cause infectious diseases of tropical Africa, such as malaria, dengue fever and trypanosomiasis. Hence we obtained little sleep until the plane started to cross the Atlantic Ocean. In the morning, we arrived at John F. Kennedy airport and were struck by the warmth within the heated buildings. This was particularly striking because we had been led to believe that it would be really cold after coming from the South African summer. For me the temperature in the airport was specifically unpleasant because I had traveled with thick undergarments in preparation for a freezing New York. For our final destination to Raleigh-Durham, we needed to reach the Newark airport. To make the connection, we traveled across New York with our baby in a helicopter. We were met at the small, single-terminal Raleigh-Durham airport by Dr. F. Stephen Vogel.

In retrospect the timing of our arrival in Durham was not ideal because of the cold and

rainy weather. Our neighbors spent most of their time indoors and seldom saw each other. It was only in March that we attended a party given by a neighbor, but we were amazed to find that most attendees were not particularly sociable and stood around the television set watching a game of basketball. Basketball was a new game for us, not played in South Africa at that time. Later we realized that "March Madness" is very common in this part of the country, where basketball is taken seriously. I found the walk from Poplar Apartments to the pathology department during my first few months at Duke often bitterly cold, particularly after coming from the Deep South in the middle of summer, since I had never experienced temperatures this low in my life.

The first year was particularly difficult for my homesick wife, who no longer had contact with her parents and close friends while taking care of our baby daughter. She waited for mail from South Africa with considerable apprehension, but it arrived less frequently than she would have liked. Public transportation in Durham was virtually nonexistent, and we depended on others to visit places. In this regard, we were extremely grateful to Lilo Kemper, Vogel's technician, for taking Felicity to the stores as often as necessary until I was able save enough money to make a down payment on a Ford Falcon a few months after our arrival.

Immediately after arriving at Duke, I started to learn all that I could about neuropathology and anatomic pathology. I was amazed at the vast number of lectures and seminars that one could attend. Some were given by Duke faculty, but many were by distinguished individuals from other institutions who gave named lectures. Some were by recruits that Duke was evaluating for faculty positions. An inquiring mind could garnish much new information about all aspects of medicine and science. Duke was paradise, and I was blessed to come when academic activities were an extremely high priority of the medical center and research and scholarly activities were the game of the day. Federal research funding was plentiful, and most members of the medical faculty had ample protected time to pursue such

endeavors. Because the faculty at Duke University Medical Center were expected to assume not only clinical and teaching responsibilities, but also to pursue laboratory research, I found the atmosphere at Duke to be particularly pleasing and ideal for someone with my many interests.

F. Stephen Vogel was not only an outstanding neuropathologist, but also an excellent general pathologist. A highlight of Vogel's time at Duke was the Saturday morning weekly clinicopathologic conferences related to the nervous system. They were attended by a diverse body of interested individuals, including neurologists, neurosurgeons, neuroradiologists, and trainees in different disciplines. Guy Odom, the chief of neurosurgery, who was particularly knowledgeable about brain tumors, was a regular attendee. On each occasion, usually two cases were presented by neuropathology fellows, and brain tumors were a common topic of discussion. Duke lost something special when these conferences stopped. Over the years, Vogel trained many neuropathologists, and he insisted on making his trainees learn anatomic pathology as well as neuropathology. Some Duke-trained neuropathologists remained at Duke, making the Department of Pathology one with the largest number of board-certified neuropathologists. At one time there were seven! Vogel was an exceptional teacher and loved to teach medical students about diseases of the brain, especially in the laboratory sessions when specimens were brought to the students as part of the so-called "road shows." His prose and command of the English language was superb, and I found his critical point-by-point review of my manuscripts extremely worthwhile as he improved them beyond recognition. Together with Peter C. Burger, he co-authored the tremendously well-received book entitled *Surgical Pathology of the Nervous System and Its Coverings*. Vogel became extensively involved with the US-Canadian Academy of Pathology (USCAP), initially by organizing a special evening specialty conference on neuropathy and eventually by becoming its secretary-treasurer (a position now known as executive vice president)

and president. For his long contributions to that society, USCAP started a F. Stephen Vogel award in his honor to be awarded to a resident or fellow for an outstanding paper published in *Modern Pathology* or *Laboratory Investigation*, journals of the USCAP.

When I came to Duke ophthalmic surgical pathology, specimens were processed and signed out in the Division of Neuropathology, and unusual cases were usually sent to the Armed Forces Institute of Pathology (AFIP) for the opinion of Lorenz E. Zimmerman, the most famous ophthalmic pathologist in the USA, who had been trained initially in general pathology. Indeed, aside from him, very few pathologists throughout the world had any interest in ophthalmic pathology. Hence in many institutions, ophthalmologists created their own laboratories for processing the specimens that they excised because pathologists did not provide the required quality of service. Had Proctor come to Duke, these duties would have been his responsibility, but since he did not, this duty fell upon my shoulders because nobody else at Duke had an apparent interest in ophthalmic pathology.

I found diseases of the eye and its adnexa fascinating and was happy to become extensively involved in ophthalmic pathology. Specimens of particular interest to me were the round pieces of cornea (corneal buttons) that ophthalmologists excised when they performed corneal grafts. Some of the first cases of this type that I studied had rare, genetically determined diseases of the cornea (corneal dystrophies). They were of particular interest to me because I had already developed a major interest in genetics while in Johannesburg, after coming under the influence of professors Tobias and Hurst. Moreover, some corneal dystrophies manifest characteristic histochemical features, and histochemistry had been a major component of the first paper that I published. Also, in contrast to research on the nervous system, the corneal tissue is rather simple and can be easily studied with a wide variety of research techniques. Vogel and I carried out the first transmission electron microscopic studies on a corneal dystrophy, and later I

pioneered the use of organ and cell cultures for biochemical analyses of the cornea. Another attraction of the cornea was the realization that the subject of corneal disease was predominantly an unexplored territory that had not been extensively investigated.

My fascination with the corneal dystrophies has occupied a major portion of my time for more than four decades because of my desire to understand the basic nature of these errors of nature. At Duke I have fortunately had sufficient protected time to pursue knowledge about these diseases in great detail with continuous grant support from the National Eye Institute (NEI). Most of my knowledge about ophthalmic pathology was self-taught with the aid of existing textbooks and from participation at professional meetings. To learn more about the subject, I spent a sabbatical leave at the Institute of Ophthalmology in London with Norman Ashton, the first pathologist to devote a career to ophthalmic pathology.

When I arrived at Duke, there was no Department of Ophthalmology, and patients with eye diseases were treated in a small division of the Department of Surgery, started under W. Banks Anderson Sr. One of my first papers on an eye disease was a review of more than 50 melanomas of the iris, co-authored with him. Then another major lucky break propelled me to pursue ophthalmic pathology in more detail occurred when Duke decided to create a Department of Ophthalmology in 1965. Joseph A.C. Wadsworth was appointed its founding chairman. Wadsworth was a 1939 graduate of Duke School of Medicine and had more than a casual interest in ophthalmic pathology, having been a member of the prestigious Verhoeff Society (now known as the Verhoeff-Zimmerman Society) since the early 1950s. After returning to Duke, he raised funds to build the initial Duke Eye Center.

Soon after its dedication, I was caught in the crossfire between the chairs of pathology and ophthalmology. Kinney would not allow the pathology department to become fragmented by having clinical departments take

over subspecialties of pathology. Wadsworth, on the other hand, wanted an ophthalmic pathology laboratory in the Duke Eye Center, as was the custom in many ophthalmology departments, and indeed one had been built in the original building. After the battle was over, a consensus was reached to continue processing all surgically excised ophthalmic specimens in the pathology department.

A watershed in my career occurred after Wadsworth retired and Robert Macheimer was recruited to chair the Department of Ophthalmology. Macheimer advanced the academic standing of the department during his leadership from 1978 to 1991. In 1978, soon after his arrival at Duke, Macheimer recruited me to the Department of Ophthalmology as professor of ophthalmology and director of research with the blessing of the chair of pathology, Robert Jennings. Macheimer was a magnificent clinician-scientist who fathered the most important development in ophthalmology of the century by creating the vitrectomy and constructing delicate instruments that allowed pathologic contents to be removed surgically from the inside of the eye to restore vision. When Macheimer arrived, there was very little research on vision and ophthalmology at Duke, and it was extremely difficult to get a core grant to support vision research. We lacked the critical mass of investigators in ophthalmology with grants from the NEI. To overcome this difficulty, I brought all investigators with NEI grants from the campuses of Duke, the University of North Carolina, and North Carolina State University together and submitted a successful application stressing the multidisciplinary nature of the investigators and the resources available in the remarkable Research Triangle Park. The grant was awarded in 1985, and it has been continuously funded since then, providing core facilities to a much larger number of investigators.

In 1966 Duke replaced the traditional American medical school curriculum with one year of core courses in the basic sciences, followed by a second year in the wards as clinical clerks, followed by two years of elective

courses divided equally between topics in basic sciences and clinical disciplines. For this curriculum change, Kinney encouraged me to include a lecture and laboratory session on eye diseases in the required pathology core course for all medical students and to give a 72-hour elective to students wanting to learn more about ophthalmic pathology. At that time, practically nothing was written about the eye in textbooks of pathology. Indeed, I could only find two citations in a standard text recommended for our students, namely that the retina is affected in hypertension and in diabetes mellitus. From 1966 to 2007, all students at the Duke University School of Medicine received my basic lecture, which was modified annually, depending on new information and feedback from the students. The detailed course covered more ophthalmic pathology than what residents in ophthalmology receive anywhere. Participants in the comprehensive course included Dr. Doyle Graham, a former professor of pathology and dean of medical education at Duke.

In 1976 I published a textbook titled *The Eye* with Maurice B. Landers III, an ophthalmologist in the Department of Ophthalmology, based on this course. The text was criticized for containing too much information for medical students, but not enough for residents in ophthalmology. Later I edited a much more extensive text with Alec Garner, whom I met while on a sabbatical leave in London in 1970 and of whom I had an extremely high opinion. The third edition of this widely acclaimed two-volume text, *The Pathobiology of Ocular Disease*, was released in 2008 with almost 100 contributors from around the globe, including 20 from Duke, but marketed at a price that few can afford (\$699.95).

Because I had collected a vast amount of teaching material during my career, I developed a Web-based resource on the anatomy and pathology of the eye and its adnexa with Duke's Anthony Benson (eyepathologist.com). It started as a brief teaching resource for medical students and gradually evolved into an encyclopedic resource with over 900 contributors. In contrast to textbooks, it can be updated within minutes

in response to new information or comments received via a feedback button from users. It currently has almost 6,000 diseases, 3,950 images, a glossary of 6,286 terms, and it is available 24 hours a day, seven days a week. It is free as I wanted people to use it rather than to have its use restricted to individuals who could afford to pay. Currently there are 10,573 registered users from 174 countries.

During Forbus's tenure, deaths of a suspicious or unusual or unnatural nature in North Carolina were investigated by a coroner who had the power to determine the manner of death. Coroners were elected and did not need to be physicians. The pay was low, and most coroners were undertakers who subsidized their income by making money from the burials. Forbus fought a long uphill battle to have the system changed, and he was eventually successful when North Carolina established the Medical Examiner System, requiring a qualified pathologist to oversee such deaths. Dr. Page Hudson became the first chief medical examiner in 1968, and currently the system has a network of 600 medical doctors who investigate such deaths.

After the Medical Examiner System began, I was appointed the Durham County medical examiner largely because I came from Johannesburg, where all medical students took a one-year course in forensic medicine in contrast to their counterparts in the USA. I held this part-time position from July 1972 to August 1986, when I gave it up because of many other commitments. The investigation of these deaths within Durham County became part of the pathology residency training program at Duke, and residents were on call and went to the scenes as part of the investigating team when bodies were found under unnatural circumstances. Once a month, a conference was held that was attended by residents and representatives of the Office of the Chief Medical Examiner. This was followed by an informal beer and pretzel reception at my home on Spencer Street in Duke Forest.

Despite my limited knowledge of Duke University before coming here, it did not take long for me to realize that the university had

many top-notch distinguished faculty who were famous for their achievements. Many of the faculty had already pioneered clinically relevant studies which fall under the umbrella of “translational research” that is currently in vogue. These studies included the introduction of germicidal ultraviolet lamps into the operating rooms by Dr. J. Deryl Hart, the first head of surgery, to diminish postoperative infections. I was ecstatic after my arrival when I learnt about the excellent faculty at the medical center and their achievements. These individuals included David T. Smith and Norman Francis Conant, whose interests overlapped with my interests in pathology.

Duke had an obvious reputation in infectious diseases. Prior to my arrival at Duke, the 11th edition of the internationally renowned *Zinsser's Microbiology*, authored by a distinguished team from the Duke University School of Medicine (Dr. David T. Smith, Dr. Norman F. Conant, Dr. Joseph W. Beard, Dr. Hilda Pope Willard, Dr. Ivan W. Brown, Dr. Gordon Sharp, and Ms. Mary A. Poston) was published in 1957, and a Spanish edition came out in 1960. Wolfgang K. Joklik continued to edit Zinsser's book for the next three decades. Conant, one-time James B. Duke Professor and Chair of Microbiology and Immunology and a world-leading mycologist, had also written a popular manual of clinical mycology. Another Duke specialist in the Department of Pathology under Forbus was Roger Denio Baker, who co-authored important papers with Conant. Baker became head of pathology at the Veterans Administration Medical Center in Durham.

I knew nothing about fungi but had always been fascinated by them and was particularly excited to learn about Duke's fame in fungi. Indeed, one day Wilson Hendry, a contemporary neuropathology fellow, suggested that we write a book. I agreed and proposed that for the topic we combine diseases of the nervous system with something for which Duke had an established reputation, namely fungi. My hope was to use the exercise to learn about diseases caused by fungi. During our conversation, Bernard F. Fetter, a superb surgical pathologist with a

distinct affection for fungal disease, who was an associate professor of pathology at the time, asked if he could also become involved in writing this book. The end result was *Mycoses of the Nervous System* by Fetter, Klintworth, and Hendry, and the foreword was written by Conant. Soon after the publication of this book, Fetter was promoted to professor of pathology.

Moreover, it did not take long to realize that Duke University had a considerable number of outstanding individuals in positions of leadership when I arrived. They included Mary Duke Biddle Trent Semans, a member of the Duke family who was a trustee of Duke University. Barnes Woodhall was dean of the medical school after earning a reputation as an outstanding neurosurgeon. He had also founded Duke's Neuro-Oncology Research Program in 1937, which is currently under the leadership of Drs. Darell D. Bigner, Allen H. Friedman, and Henry S. Friedman. William Anlyan had been at Duke since 1949, and he was waiting in the wings to become dean in 1964 before climbing the academic administrative ladder to CEO of the entire Duke medical enterprise. The heads of the Departments of Pathology (Thomas Kinney), Biochemistry (Philip Handler), Physiology-Pharmacology (Daniel D. Tostesen), Medicine (Eugene Stead), Surgery (Clarence E. Garner Jr.), Radiology (Robert J. Reeves), Psychiatry (Ewald W. Busse), Anatomy (Joseph E. Markee), and Pediatrics (Jerome S. Harris) were all outstanding.

Philip Handler, who had an excellent reputation, came to Duke as a postdoctoral fellow studying pellagra, a disease caused by a dietary deficiency of vitamin B₃ (nicotinic acid) which was prevalent in the southeastern USA at the time. Subsequently, Handler became professor and chairman of biochemistry. During the year before my arrival, he was made a James B. Duke Professor, and he remained on the Duke faculty until 1969, when he became president of the National Academy of Sciences for two consecutive terms. Because of his exceptional contributions to science, Handler became the recipient of the extremely prestigious National Medal of Science. Handler had helped recruit

Tosteson, who was not only an outstanding physiologist, but a person who developed innovative ways to foster research and change the way medicine is taught. He eventually returned to his alma mater Harvard Medical School in 1977 as dean. Busse headed a reputable Department of Psychiatry and had established a strong interdisciplinary program in geriatrics.

A year before my arrival, James B. Sidbury Jr. and Robert Hill joined the Duke faculty. Sidbury remained in the Department of Pediatrics until 1975 before becoming scientific director of the National Institute of Child Health and Development (NICCHD) until 1981. His lifelong interest was in understanding the molecular mechanism of glycogen storage disease and in developing effective treatments. What he started ultimately led to the advances that were carried out by Yuan-Tsong Chen. Hill became chairman of biochemistry in 1969. Bernard Amos arrived at Duke in 1962 as professor of immunology and was an outstanding scientist involved in the immunology of tissue transplantation.

Only needing to complete my research and submit a thesis to obtain a PhD in anatomy at the University of the Witwatersrand, I had an interest in the Anatomy Department and learnt that Dr. Markee had been producing innovative instructional movies for anatomy classes. In 1961 the second edition of the excellent textbook titled *The Neuroanatomical Basis of Clinical Neurology* by Talmage Lee Peele, professor of anatomy, was released, but I was unaware of it until after I came to Duke. Having studied neuroanatomy in depth in South Africa, I was most impressed by this lucid book that provided essential information for neurologists. Peele was clearly another Duke star; since 1990 an award in neurobiology has been given annually in honor of his remarkable career, and a portrait of him hangs in the Bryan Building alongside other distinguished neurobiologists. In 1966 Robertson was recruited to Duke as the chairman of the Anatomy Department, which spawned the Departments of Cell Biology, Neurobiology, and Biological Anthropology and Anatomy in 1988. He came from Harvard

Medical School, where he had been an associate professor of neuropathology in the Department of Neurology and Psychiatry.

I also discovered the Bell Building, situated a short distance from the medical school and built in a non-Gothic style, in contrast to rest of the beautiful Duke campus. As a focus of research, it attracted a lot of attention despite its unorthodox architecture and obvious unpleasant odor of chicken feces. The building housed the research of the internationally prominent cancer research team of Joseph Willis Beard, a virologist, and his research partner and wife Dorothy Waters Beard. Joseph Beard became a James B. Duke Professor of Surgery in 1946, and a few years after my arrival he was also made a professor of virology. In 1937 Joseph Beard had joined the Duke faculty after working at Rockefeller University with Peyton Rous, the 1966 Nobel laureate in Medicine. Beard purified and photographed the virus responsible for warts and skin cancer in rabbits using one of the earliest transmission electron microscopes. Other accomplishments included the development of the first usable vaccine for equine encephalopathy, a mosquito-borne viral disease of horses that struck down thousands of horses in the USA, and investigations into avian leukosis and chicken leukemia that were of considerable interest to the poultry industry.

Research by the Beards was generously supported by William Brown Bell, a former trustee of The Duke Endowment, owner of Lederle Laboratories, and president of American Cyanamid Company. Because Beard taught a course in animal surgery as part of his duties to the Department of Surgery, in which he held the title of professor of experimental surgery, the Bell Building also became known as “the dog house.” Despite being an historic landmark in the research activities of Duke, the building, named after the philanthropist who liberally supported the research within it, has been targeted for demolition [in 2009] because of a pressing need for the valuable space.

The Research Training Program (RTP) was already under way under the leadership of

Dr. James Barnes Wyngaarden, and it enabled medical students and residents to obtain research experience that would hopefully lead them into careers as clinician-scientists. The program had some similarities to the medical BSc degree that I had taken during my medical training in South Africa and which imprinted me for an academic career as a physician-scientist. The RTP evolved and obtained financial support from several sources, including the various K grants from the National Institutes of Health (NIH) (K12, K08, and K23). The program that Wyngaarden started was subsequently maintained by William H. Keely and Edward W. Holmes Jr., who propelled their careers into prominent administrative positions. Wyngaarden later became the director of the NIH from 1982 to 1989. Capitalizing on the excellent clinician-scientist track record of Duke and the reputation of David Epstein as an outstanding chairman of ophthalmology, we received one of the first five K12 grants from the NEI in 2004 to develop the careers of young ophthalmologists into potential clinician-scientists.

When Tom Kinney was chairman, he once told the faculty that the Duke Department of Pathology was the best one in the world. When I first heard this, I thought that it was an exaggeration, but over the years I realized that Kinney's statement was probably true, at least in certain respects. The chairs of the department have all been outstanding, and as testimony all three of Duke's past chairs of pathology (Forbus, Kinney, and Jennings) received the Gold-Headed Cane Award of the American Society of Investigative Pathology (ASIP), which is the highest honor bestowed upon a member of the ASIP in recognition of long-term contributions to pathology.

Duke has changed considerably since my arrival almost 50 years ago, and it has been my pleasure to watch the growth and be part of it. There has not been a day without construction since I arrived. Under the superb leadership of the Duke trustees and administration, the university has grown into one of the leading universities in the world, with an international reputation in many areas of endeavor. I have constantly marveled at the organized, orderly growth of the

institution in both size and caliber. During my tenure at Duke, I saw the creation of the Duke Comprehensive Cancer Center, the Searle Center and the adjacent markedly enlarged Medical Center Library, Duke North (Duke University Hospital), The Fuqua School of Business, the Terry Sanford School of Public Policy, the Pratt School of Engineering, Levine Science Building, the Duke Clinical Research Institute, the Institute for Genome Sciences & Policy, the Duke Global Health Institute, and the Duke Human Vaccine Institute, to name but a few of the vast improvements. I was also fortunate to witness the remarkable transformation that the Department of Surgery underwent during the tenure of David C. Sabiston Jr., who served as the chair of that department from 1964 to 1994. I also bore witness to the remarkable David L. Epstein, who helped make the Department of Ophthalmology one of the best in the country, surpassing the expectations of the search committee that recommended him to Ralph Snyderman.

Over the years, the caliber of the visiting lecturers at Duke has improved considerably, particularly since Victor Dzau became chancellor of health affairs and recruited Peter Agre, the first Nobel laureate on the university faculty (2003 Nobel Prize in Chemistry). I have received substantial pride and inspiration from being on the same campus as Duke's top scientists, which include the current and past Howard Hughes Medical Investigators. Standing head and shoulders above them all is my idol, Robert J. Lefkowitz, who came to Duke in 1973, and who is without doubt Duke's number-one candidate for a future Nobel Prize. Like Handler, he was a recipient of the National Medal of Science, the highest national honor for science and engineering.

Despite its growth, the medical center has lost some major attributes of the past. When I arrived here, the faculty was small and an important weekly event was the clinicopathologic conferences (CPCs) that took place in a semicircular auditorium in the original medical school and were widely attended by all faculty, students, and residents. The CPCs involved the

discussion of a case that had been autopsied in the pathology department. Case selection was based on the teaching value, and many cases were ones that were not diagnosed during life. Based on the clinical information provided in a protocol, an internist discussed the case in detail and came to a diagnosis. A pathologist would then provide the autopsy findings.

It was during these sessions that we were able to watch Eugene Stead, a major innovative leader at Duke University, who had been chair of the Department of Medicine since 1947. The first time that I participated in one of these CPCs, the designated clinician was Stead and the patient was one in whom I had found meningeal carcinomatosis and a small bronchogenic carcinoma that were not diagnosed during life. I dreaded going into the lion's den with the top dog in medicine. Although Stead did not arrive at the correct diagnosis as expected, he did not accept my findings as an explanation for the patient's symptoms. Sadly, this worthwhile teaching exercise was eventually stopped because clinical diagnoses could usually be made with reasonable certainty as a result of imaging and other diagnostic techniques, and attention to missed diagnoses at a public forum provided the potential for litigation. An extremely stimulating teaching session in the pathology department took place every Thursday evening, when the findings on different autopsies were presented to the entire pathology faculty and its trainees.

I came here with my wife and firstborn at a time of social turmoil. Racial discrimination was still prevalent in the USA, and the civil rights movement was gaining momentum. The Cold War was heating up, and the Cuban missile crisis arrived shortly after us. The Vietnam War was lasting longer than anyone had predicted, and foreigners with immigrant visas like me could potentially be drafted to help fight this war that many still do not understand. The feminist movement was gaining momentum. Student unrest on the Duke campus resulted in a takeover of the Allen Building. On November 22, 1963, while I was performing an experiment on brainstem hemorrhages secondary to

expanding intracranial masses, someone entered the pathology laboratory and told me that the president had been shot. My first reaction was to think that Duke University President Douglas M. Knight, who had recently succeeded Deryl Hart, the founding chairman of surgery, was the victim. However, this was the start of assassinations of public figures. After President John Kennedy came Martin Luther King and Robert Kennedy. Some suggested to me that we had come from the frying pan into the fire. However, I was confident that this country could solve its political problems, unlike Africa, where the problems were more difficult and would last longer than my lifetime.

I have been proud to be a citizen of the USA since the day I became one in 1967, as soon as I could. It was indeed a happy occasion when I became a naturalized African American. In this country, we take much for granted, and it may be difficult for those who are born here to appreciate all of their blessings. One needs to live in and visit many other countries to realize how fortunate people are to dwell here. Space restrictions will not permit a full discourse on the subject, but I will single out a few examples. In many parts of the world, famine and drought are ways of life and health care is nonexistent. In my world travels, I have visited places where clean water is unavailable to drink and what can be ingested is contaminated with pathogenic organisms that cause serious disease. In developing countries of Africa and elsewhere, biting insects inject myriads of viral particles or parasites into the host.

Freedom of speech is something else that is most appreciated by those who did not have it or still do not have it. I grew up in an environment where children accepted everything that they were told by adults, and the words of government were unchallenged. What a parent or teacher said was taken as the gospel truth. Nobody dared to confront the authoritarian figure. What the government said and did was uncontested by the average citizen for fear of repercussions. To attempt to bring about political change was an extremely dangerous venture. After coming to

the USA, I found freedom of speech as laid down in the Constitution astounding and was amazed to learn that one could criticize anyone, even the president of the United States, the greatest nation in the world.

The constant investigation of the unexplored has provided me with considerable personal satisfaction and an opportunity to travel and visit almost every country in the world. What is even more amazing is that I have been paid for doing these enjoyable things. Major reasons why I have remained at Duke this long include: the high priority that research receives; the outstanding environment for medical research at a medical school on a university campus; and superb administrators and trustees who have constantly steered the university on a logical path to excellence. While at Duke, I was offered several faculty positions at other institutions, including chairs of pathology, but when everything was analyzed, I realized that as a refugee I had attained all that I desired and Duke provided all of the freedom and opportunities that I needed. I saw no merit in making a move, particularly since I would need to give up a lot. Durham originally lacked the excellent museums, art galleries, and theatres of the large cities, but by being stationed at Duke, I had ample opportunity to take advantage of these fine things in life when I visited other places to attend scientific meetings or deliver lectures. Over the years, I have also been fortunate to witness the development of such excellent local resources at Duke as the Bryan Center and Nasher Museum of Art, as well as the North Carolina Museum of Art, the North Carolina Zoo, and the recently opened Durham Performing Arts Center.

To leave South Africa and come to Duke was one of the most important decisions in my life. Now that I have been at Duke for almost half a century, I realize that my wife and I came here with the confidence of youth from a country thought to be on the verge of a major bloodbath, without thinking or worrying about all the potential ramifications to traveling a long distance, having little money and no friends and few contacts at our destination. We also knew

that contact with friends and relatives would only be by regular mail. Our family could not afford to visit us, and we could not afford to return to South Africa for a long time. Indeed, we did not return home until 1970. Communications by telephone were not practical because of the high cost of long distance phone calls, and e-mail did not exist.

I was not born with a silver spoon in my mouth and had to work hard for everything that I have achieved, but it was worth the effort. After coming to Duke, I achieved more than the “American Dream.” I was able to follow my nose and perform research on topics that interested me, and I had sufficient protected free time to do this. The environment at Duke and the reputation of the institution enhanced my ability to obtain continuous grant support from the NEI. In 1986 I was fortunate to be honored by this great university; I became the Joseph A.C. Wadsworth Research Professor of Ophthalmology. This distinguished professorship was generously funded by the late James M. Hornaday and his wife, Virginia, to honor Wadsworth. To the best of my knowledge, I am the only person holding an endowed chair in a secondary department. I am forever grateful to the USA, Duke University, and all the people that made this possible.



Gordon Klintworth immigrated to the United States in January 1962 to undergo postdoctoral training in anatomic pathology and neuropathology at Duke. He then decided to become one of the very few pathologists devoted to a career to ophthalmic pathology, due to the planned creation of the Duke Department of Ophthalmology. He was appointed to the Duke faculty in 1966 and gradually rose through the academic ranks to his current position as the Joseph A.C. Wadsworth Research Professor of Ophthalmology and professor of pathology. He has been married for more than 50 years and has three children and four grandchildren.