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Giovanni Di Chiro (1926–1997)

With the death of Giovanni Di Chiro on August 27, 1997, modern neuroradiology lost one of its great statesmen and innovators. For almost 40 years he directed the Section of Neuroimaging at the National Institutes of Health while courageously living with a disability to which he stubbornly refused to surrender. That he should have reached the zenith of his profession in spite of that disability is a testament to the strength of his character and the devotion of a saintly wife and family.

Giovanni was born on October 17, 1926 in Vinchiatur, Italy, the second of the four children of Professor Umberto Di Chiro and his wife, the former Antoinetta Primiani. Vinchiatur is situated in an area known as *Abruzzi e Molise*, a somewhat isolated mountainous area devoted largely to agriculture, especially to the growing of grapes and olives. Umberto's family were farmers in nearby Baranello; his home still stands on a street renamed *Via Umberto Di Chiro* in his memory. Antoinetta was the daughter of a landowner from Vinchiatur. Although Umberto had intended to study medicine, he contracted malaria while on military service and ultimately became a professor of Greek and Latin in Campobasso, near Vinchiatur.

Giovanni started school in Campobasso at the age of 4. He sang in the school choir with a voice so loud that the conductor had to "tone him down" during the Christmas pageant. Because of his malaria and the harsh climate in the Abruzzi, Umberto accepted a teaching position in Naples where the family moved when Giovanni was 13.

Throughout World War II, Giovanni studied medicine at the University of Naples (Fig. 1), receiving his MD degree *summa cum laude* in 1949. The events of those years "deeply involved him in moral and social controversies", and led him to join a budding antifascist organization (1). Because of postwar shortages of food and water, it became necessary for him to go elsewhere to earn a living. He traveled to Switzerland in hopes of studying cardiology, but quickly changed his mind and traveled north to Sweden where there was a shortage of physicians. He met a Swedish radiologist on the train to Stockholm who convinced him to seek training in radiology.

After his arrival in Stockholm, he obtained lodging with a Swedish family. Although he had studied German and spoke French, he now had to learn Swedish and English, since many of the lectures were given in English. From 1949–1953, he served as a radiology resident in various Swedish hospitals such as Södersjukhuset and Serafimerlassarettet that were affiliated with the Karolinska University, Stockholm. He and Torgny Greitz were fellow students under the tutelage of Professor Erik Lindgren, the successor to



FIG 1. Giovanni, a 20-year-old medical student (left), strolls the streets of Naples with a friend in 1946.

Lysholm who was generally acknowledged to be the founder of the modern "Stockholm School of Neuro-radiology." In the 1950s, this was the place to come for those who wanted to learn the latest techniques of pneumoencephalography and cerebral arteriography. Neuroradiology had become a part of radiology in Sweden, whereas in most other countries at that time, procedures were still being performed by neurosurgeons.

After a brief stint as a ship's doctor on a Swedish cargo boat, Giovanni continued his studies in neuroradiology at the Hospital des Enfants Malades in Paris. In July of 1953, he came to the Boston City Hospital on a Fulbright Fellowship where he served 6 months as an assistant resident in radiology. At that time, a mutual friend introduced him to Barbara Phillips, a schoolteacher in Boston. Her father was of Irish-Welsh ancestry, but her mother's family, the Pezzettis, had emigrated to the United States from Bologna. After a two-month courtship, Giovanni proposed to Barbara. She recalls that during the 6 months of his fellowship, he attended many conferences at the Massachusetts General Hospital. Years later friends recalled him as a brash young Italian neuroradiologist who sat in the front row and constantly debated with the radiologists and neurosurgeons. He left in December of that year, and returned to Italy where he organized and directed the x-ray departments of the Neurological Institute of the University of Naples and the St. Mary's Hospital in Aversa.

In early 1954, Barbara traveled to Naples for an extended visit. She and Giovanni were married in a

small ceremony in a church in Naples on October 9, 1954. Although her father was only concerned whether Giovanni could support her, his father disapproved of his marrying a "foreigner" and refused to attend the ceremony, but relented after pressure from Giovanni's mother. He ultimately developed great fondness for Barbara. They established residence in a home overlooking the Bay of Naples, and there, 9 months and 9 days after their wedding, Barbara gave birth to a daughter, Giovanna, who was also Umberto's first grandchild. Eleven months later, twin boys, Patrick and Marco were born.

In 1957, Giovanni developed a keen interest in the use of radioactive isotopes in neurological diagnosis, and in October of that year was awarded a 1-year appointment as Visiting Scientist at the National Institute of Neurological Diseases and Blindness in Bethesda. With the enthusiastic backing of the Institute's director G. Milton Shy, Giovanni traveled to Bethesda. In January of 1958 he established and directed what would eventually become its Neuroimaging Branch, a post he held through many name changes and administrations of the Institute for the next 40 years.

In March of 1958, Barbara arrived with the three children and found Giovanni heavily immersed in his work with clinical duties and frequent trips to Oak Ridge for courses in nuclear medicine. For several years he had been experiencing leg pain that became increasingly worse in April of 1958. In May of 1958, after much deliberation, he underwent exploratory surgery at Johns Hopkins Hospital and a spinal ependymoma was identified. Barbara had flown the children to Boston and returned to be with him after the surgery. Because of post-operative bleeding, he began to experience numbness in the legs, and 2 days after the operation had become paraplegic. Two weeks later he returned to NIH by ambulance, where he stayed for 5 months of rehabilitation. At that time, he was 32 years of age, an immigrant for only 5 months, a father of 3 children under the age of 3 years, and unable to stand or walk.

Giovanni's adjustment to this catastrophic change in his life was an inspiration to all who worked with and knew him. He embarked on a brilliant career as an investigator, teacher, editor, and spokesperson for Neuroradiology. Many will recall his lecturing from a wheelchair at meetings and courses, the microphone wires often becoming tangled in the wheels of his chair as he moved back and forth in front of the podium, expounding in that *basso profundo* voice in grammatically perfect English embellished with Neapolitan phonetics. The pompous were deflated, the dishonest exposed, and the humble and forgotten geniuses received kudos as he relentlessly pursued truth in our discipline. His friend Bud Baker once wrote that Giovanni was "known throughout the world for his keen intellect, fiery oratory, unimpeachable honesty, and droll wit" (1).

His interest in nuclear medicine in the late 1950s and early 1960s, a time when neuroradiology was primarily an "anatomic" discipline, was indeed pro-

phetic. He saw early on that the traditional anatomic ways of imaging the brain would soon give way to "functional imaging." He brought nuclear medicine into the armamentarium of the neuroradiologist and goaded his reluctant colleagues to expand their horizons beyond the traditional aspects of neuroradiology. His early work was devoted to a study of the flow of cerebro-spinal fluid. Using I-131 serum albumin, he performed a landmark study of its pathways (2). This laid the groundwork for subsequent studies of communicating hydrocephalus and cerebro-spinal fluid rhinorrhea. In 1961, he authored an atlas of normal pneumoencephalographic anatomy, and in 1967 authored a companion volume on pathologic pneumoencephalographic anatomy (3, 4). When computed tomography was suddenly sprung upon unsuspecting neuroradiologists in 1972, they turned to these two volumes to make sense out of the alien cross-sectional images they were called upon to interpret.

His other important contributions were in the field of spinal cord arteriography where he, with Doppman and Ommaya, reported the obliteration of spinal cord arteriovenous malformations by percutaneous embolization of an intercostal artery using small stainless steel pellets. The article stated, "occlusion by percutaneous embolization as described, seems to be an effective and even less traumatic approach than surgical ligation and may represent the method of choice for dealing with these problems." This was one of the earliest reports in interventional neuroradiology (5). As new developments arose, he continually incorporated them into his research. He used PET scanning to distinguish between recurrent tumor and radiation necrosis (6) and later studied cerebro-spinal fluid and spinal cord motion using magnetic resonance imaging.

By 1962, neuroimaging at the National Institute of Neurological Disorders and Stroke (NINDS), was of such stature, that Di Chiro was invited to attend that famous dinner at Keene's Chop House in New York as one of 14 founding members of the American Society of Neuroradiology (ASNR). He would later serve as president of the ASNR, and in 1982 was president of the XIIth Symposium Neuroradiologicum in Washington, D.C., only the second of those international congresses to be held in North America. In 1977, he founded the *Journal of Computer Assisted Tomography*, one of the major scientific publications in cross-sectional imaging. At Georgetown University Medical School he held the title of Clinical Professor of Radiology and at George Washington University School of Medicine he was Clinical Professor of Neurosurgery.

As his training program attracted more and more international investigators and trainees, he became much in demand as a speaker. In spite of having to use a wheelchair, he was able to travel to the far corners of the earth. Of necessity he had developed incredible upper body strength and could lift himself onto a bed or chair, and even into a bathtub. Dinners on the second and third floors of chic restaurants with narrow staircases were no problem for him. He



Fig 2. Giovanni is the center of attention on a sentimental visit to Baranello on the occasion of his receiving the *Premio di Cultura* (Cultural Award) from the City of Campobasso in 1993.

proudly stated that he had seen the kitchens of some of the great restaurants in the world because of the necessity of gaining entry via the freight elevators.

Although he held Gold Medals from the Radiological Society of North America and the American Society of Neuroradiology, and was awarded the Distinguished Service Award of the U.S. Department of Health, Education and Welfare, he was a true citizen of the world. He was an honorary member of six national neuroradiology, radiology and medical societies.

He harbored great fondness for the culture of his native country—its literature, poetry, language, history, politics, and especially its music. He loved to expound on the operas of Verdi and Puccini, as well as Mozart's Da Ponte operas, and was familiar with their hidden political agendas. He was proud of his heritage and the struggles of his ancestors, and the acknowledgments of his first textbook include the following statement: "This study was initiated under spurring of Professor Umberto Di Chiro, Latin and Old Greek Scholar. The idea of this atlas was thus born, but during its preparation Umberto died. To his memory goes the gratitude of a son and a pupil (4)."

As he loved his native land, so did it revere him. He was an honorary member of the Italian Society of Neuroradiology and of the *Accademia Medico-Chirurgica del Piceno* of Ancona. He twice delivered the *Fondazione Carlo Erba* Lecture in Milano and spoke on the occasion of the IX Centenary Celebration: Athanaeum Conference at Bologna University. The Italian Government awarded him the title of *Cavaliere Ufficiale* in 1975 and *Commendatore al Merito* in 1983. In 1992, he received a Gold Plaque from the Italian Society of Neuroradiology and the City of Genoa. In that same year, at the International Meeting on Functional and Therapeutic Neuroradiology that was organized in his honor, Dr. Di Chiro received the Ottorino Rossi Award of the University of

Pavia for outstanding contributions to the neurological sciences, and in 1993, the City of Campobasso honored him with its *Premio di Cultura* (Fig. 2).

Giovanni's curiosity was insatiable, and work was his nourishment. His final illness began in April of 1997 when he experienced weight loss and gastric upset. He continued to work up until the first week of August, when his physician noted decreased breath sounds. A chest x-ray confirmed a lung tumor and a CT scan demonstrated brain metastases. Oncologists urged him to undergo radiation or chemotherapy, but he was adamant in refusing. He replied to the entreaties of one of his physicians with, "I have been working with tumors for forty years, and I know what to expect." He died at home on August 27, 1997.

Tributes poured in from around the world. Zach Hall, Director of NINDS, said "Giovanni will be remembered for his enthusiastic support of young radiologists. . .and his generosity in sharing expertise and establishing collaboration" (7). Torgny Greitz, his friend since the early years in Stockholm, wrote to Barbara, "Giovanni was honest and outspoken and never feared to tell people his opinion. . . His honesty was a warranty for the quality of his research. He will be remembered as a great scientist, a pioneer in the field of neuroradiology (September 9, 1997)." Dr. Josef Vymazal of the Czech Republic remarked in a letter, "I admired his unbelievable ability to understand everything—from the brain to music, history, or art. We spent hours discussing European history, and I admired his deep understanding and knowledge of the complicated and tragic history of my country in this century (August 27, 1997)."

A memorial service was held at the Mary Woodward Lasker Center for Health Research and Education (The Cloisters) at NIH on September 12, 1997. Among the moving tributes at that service was one by his long-time associate, Dr. Nicholas Patronas. He spoke of Giovanni's integrity, impeccable honesty,

and struggle for perfection in his publications. He closed by saying, "Dr. Di Chiro was a man with a great heart, full of compassion for his fellow man. He could not understand and could not accept exploitation of one man by another. He was saddened every time he encountered social injustice. He saw the high peaks of prosperity and the deep valleys of poverty and despair. . . If he was not a doctor, he would have been a political leader. I am certain he would have liked to make a contribution to the social texture of our society. He was painfully aware of how imperfect our world is and annoyed he could not do anything about it" (8).

So ended a remarkable career in Neuroradiology. Dr. Di Chiro is survived by his daughter, Giovanna Di Chiro, PhD, an Assistant Professor in the Department of Environmental Science at Allegheny College in Pennsylvania, and twin sons, Patrick who works in advertising in San Francisco, and Marco, a law enforcement officer in Montgomery County, Maryland. Giovanni's older sister, Lucia Greco, is a university professor in Naples, and a younger brother, Rinuccio, is a retired businessman in Rome, where a younger sister, Anna Conventi is a teacher.

He is also survived by his wife and constant companion, Barbara, whose unselfish devotion to him is worthy of beatification. In his letter to her after Giovanni's death, Torgny Greitz said, "I do not want to

finish this letter without thanking you for the self-sacrificing work you have done by always taking care of Giovanni. Anyone understands that without your commitment, Giovanni's accomplishments would not have been possible. You have shown a most admirable perseverance. Thank you so much for making an important chapter in the history of neuroradiology possible (September 9, 1997)."

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Editor Emeritus

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