

The Magic World of the Heart

Professor Domingo Liotta

Overview

Today's Forgotten Mysterious Human Heart

At the dawn of the 21st century our scientific conscience is in sorrow lying in the lower realm of nature. We, scientific people, look like prejudicial minds thirsty in a desert, desperately searching for the footsteps of truth.

In the late 19th and early 20th centuries a highly erroneous conception prevailed, stating that the international dimensions of modern science would lead to an increase in the understanding and intelligence of human beings.

Under this misconception modern science was presented as the road to avoid human hatred, persecution, terrorism, war, starvation and their deadly effects –regarding both matter and spirit– on mankind. Today it is easily recognized that it has been a misconception of life. It has been an illusion. It has been an error.

On the other hand, a new human dichotomy is forming, on the one side the 4-5 billion people moving through the health transition towards longer lives and human rights and on the other, 1-2 billion people stuck in vicious circles of poverty and insecurity. Doubtless, modern science is the greatest and most magnificent enterprise of the human intellect, the accumulated scientific and technological findings of decades of medical research and the recent rapidly growing body from the investigation of the human brain is becoming increasingly influential in the new horizons of the clinical environment of healthcare.

The triumph of mind and will over illness and thousands of obstacles is one of the sunny spots in the book of man's intellect. Although we have seen intellectual advancement throughout the centuries, we could hardly see an evolution in man's dignity, in ethic values and honor and in respectability of nations. Even it may become worse in the most tragic occasions.

Research and knowledge on natural science are impetuously advancing; however, man's doctrines have failed terribly in the battlefield of

untamable human discord and rancor. Doubtless, human science and human intellect are continuously progressing whereas ethic values in human beings are not.

From the core of science we must understand today's frightening world. However, we seem to be floundering in a swamp or gasping for air in the desert.

Nevertheless, we should examine ourselves and surely we can learn from the affection and purpose of the human **heart** itself. This is the only way we can learn what we can honestly do to help in the marasmus of this century's world.

The Eternal Heart: The Discovery of the Spiritual Core of Mankind

I myself started the study of the written Chinese characters on China soil during prolonged scientific missions throughout 23 years (1973-1996). The study of Chinese phonemes (ideograms), in which the word *heart* is incorporated, displays the utmost spiritual connotation that is similar to the comparative studies of Indo-European languages.

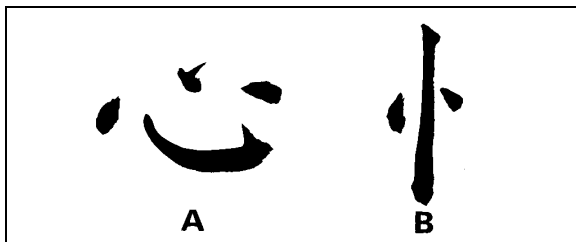
From *Cor* and *Cordis*, which means *heart* in Latin, we have *cordial*, *concord*, *cordially*, *cordialness*, *concordance*, *Courage*, *discouragement*, and on the negative side, *rancor*, *rancorous*.

Besides *Kardiac* which means *heart* in Greek, gives birth to *cardiology*, *cardiac*, *electrocardiogram* in Aryan languages.

Heart comes from the Teutonic tongues and from the Sanskrit word *hrid*, from a deeper root meaning to leap, the bounces of the chest, the jumping of the chest that always means life. That is obviously the heart; it is the only organ in the body that jumps. Also the Sanskrit words *krid* and *rurd* curiously mean *deer*, which is continuously leaping. The observations of nature were incorporated into the early roots of man's expressive language. From *heart* we have the following derivations: *hearty*, *heartening*, and

heartened; and the numerous composed words: heartache, heartbreak, heartburn, heartfelt, heartless, heart sore, heartsick, etc.

In the study of the written Chinese languages, the representations of the graphic phonemes appear as photographs of the ideas, or ideograms. As a matter of fact, I insist, the study of the Chinese phonemes in which the character of the *heart* is incorporated shows a spiritual connotation, similar to that of the Aryan tongues.



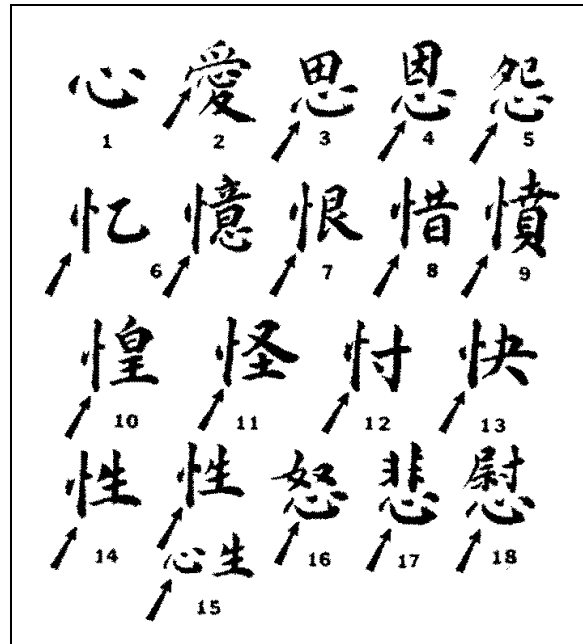
Chinese Ideograms. Two ways of representing the ideogram of the word heart in the modern Chinese language; **A** is the present writing; **B** is usually a left radical of another Chinese character. Chinese calligraphy is presented through the courtesy of the Honorable Han Xu, Ambassador of the People's Republic of China to the United States.

Once we had studied the word *heart* in the Chinese phonemes, we were able to identify more properly eighteen hieroglyphs with the highest spiritualist significance (see figure in right column).

From the linguistic point of view, the Chinese language comes from the Tibet-Burma family. A distinct doctrine founded in deep-rooted philological facts demonstrated the lack of relation between Chinese and Aryan languages whatsoever.

It is evident that the comparative study of Aryan and Chinese languages, absolutely distant and strange from the philological point of view, has demonstrated through the word *heart* a moving testimony: The spiritual unity of mankind.

I must remark that mankind has a unique spiritual and common golden mother since the mist of time. The heart is at the core of this spiritual nucleus.



Many phonemes in the Chinese language have strong spiritualistic connotations.

Their graphic representation incorporates the word heart (phonemes 1-18). Arrows indicate the position of the word heart in the phonemes. The pronunciation (in bold characters) and the meaning are as follows: 1, **xin**, heart, feel, center; 2, **ai**, love; 3, **si**, think, recall; 4, **en**, favor, kindness; 5, **yuan**, rancor, hate; 6, **yi**, remember, the left being a simplified version of the right; 7, **hen**, hate; 8, **xi**, hurt, regret, pity; 9, **fen**, irritate, resent, angry; 10, **huang**, alarmed; 11, **guai**, blame, strange; 12, **cun**, reflect, consider; 13, **kuai**, happy, rapid, sharp; 14, **xing**, sex, characteristics; 15, **xing**, heart + birth, heart + life; 16, **nu**, anger; 17, **bei**, sad; 18, **wei**, comfort. Numbers 14 and 15 are highly interesting; note how the ideas of sex and characteristics (**xing**) are integrated into birth and life (**sheng**), the right radical in 15. Chinese calligraphy is presented through the courtesy of the Honorable Han Xu, Ambassador of the People's Republic of China to the United States.

'Lev', the Hebrew word for Heart

The *heart* is spoken of in the Scriptures as the center of the physical, mental and spiritual life of human beings. Both the anatomical organ and the spiritual and moral life of the person are conceived in the word *heart*. Then, the heart is closely connected with the intellect and is the seat of intelligence. To the ancient Hebrew the *heart* was the mind -all thoughts- including emotions.

Not only is the heart associated with the activities of the mind and the will but is also the seat of the affection and love -'Ahava'- of a person.

The heart is the place where the natural eternal laws of God, *the ethical values*, are written. Whether the *matter* of the Universe is the dwelling place for scientific research, the *human heart* is the spiritual dwelling place of God.

The Hebrew language has no word for *conscience*. The Hebrew translates the word *heart* as meaning conscience.

Kardia is only referring to the natural organ, the anatomical heart in Greek. It contrasts with the word *Lev* in Hebrew, which refers to both the physical organ and the intellectual and spiritual life of a person.

On the negative side, in the Scriptures the words *rancor*, *depravity*, *hate* are said to come from the word *heart*.

In May 1974, I had the honor to meet the President of the State of Israel Professor Ephraim Katzir, who was a biophysicist and a well known scientific researcher.



President of Israel Professor Ephraim Katzir, MD;
Mrs. Liotta; and D. Liotta. Jerusalem (1974).

President Katzir gave me the Holy Scriptures as a present, which I accepted with great emotion. I keep said holy Bible -with covers made of heavy metal, inlaid with four big emeralds and an endless number of small precious stones- in my bookcase at home, in Buenos Aires. I would like to tell you an unforgettable anecdote of a situation that

occurred because of the heavy weight of this Holy Bible.

At the end of President Katzir meeting, Minister Abba Eban took me to his office at the Ministry of Education. I left the heavy bible on the upper part of the back seat of the Minister's car. Suddenly the driver braked sharply and the heavy bible slid and hit Eban's head. I did not know how to apologize, but Eban smiling uttered a sentence I have never forgotten: "*Don't worry, of the several blows I have received in my life this is the best one, since it is a cultural blow*"



Abba Eban
(1915-2002)

The Hearts of Jericho

Jericho, situated on the west side of the Jordan Valley to the north of the Dead Sea in the middle of the scorched reddish soil from the desert of Judea, appeared as if it had belonged to another world. When at some distance we were able to see Jericho, Olga and I raised our eyes to heaven, and exclaimed the phrase from the Scriptures '*aeli enarrant gloriant Dei*': The Heavens are telling the glory of God (Psalm 19:2). At that small oasis in Jericho, we really felt something we had never felt before.

'*Peace upon Israel*': These words appear on the mosaic of the oldest Synagogue of Jericho, which dates from the sixth and seventh centuries and was resistant to the passage of Christians and Muslims for almost fourteen centuries. The artist at that time surrounded the meaningful phrase '*Peace upon Israel*' with a circle of mosaics, each one having the imprint of a *heart*.

Every human passage has left a mark on the floor of the old Synagogue, but the small *hearts* have lasted despite the fury of men.

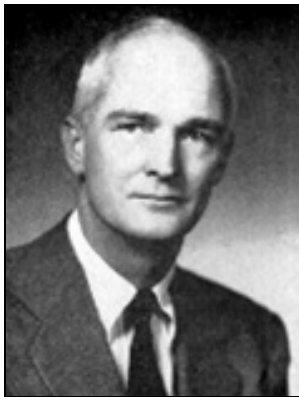
**The Great Adventure in the 20th Century:
Native Human Heart Mended**

The remarkable story -which involves the repair of the anatomy and physiology of the human heart- merely began about sixty years ago.

In the medical field it had never been surpassed the courage of patient, physician, surgeon and anesthetist in attempting the unknown and entering upon uncharted courses.

No single factor has been all-important in achieving success in this field of medicine. Rather, it is verily the unique teamwork of the entire medical profession- nursing, personnel and hospital staff- that has afforded so many patients a new tenure of life.

At the dawn of open cardiac surgery the feasibility of open intracardiac surgical repairs with complete bypass of the heart and lungs by a mechanical pump-oxygenator was first established by John H. Gibbon, Jr. at Jefferson Medical College of Philadelphia on May 6, 1953 when he successfully repaired in an 18-year old woman named Cecilia Bavolek an atrial septal defect (ASD) by this method.



John H. Gibbon, Jr.
(1903-1973)

C. Walton Lillehei with his co-workers Morley Cohen, Herb Warden, and Richard Varco at the University of Minnesota reported in 1954 the first direct vision of intracardiac anomalies, utilizing the native cardiopulmonary system of the infant patient's parent as a biologic pump - oxygenator- controlled cross circulation. Repair of ventricular septal defect and of Tetralogy of Fallot was first accomplished by the Minnesota

University's group by the cross-circulation method.

Richard DeWall, a junior colleague of Lillehei -the perfusionist of the cross-circulation method- initiated the research on the mechanical oxygenation of the blood- the unbelievable power of red cell's hemoglobin to absorb molecules of oxygen from every possible source. DeWall developed the helical bubble oxygenator, first used in a patient on May 5th, 1955.



**C. Walton
Lillehei**
(1918-1999)

Richard Varco
(1912-2004)

**Richard
DeWall**

John W. Kirklin at the Mayo Clinic used a mechanical pump-oxygenator (Gibbon type) and greatly contributed to open heart surgery.



Famous picture::Varco (left) and Lillehei, shaking hands across the operating table, still with the patient at the end of ASD Repair by cross-circulation procedure.

The hallmark of Kirklin's discovery was a key question, that is, the reproducibility of accomplishing open cardiotomy in man while the circulation was supported by means of a mechanical pump-oxygenator.

All-in-all John Kirklin was a man of tremendous quality; he visited us at the Texas Heart Institute in Houston and was impressed by our work on Assisted Circulation. Later I spent

some time in his service at Birmingham University as an observer.



John W. Kirklin
(1917-2004)

Few years ago I received Dr. Kirklin at the Society of Cardiology in Buenos Aires and I proudly included in my statement to the crowded audience the following words 'Argentine cardiologists, cardiac surgeons, look at yourselves in this mirror'.

Denton A. Cooley appeared in the scenario of open surgery in about 1956 and he was one of the first using simplified techniques to make bloodless open cardiomy possible, and without minimal operative time constraints.

Denton A. Cooley, Michael E. DeBakey and E. Stanley Crawford from Baylor University College of Medicine in Houston are the most outstanding exponents -the living legend- of the 20th Century cardiovascular surgeons.



Michael E. DeBakey
(1908-2008)



E. Stanley Crawford
(1922-1992)

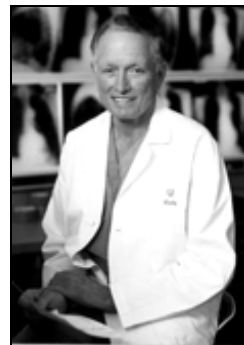
The signal event of the modern era of cardiac surgery was firstly the discovery of a safe method of extracorporeal circulation followed by specific

protections of the myocardium during the open cardiomy procedure. Later, the discovery of effective drugs to secure a smooth cardiovascular postcardiomy and postoperative periods; the contribution of trained anesthetics on cardiovascular management has been crucial.

The Houston's group and Kirklin at the Mayo Clinic, and Lillehei at the Minnesota University were earlier milestones on the development of cardiac surgery; their observations proved the surgical functional resolution of heart's pathology to be remarkably predictive.

Additionally, modern off pump and catheterization procedures in the resolution of defined cardiac pathology are progressively expanded. Furthermore, minimally invasive robotic heart surgery may also have a place in the future.

Denton A. Cooley -the legendary Houstonian man- and Christian Cabrol in Europe are widely regarded as cardiac surgery's deans today.



Denton A. Cooley



Christian Cabrol

Cardiac Surgery: A Scientific Revolution

A scientific revolution -as the cardiac surgery- requires a series of paradigm shifts that are promoted by a series of previous discoveries. Hence, a truly *revolution* was erected on the shoulders of giant pioneers.

Clarence Crafoord and Viking O. Björk from Sweden were giants in cardiothoracic surgery. Crafoord did the first aortic coarctation repair in October 19, 1944. In 1930 he introduced *Heparin* as thrombosis prophylaxis in pulmonary embolectomy. Viking Bjork invented an oxygenator with multiple screen discs that

rotated slowly in a shaft over which a film of blood was injected.



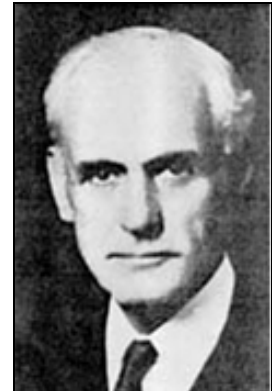
Clarence Crafoord
(1899 - 1983)



Viking O. Björk
(1918-2009)



Robert Edward Gross
(1905-1988)



William E. Ladd
(1880-1969)

In April 1951 Clarence Dennis -a true Renaissance person- using an early model pump-oxygenator operated a 6-year old girl to repair an ASD (Ostium Secundum); the girl died within hours. It has been reported that Lillehei observed Dennis' surgery.



Clarence Dennis
(1909-2005)

From 1972 to 1974, Clarence Dennis headed a National Heart and Lung Institute program in Bethesda, Md. that focused on developing artificial hearts.

On August 26, 1938 Robert Edward Gross at the Children's Hospital in Boston performed the first operation for Patent Ductus Arteriosus (PDA) upon a 7-year-old girl named Lorraine Sweeney. He was then Chief Resident in Surgery under William E. Ladd, the Surgeon-in Chief. Gross did the surgery when Ladd was on summer vacation. Ladd never forgave Gross for that surgical coup. Gross was certain Ladd would not have allowed him to do it if he had been in town.

'This bold adventure was the opening wedge for surgical correction of congenital cardiac malformations'.

When Lorraine Sweeney last visited Gross she was 58 years old. Lorraine is now 77, and in excellent health. By the time of his retirement more than 1,400 PDAs had been divided by Gross and his residents.

Gross had no vision in one eye. None of the residents who trained with Gross knew that he had that problem. He operated throughout his entire career with just one eye. His congenital cataract was removed after he retired.

Helen Taussig from Johns Hopkins Hospital visited him in Boston. She suggested making an artificial patent ductus arteriosus, connecting the pulmonary artery to the aorta as a palliative measure for blue babies who lacked pulmonary artery blood flow. Gross dismissed that idea. Taussig then presented it to Alfred Blalock at Hopkins who successfully created the Blalock-Taussig shunt. *Gross often retold that story as a lesson to young surgeons to listen to others around them.*

Gross invented a latex rubber well that he would sew at the right atrium's lateral wall for the ASD repair. The well would fill with blood to a certain level due to the atrial pressure when the right atrium wall was incised. By palpation through the blood level that filled the well Gross would localize the ASD- Ostium Secundum- and suture it.

On April 3, 1952 at the Children Hospital in Boston the first operation using his method was performed -the girl named Maria Zinni died after surgery. Gross applied his ASD closure technique upon 2 more young patients and both died.

It was still the month of April and Gross closed the ASD-Ostium Secundum of a 9-year-old boy named Gerald Soucy on April 15, 1952 and immediately afterwards in the next patient named Gail Corbett; both survived. I have seen a picture of both of them enjoying life as teenagers. Still in April the following patient died.

It is hard to believe the tremendous courage, goodwill, confidence, perseverance and faith that these giant predecessors of modern cardiac surgery have in their own dreams.

John H. Gibbon's, Jr single successful ASD closure using his pump oxygenator machine - May 6, 1953- was preceded and followed by the death of his patients.

On September 2, 1952, Floyd John Lewis and his associates Mansur Taufic, Richard Varco and Walton Lillehei at the University of Minnesota's Department of Surgery closed an ASD -Ostium Secundum- *under direct vision*, using moderate surface-induced hypothermia and inflow occlusion of the superior vena cava and the inferior vena cava upon a 5-year-old girl named Jacqueline Johnson. Lewis sutured the atrial defect and closed the wall of the right atrium in about 5 minutes and then released both venae cavae, allowing the heart to regain its function. Dr Gibbon's patient Cecilia Bavolek on May 6, 1953 was totally dependent upon the pump oxygenator for 26 minutes.

Jacqueline Johnson was the first survivor in the medical history of an ASD repair under direct vision; Richard Varco was the first assistant and Lillehei the second assistant in the historical operation.

The era from 1950 to 1967 was an incredible time of innovation within the University of Minnesota's Department of Surgery. The Department was led by a chairman, Owen H. Wangensteen, who was considered the mentor of thousands of surgeons.

Norman Shumway as a young Resident was a privileged witness of these historical hours at the University of Minnesota; in 2003 he wrote the following statement:

"Walton Lillehei was a great friend of F. John Lewis. They were buddies all through medical school and then went into the Service together. Lewis who did the first ASD successful case was an extremely brilliant man and a very funny man. He had a wonderful sense of humor, and he was in essence an inventor as well as of course a very accomplished surgeon"



Floyd John Lewis
(1916-1993)



Norman Shumway
(1923-2006)

I am rather reminiscent of Lewis' clinical method of ASD repair. I myself learned the procedure from Paul Santy and Pierre Marion in the last year of my Residence at the University of Lyon in France (1958-59). At that time, the anesthetist responsible for the critical period of moderate surface-induced hypothermia procedure was a bright woman, Dr Suzanne Stanove.



From left to right, Mr. Enrique Cresto, Governor of the Province of Entre Rios, Domingo Liotta talking to Professor Pierre Marion at the Government House in Paraná, capital city of the Province of Entre Rios, Argentina (1974).

Total Artificial Heart
Left Ventricular Assist Systems (LVASs)

Our own and others' works played an important role in the development of this wealthy new area of medical research. For me, it started in Lyon at the end of my Residency -Assistant Étranger- in general and thoracic surgery (1958-59).

In 1958, Pierre Marion started studies on extracorporeal circulation at the animal laboratory of the University of Lyon and I assisted him.

Why did I begin thinking one day of the mechanical miniaturizations of the blood pumping system to replace the heart function? I don't know -it is still a mystery to me- however, it was frankly a rather superb crazy idea at that time.

In the words of Hans Selye, to make a great dream come true the first step is a great capacity to dream, that is, to have creative ideas within a basement of elaborate inward mental disposition; the second one is persistence on it; and the third one is to have faith in your own dream. Humbly, I would add to Dr Selye thoughts: *Courage and Audacity*.



Hans Selye
(1907-1982)

Truly, the nature of the human brain that suddenly starts an intellectual line of action - changing the course of our own life forever- is a mystery.

In my own life experience, I may say that - besides the seminal "*dream*"- it is relevant the second Selye's rule, that is, persistence and strong

persistence. Truly for me, it was constant persistence the "*secret*" to develop the seminal '*dream*'.

If you don't believe me, that persistent work is the key, just remember Pablo Mirizzi, Pierre Mallet-Guy, Pierre Marion, Christian Cabrol, E. Stanley Crawford, Michael E. DeBakey and Denton A. Cooley, just to mention vivid examples in my own life.

Mirizzi in Argentine and Mallet-Guy in France were my unforgettable teachers in General Surgery.



Pablo L. Mirizzi
(1893-1964)



Pierre Mallet-Guy
(1897-1995)

I am adding, however, *courage* and again if you don't believe me, just remember the historical operation—the first in medical history of the Total Artificial Heart in the afternoon of April 4, 1969 at the Texas Heart Institute in Houston. A dying human being was able to live with the Liotta-Cooley TAH until human donor replaced it. That was a medical hard time but full of glory and courage. The clinical prototype of Liotta-Cooley TAH was selected in 2006 to be displayed prominently in the new Smithsonian Treasures of American History. In Dr Cooley's opinion, "*this establishes it as a worthy part of human history*".

End of Part I out of III

Domingo LIOTTA
Dean Faculty of Medicine
University of Morón
