

though they were intellectually much less than De Gaulle or LaRouche, the idea of Spain was not folklore, it was not a joke. They built industry, they made progress, and the population grew by over 10 million people. When Franco was dying, and wrote the following words to the nation: "Spaniards: In the name of Christ I rejoice. . . . I should like in my final moment, to join the names of God and Spain and to embrace you all, to call out together: Long live Spain!" he

was not cynical. The proof of that, is what he did do for his country in 40 years, in spite of everything.

What he did not do was bad enough: He feared to crush the Duke of Alba and the Andalusian latifundists, and being a relatively uneducated man, he had a very faint and sketchy idea of popular schooling, which lack is the root of all evil in Spain. But Franco and Carrero died 15 years ago, and the rest of the job is ours, not theirs.

The beauty of the human body's form, composition, and operation

by Warren J. Hamerman

The Body Victorious

by Lennart Nilsson

Dell Publishing Co., Inc., New York, 1987

196 pages, hardbound, with photographs and index, \$25.00.

Leonardo da Vinci on the Human Body: The Anatomical, Physiological, and Embryological Drawings

Edited by Charles D. O'Malley and J.B. de C.M. Saunders

Crown Publishers, Inc., New York, 1982.

506 pages, hardbound, with 1,200+ drawings, \$25.00.

Leonardo's and Dürer's "integrative" approach to the human body, subsuming questions of geometric form, aesthetics, construction, and biological function at once, has stood the test of time. While modern science has learned how to "measure" the human body in its minutest molecular biological detail, and the modern photographer and spectroscopist have achieved remarkable images of basic biological processes, Leonardo da Vinci (1452-1519) and Albrecht Dürer (1471-1528) have established the basic principles of golden section proportion as both the way in which man is built as a whole as well as his particular organs. The principles of human biological phase-space establish the geometric ordering principle of how we grow and physically act.

Furthermore, Leonardo's remarkable notion that the "in-

Human Body Composition: Growth, Aging, Nutrition, and Activity

by Gilbert B. Forbes

Springer-Verlag, New York, 1987

350 pages, hardbound, with references, index, and figures, \$66.00.

The Human Figure by Albrecht Dürer: The Complete Dresden Sketchbook

Edited by Walter L. Strauss

Dover Publications, Inc., New York, 1972

347 pages, paperbound, with figures and bibliography, \$9.95.

side" of the human body is characterized by fluid flows similar to that of water is the basis of the most advanced 20th-century scientific insights into conquering disease and aging.

The refreshing aspect of this subject is that one cannot help but be filled with optimism and joy both about the way in which the human body is constructed and operates as well as man's ability to study and know its processes. Although the purposes and audiences for which each of the just-released "modern" volumes are written are completely different, they nonetheless are imbued with the Renaissance spirit that man's "natural biological state" is one of health, growth, and activity while disease, aging, impairment, and death are biologically "unnatural."

While the books of world-famous photographer Lennart

Nilsson and biophysicist Gilbert Forbes clearly demonstrate that over the centuries we have learned to measure chemical elements and see ultra-fine detail in the human body with ever greater precision, they nonetheless are less “modern” and advanced in capturing the essential principles of the human form’s “constructability,” function, and action potential than the works of Leonardo and Dürer. Leonardo and Dürer, informed by Luca Pacioli’s work on *The Divine Proportion*, explored the “golden section” harmonies of the human body in a systematic way from the highest synthetic or constructive geometry standpoint.

Mankind’s inner defenses

The Body Victorious is a lavishly printed photographic essay of mankind’s inner defenses by a world-famous Swedish photographer. At a time that we are daily assaulted with reports of AIDS, cancer, and other biological calamities, it is thrilling to look through the 196 pages of over 300 extraordinary photographs (200 in color) taken with the most advanced equipment, which study the human body’s immune system in its battles against viruses, bacteria, fungi, and protozoa. With the aid of an electron microscope, this award-winning master photographer has captured biological events never before captured in such photographic clarity. Spectacular photographs are presented of killer T-cells attacking cancer, the battles between white blood cells and bacteria, the architecture of blood clots and antibodies struggling to locate and repel foreign deadly substances.

Human Body Composition is a scientific text intended to give the reader the latest overview of what has been learned by “measuring” the chemical elements of the human body in finer and finer detail in order to better understand the processes of health and growth as well as their contraries, disease and aging. Using modern spectroscopic methods, precise measurements have been achieved for body fluid constituents, body fluid volumes, and the water content of various organs. These components have been catalogued into a so-called “reference man.”

Written by a Professor of Pediatrics and Radiation Biology and Biophysics at the University of Rochester, the book correctly emphasizes that the human body cannot be understood as a fixed, closed system. In short, our nature is biodynamic.

Biohydrodynamics

From one-half to two-thirds of the body weight of normal individuals is water. The various fluids of the body are interconnected since water, amino acids, electrolytes, carbon dioxide, and oxygen pass freely from one compartment to another. Extracellular fluid (ECF) consists of blood plasma and the interstitial fluid which bathes tissue cells. The remainder of the body’s water is contained in specialized “transcellular” fluids such as cerebrospinal fluid and fluids in the intestine.

Body cells are connected to the outside world by means of blood plasma and interstitial fluid (ISF), and it is these avenues that provide for exchange of gases in the lungs, absorption of nutrients and water in the gastrointestinal tract, excretion by the kidneys, and the transfer of materials to the fetus. These transfers of materials from the environment to the interior of the body cells, and from the cells to the outside world, have been found by modern techniques to take place very rapidly and to involve considerable quantities. In the adult, the fractional turnover of body water is about 7% per day, and that of body sodium (Na) is about 7% per day.

Thus, the ultimate precision of modern measurements of body volume and weight is limited by the fact that the body is not a static system. For example, body weight varies during the course of a day, being up to a kilogram higher in the evening than in the morning. There exist daily variations in serum quantities of sodium, calcium, potassium, and phosphorus. In physiochemical terms the body is an “open” system: There is a continuous exchange of body constituents with the environment, and although such exchanges are minimized during fasting and thirsting, they are never completely absent.

Renaissance knowledge

Leonardo’s startling modern investigation of the “constructability” of the human form from the inside as well as the outside is based upon his remarkable conception that the geometric ordering of the human body is in conformity with Natural Law—what he called the Cosmography of the Living Microcosmos. Hence, his remarkable anatomical drawings are not mere scaffolds and hinges. For instance, his drawings of the skeletal and muscular systems highlight their “action potential.” His extraordinary drawings of the cardiovascular system study the ebb and flow motion of blood in and around obstacles as well as through valves from a standpoint similar to his hydrodynamic studies of water flows, vortices, eddies, whirlpools, and streamlines.

Dürer’s famous *Four Books On Human Proportions* are unique because of the method with which he studies the way “transformations” and “mappings” are accomplished. For instance, in his famous series of heads undergoing caricature changes, he employs a geometric “transfer method” to demonstrate changes in physiognomy. He also constructs “experiments” on the drawing board to create “stereometric men” on the basis of golden section ratios which are deliberately distorted in order to test the “boundary points” of the human form.

What Leonardo and Dürer have bequeathed to mankind is fundamental knowledge, presented in the most breathtaking beauty, about the geometric principle of every man and woman’s potential to grow, change, act, and be healthy. In these troubled times of pandemics, biological holocaust, and death, we urge that all scientists today strive to catch up with their knowledge.