MAGICAL MOMENTS IN MEDICINE
Part 6: Renaissance Medicine

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Prologue

The period between the last breath of the medieval night and the first glimpse of dawn of the next era is a dreary 75 years, during which we see no spectacular happenings. After the devastating medieval Black Death in 1347 AD, the process of medical evolution appears to have taken a long sabbatical. Demoralised physicians and barber surgeons, who could offer no cure for the plague epidemic, lost their credibility with the public and therefore, lapsed into oblivion. Shakespeare's comment "trust not the physician; his antidotes are poison" in *Timon of Athens* (1607) therefore, does not strike us as bizarre.

However, in the middle of the fifteenth century, there was a discernible pattern of change occurring in the minds of men. This new mind-set pushed them away from traditional beliefs towards independent thinking and created eagerness within them to consider aspects of the world and human life. This movement was, naturally, away from spiritual realms and quite innocuous at the start and I dare say the church saw this change as one that might eventually undermine its authority. But later, when the church tried to defend its authority, it realised it was fighting a losing battle, since Universities were now forging ahead with studies totally independent of the church and clergy. Thoughts, observations and experiments were unconstrained by theological doctrines. Interpretations of phenomena were made without consideration of religious implications. Political independence from the church coupled with a renewed interest in ancient classics, fostered a flowering of scientific, medical and cultural accomplishment that is almost unparalleled in human history. This welcome and worthy transformation warranted an appropriate name and was christened Renaissance. The term originates from *rinascita* (meaning rebirth or revival), a word first used by a Florentine artist named Giorgio Vasari to describe the period where evolution looks back to ancient Greek and Roman culture to rediscover their truth and glory. Officially, it extended between 1451 and 1600 AD.

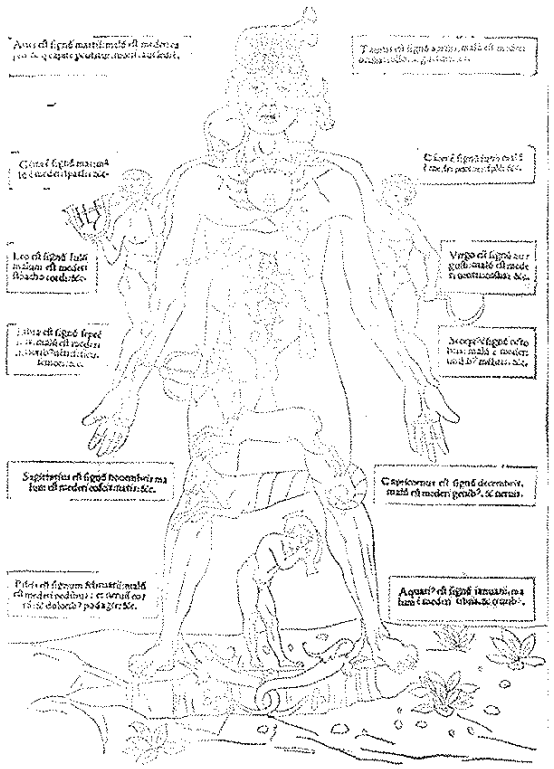
The first nation to recover from late medieval inactivity was Italy, which realised it was time to patch wounds, tighten belts and move on. The Italian Renaissance stimulated medical practice, just as it did all other intellectual pursuits. Physicians and scholars began to scientifically study medicine with renewed zeal and vigour. Nobody knows where all this creative energy came from, but the boot-shaped Mediterranean peninsula was surfeiting with new ideas and artistic thinking. The fine "art' of medicine was literally made artistic, thanks to the gifted artists of this period.

The landmark breakthrough of this age, however, came from an obscure goldsmith in Germany named Johanes Gutenberg, who invented printing with mobile type in 1454. This one technique itself may be said to have changed the nature of the human world. Knowledge, which was hitherto the prerogative of the elite rich, became gradually available to the masses.

Art and Astronomy

It may seem strange (and even inappropriate) to include descriptions about the evolution of natural sciences apparently remote and unrelated to the practice of medicine. But in the final analysis, it would be clear that the advancement of medicine is very much dependent on the technology gained from basic natural sciences. The laser, the ultrasound, gamma radiation and the like were contributions to medicine from physics, while antiseptics and antibiotics were nothing but chemicals with pharmacological value. Therefore, it is evident that ideas and the discoveries that arise from hypotheses of natural knowledge have significance to other fields as well.

Vast knowledge was gained in astronomy, thanks to the work of Copernicus and his contemporaries. Its progression was scientific, rational and methodical. However, Renaissance astrology was just an extension of popular ancestral doctrines and although it was taught as a subject in the Universities, many Renaissance treatises explicitly condemn it. Certain astrological concepts eventually got entangled with medicine, resulting in a hybrid product called astrological medicine. This assumed that the motions of the heavenly bodies influenced all human affairs and health. In practice, astrological medicine required knowing the exact time at which the patient became ill. With that information and the study of the heavens, the physician was able to predict the gravity of the condition, the prognosis of the disease and even foresee critical periods, where the patient's condition is likely to get worse. Jerome Cardan was a mathematician cum doctor, who firmly believed in astrological medicine. In his book *De Vita Propria* (Book of my Life) he states that specific points on the patient's head can represent astral influences (Picture A). Cardan invented a system called *metocoscopy*, which was a kind of astrological divinatory technique to diagnose diseases. Horoscopes



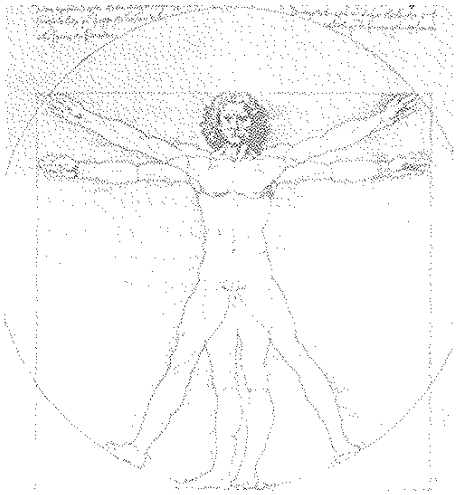
Picture A. Astrology and Medicine: Picture from Johanes de Kelham's Fasciculus Medicinae (1522) which is a zodiac illustration relating the astrological ties of Renaissance Medicine.

soon came into vogue and astrologers started writing them as soon as babies were delivered.

Professional artists and sculptors played a vital role in the early development of anatomy. Apart from familiar names like Leonardo da Vinci, Michelangelo and Raphael, there were others like Durer, Titian, Donatello, Verrocchio and Tintoretto who were no less accomplished. However, Leonardo da Vinci deserves mention since apart from being an extraordinary artist, he was also an anatomist, an inventor, alchemist, engineer and architect.

Leonardo da Vinci

Leonardo da Vinci (1452 - 1519) is perhaps the ideal "Renaissance Man" who studied almost everything that existed. Although he focused on the practical workings of nature, he also had an idealised sense of humanity that was the hallmark of the Renaissance era. We see this left-handed artist as a genius with great intellectual hunger. He hypothesised on human beings, animals, light, mechanics and had numerous futuristic projects on the anvil. However, none of them took off, including the aeroplane and helicopter that he designed. (I would recommend the movie 'The Hudson Hawk' to those who would like to see a very realistic Leonardo and his laboratory, complete with alchemy cauldrons, aeronautical models and other gadgets). He might have been a wee bit paranoid about people stealing his ideas, since he kept all his notebooks in a code. He had made thousands of pages of scientific and other observations, but since most of them remained undiscovered or unpublished, no major scientific breakthroughs resulted from



Picture B. Mathematics and Medicine: The Vitruvian Man of Leonardo da Vinci, illustrating the geometric symmetry, proportion and relations of the human body.

his work. Therefore Leonardo's legacy has been described as "the epitome of greatness in failure."

Leonardo's interest in anatomy started when he joined Andrea del Verrachio as an apprentice. Verrachio insisted that all his pupils learn anatomy and hence, to make realistic drawings and to further his knowledge of anatomy, Leonardo dissected human bodies at a hospital in Florence to see how the structures were put together. He is said to have spent countless nights dissecting and apparently he enjoyed "cadavers by candlelight". He also dissected pigs, oxen, horses and monkeys. He was convinced that all problems could be reduced to mathematics and mechanics. In his famous "Proportional Study of Man in the Manner of Vitruvius" (drawn in 1487) Leonardo saw a kind of mathematical perfection in the human form. It depicts the human body within the ideal form of the circle and within the perfect proportions of the square. (Picture B). More than 750 anatomical diagrams of Leonardo are in existence today and most of them show amazing accuracy and detail. They represent the skeletal, muscular, nervous and vascular systems and many of them also have annotations of a physiological nature. His correct assessment of the curvatures of the vertebral column and exact depiction of the foetus *in utero* were examples of his meticulous work.

Medicine

Renaissance medicine was a bit slower to develop than other subjects like astronomy and physics mainly since medicine did not have suitable technologies available as

they were to others. Moreover, medicine was a discipline having not only physical and biological dimensions, but also another abstract dimension of psychological, social, philosophical and religious overtones. This made understanding of the human body much more difficult than the stars and the sky.

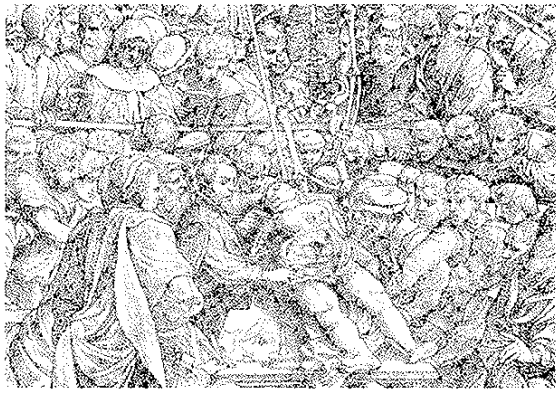
Pharmaceutical practices established by Arabic physicians were studied and refined. Pain was identified as one of the key elements causing emotional and physical distress to mankind and new medicines (like laudanum) that helped to stop or reduce pain were introduced. Some Renaissance physicians investigated the spread of infectious diseases. Human anatomy was one area where a great deal of attention was paid. This led to the detection and correction of many of the errors that had gone undetected for centuries and were rapidly disseminated through the new invention of printing. One man – an anatomist – considered the greatest of his time (and perhaps of all times) who played a key role in this process was Andreas Vesalius.

Andreas Vesalius

Born in Brussels on New Year's Eve, 1514, Andreas Vesalius came from a long line of physicians who were in royal service. His father was an apothecary to Emperor Maximillian and later, to his son Charles V. Vesalius matriculated at the University of Louvain in 1530 to pursue an arts curriculum and studied ancient languages. It is unknown when or why he decided to study medicine, but he enrolled for a medical degree from the University of Paris. He was, however, forced to discontinue in 1536, when he fled Paris because of the war between France and the Holy Roman Empire. He returned later to continue his studies and received his bachelor's degree in medicine the following year. In the same year, he enrolled in the medical school of the University of Padua. With his previous clinical experience and knowledge at Louvain and Paris, it was only months before Vesalius passed his exams and received his second doctorate in medicine.

Picture C. Andreas Vesalius. *Anatomist Extraordinairé.*

His primary interest was in anatomy, but medicine, physiology and pharmacology also intrigued him. He acquired great skill in dissection, but for a period, remained under the influence of the Galenic concepts of anatomy. Immediately after his graduation from Padua, Vesalius accepted a position there as an *explicator chirurgiae* or a surgical demonstrator and began lecturing on surgery and anatomy. Very soon, he established a style of his own and rose to the professorial cadre. In his time, there was



Picture D. Vesalius performing a public dissection. The audience consisted of people from all walks of life.

a definite hierarchical system, at least as far as anatomy teaching was concerned. The professor, draped in long robes, sat in a great chair reading the lecture, with a cadaver on a table down below. A junior colleague – the *ostensor* – pointed out the line of incision, while the third – the *demonstrator* – did the actual cutting. But Prof. Vesalius broke protocol and shifted paradigms by carrying out his own dissections for his classes. In his audience were medical students, physicians, interested civic officials, sculptors and artists (Picture D). He first produced, as teaching aids, four large anatomical charts. As one would expect, one of his charts was plagiarised and published. As copyright violation acts hadn't yet been enacted, Vesalius painfully soon realised that there were unscrupulous businessmen around and printed the remaining three charts with three views of the skeleton. This work appeared in 1538 as *Tabulae Anatomicae Sex*. The following year, he produced an anatomical manual for his students called the *Institutiones Anatomicae*. Vesalius's anatomical researches began to reveal findings contradictory to that of those recorded by Galen in his works. By 1540, Vesalius was convinced that Galen's research did not reflect human anatomy, but was rather the anatomy of animals, which wasn't quite the same as humans. Thereafter, his aspiration in life was to revolutionise the teaching of the anatomy of the human body and to overthrow the then prevailing teachings of Galen,

the medieval hero, who had drawn his conclusions from dissections on apes and pigs. It took him only five years to shake the hitherto infallible Galenic foundations and convince the people of the truth.

As a student of anatomy in Paris, Vesalius did not mind fighting savage dogs to collect bones from the Cemetery of Innocents. In Louvain, he supposedly stole the remains of a robber chained to the gallows and smuggled the bones back home hidden under his coat. In fact, incidents of grave-robbery were reported wherever Vesalius conducted his lecture – demonstrations. His students were no less enthusiastic in collecting corpses. One ingenious group is reported to have obtained a cadaver, dressed it and "walked" it into the dissecting room as an inebriated student!

In 1543 Vesalius published two works on anatomy directed to two separate audiences. The *De humani corporis fabrica libri septum* or simply the *Fabrica,* was his masterpiece. It was essentially a classical anatomical text and the longer of the two. Apart from being a magnificent volume in the history of medicine, it revealed the courage and independence of thought in line with the resurgent spirit of the Renaissance. It was aimed to persuade the established medical world to appreciate anatomy as the foundation of all other medical research. Vesalius pointed out the glaring errors of Galen and his followers and said that only active dissection and observation of the structure of the human body could correct these misconceptions. It is noteworthy that this great work - considered the foundation of modern medicine - was published when the author was only twenty-nine. The *Fabrica* is a exquisite book, complete with 23 full-page woodcuts, about 180 illustrations in the text, and dozens of charming historiated initials. A second edition was published in 1555, which scholars consider the more interesting of the two, because it contains important corrections and additions. One such revision is the denial of the permeability of the septum of the heart, which contributed very substantially to the ultimate discovery of the circulation of the blood. It met with a great deal of opposition initially, especially from diehard Galenists who reviled and ridiculed the work. Even his teacher Jacobus Sylvius (who perhaps, couldn't stand being overshadowed by his own student) dubbed his once favourite pupil "Vesanius" which meant 'madman'. However, the validity of Vesalius' work soon overcame detractors and *Fabrica* became a classic, which Sir William Osler would later hail as 'the greatest medical book ever written.' The *Epitome*, was for students, and emphasised the importance of dissection and anatomical knowledge in general, in relation to the practice of medicine. It was written in simpler style and was intended to help orient students and other readers before attempting the more formal and advanced *Fabrica.* It is described as "a pathway beside the highway" of the major work. Both works had ample illustrations by Jan Stephan van Calcar, a pupil of Titian, who was a contemporary artist. His ancillary interest in Pharmacology encouraged Vesalius to write the *Epistola* in 1546, in which he mentions the discovery and therapeutic use of chinaroot in the treatment of syphilis, which was terrifying the public during that time. He was also the first to introduce a new surgical procedure for the drainage of empyema. He studied human bones extensively and could identify carpal bones (and their side) blindfolded. The skeleton he articulated remains in Basel till this day.

The publication of the *Fabrica*, saw Vesalius being offered a royal appointment and keeping up with family traditions, Vesalius left academic research in 1543 to become chief physician to the imperial household. He held this position for twenty years under Charles V until his abdication and later under his son Philip II, whom Vesalius served until his own death. While in royal service, Vesalius was the King's chief military surgeon and an esteemed consultant to the various members of the court. An interesting tale is mentioned about King Philip's son, who fell down a flight of stairs, while in amorous pursuit of a pretty servant maid. He developed a haematoma in the forehead, which later got infected, resulting in high physical fever, in addition to that of love. Vesalius incised the abscess, which led to the dramatic recovery of the prince and perhaps, further passionate advances.

With honourable rank attained and ambitions fulfilled, a satiated Vesalius lost steam and abandoned any further research in medicine. He made no subsequent contributions to the cause of medicine. It is not known whether this was a result of the storm of vilification and abuse hurled at him by his contemporaries, following the publication and success of *Fabrica.* Robinson says "His numerous enemies did not silence him, the Inquisition did not smite him in his prime, but the siren of aristocracy seduced him from science." Some historians even insinuate that his early work was almost a sideline to impress the Emperor enough to gain royal commission. Whatever the motives for his initial enthusiasm, he, however, started new approaches to anatomy and physiology. Seldom has any man single-handedly produced a work so phenomenal, at such young an age. Dissection, description and depiction seemed to be the watchwords for Vesalius. Vesalius drowned on 15 October, 1564, in a shipwreck in the Ionian Sea (near the Greek island of Zakynthos) while returning from a pilgrimage to Jerusalem. However, other anatomists carried on the good work in the decades that followed, proving that an innovative motivator can assuredly inspire followers to exploit his methods and gain additional knowledge. Science has always progressed thus and continues to do so until this day.

Anatomical nomenclature

When knowledge began to be shared among the masses, there rose a need for standard nomenclature and thus began the naming of anatomical parts. Jacques Dubois, Vesalius' teacher in Paris, named many blood vessels and muscles, but was lethargic in the publication of his nomenclature work until 1556. His complacency was taken advantage of by Vesalius, who, in a bid to outshine his master, hurriedly published his *Fabrica* and went down in history as the pioneer.

Vesalius took a holistic approach to the body and regarded it as a fabric of numerous inter-related parts. His contemporaries and successors, however, chose to be more regional and piece-meal in their approach. Gabriele Fallopio, who succeeded Vesalius as Professor of Anatomy at Padua is remembered for discovering the uterine tube, later named after him. He also described several cranial nerves, the canal for facial nerve, facial palsy, the inguinal ligament, the vagina and the placenta. Giralamo Fabricius

Picture E. Urethral catheterisation for retention of urine. Whether the obstruction was due to an enlarged prostate or a gonococcal stricture is anybody's guess.

explored venous valves and described the cloacal bursa of birds, which formed the basis for the discovery of B-lymphocytes and allied immunological principals. In Rome, Bartolommeo Eustachio discovered the auditory tube (also later named after him), a catheter, (Picture E) and the valve of the inferior vena cava in the heart. He also produced a superb atlas of anatomy, probably the first of its kind. This was lost for 138 years until 1714, when it was finally discovered and published. Jacobus Sylvius described the flexor digitorum accessorius and the auditory ossicles (the lenticular process of the incus is named after him). He is frequently confused with, Franciscus de la Boe Sylvius, a Dutchman, who discovered and named several arteries and fissures of the brain, much later in the 17th century. The lateral (Sylvian) fissure and the cerebral aqueduct (of Sylvius) are named after the Dutchman. However, Renaissance scientists remained clueless as to the principles of the true circulation of blood. They came close, though. Galen had mentioned that blood from the right ventricle passed into the left ventricle through 'invisible' pores in the septum. Vesalius, strangely, perpetuated this preposterous theory, in the first edition of *Fabrica*. But in 1546, Miguel Servede Servetus, a former Professor of Anatomy at Paris, completed a theological work entitled *The Restoration of Christianity*, which, rather surprisingly, included a theory on digestion and the first ever description of the pulmonary circulation. In page 171, he stated that "the blood from the heart moved through the lungs, where it is made red. Then after a long detour it returns to the left ventricle." However, this was a revolutionary statement, which was not in conformity to classical teachings and hence met with hostility. He was burned at the stake in Geneva for the controversial religious opinions voiced in the book. All traceable copies of his book were also fed to the fire together with him. Subsequently, an Italian botanist named Andrea Cesalpino is said to have stumbled upon the systemic circulation, but apparently he never realised the significance of his discovery or his finding met with lukewarm response. These two scientists changed the direction of anatomical research by focussing on the function and not merely the structure of the human body. Their findings paved the way for the research of William Harvey, who eventually discovered the mechanics of circulation of blood.

Nostradamus

One among the many fascinating personalities of 16th century France was Michel de Nostradame, (1503 - 1566) better known to the world by his pseudonym, Nostradamus. By virtue of his profession as a doctor, Nostradamus finds a spot in our narrative. However, he is renowned not for his healing skills, but for his prophesies. His mystical work, *The Centuries*, contained more than one thousand such predictions and ran into ten volumes. His ardent modern day devotees staunchly believe that

Picture F. Nostradamus - Dr. Doom of Medicine.

Nostradamus correctly predicted such events as the French Revolution[1] advent of Hitler (whom he calls Hister) and the Second World War[2], Napoleon[3], the assassination of President Kennedy[4], the end of the Cold War[5] and even the stock market crash of 1929! (Did stock markets exist then?)

From an early age, the boy showed a talent for prophecy and as a student he was skilled in mathematics and astrology and learned Greek, Latin and Hebrew. His grandfathers were instrumental in Michel's medical education, which included herbal folk medicine as well as the forbidden arts of *Kabbalah* (a mystical, occult science) and alchemy. Michel entered the University of Montpellier as a medical student in 1522, but was annoyed with the ignorance of his teachers about such matters as personal hygiene and the dangers of bleeding and catharsis. After receiving his degree, he held a place on the medical faculty for three years before moving on to practice in Toulouse. A master astrologer, Nostradamus was sought out by wealthy citizens to prepare their horoscopes. He travelled widely, practising medical arts by day while at night participating in an underground network of alchemists and Kabbalists.

He then took to the countryside with his medical and astrological books and bravely assisted in the care of victims of the Bubonic Plague. His prescribed fresh unpolluted air and water and clean bedding for the patients. He had all the corpses removed immediately and the streets cleaned frequently. Each morning before sunrise, Nostradamus would go into the fields to harvest rose petals, which he then would dry and crush into fine powder. From this he made "rose pills", which patients were advised to keep under their tongues at all times, without swallowing them. He is reputed to have saved thousands from plague in Narbonne, Carcassone, Toulouse and Bordeaux.

In 1537, the plague struck again, but this time Nostradamus wasn't so lucky. He confidently applied his methods, but when his own family was fatally afflicted, his medical reputation was ruined. He fled and spent a nomadic life for the next six years wandering all over Europe. It was during this period that he began prophesying in earnest. In 1554, he began writing the first of his books of prophecy. His fame spread throughout Europe and he became a favourite of Queen Catherine de Medici. Nostradamus is said to have died at the age of 66 of renal complications following gout (which apparently he didn't or couldn't prophesy), but his name lives, as believers look forward to the fulfilment of his prophecies.

Before I wrap up the lowdown on Nostradamus, I have some good news and bad news. Actually, I had saved one of Nostradamus' most terrifying and disheartening prophecies for the end. It says,

In the year 1999 and seven months,
From the sky will come the great King of Terror.
He will bring back to life the great king of the Mongols.
Before and after war rules happily.
(Century 10, Quatrain 72)

Interpreted it means that a great catastrophe would happen in July, 1999, which could well be the Third World War, with total annihilation. This is indeed bad news since it means that neither will I be around to write the next episode of this chronicle nor you to read it. However, the good news is that it would not be the end of the world, since according to Nostradamus the world would be ending only in 3797 AD. That leaves mankind with more than a millennium and half to continue walking its wicked ways.

[1]*From the enslaved people, songs, chants and demands,*
The princes and lords are held captive in prisons:
In the future by such headless idiots
These will be taken as divine utterances.
(Century 1, Quatrain 14)

(The French Revolution, which began when the Bastille was attacked on July 14, 1789. Members of the aristocracy were imprisoned and some lost their heads — as did the mob, metaphorically, while engaging in violent actions.)

[2]*Beasts ferocious with hunger will cross the rivers,*
The greater part of the battlefield will be against Hister.
Into a cage of iron will the great one be drawn,
When the child of Germany observes nothing.
(Century 2, Quatrain 24)

(Hitler and the Second World War.)

[3]*The captive prince, conquered, is sent to Elba;*
He will sail across the Gulf of Genoa to Marseilles.
By a great effort of the foreign forces he is overcome,
Though he escaped the fire, his bees yield blood by the barrel.
(Ward 311)

(Napoleon was exiled to the small island of Elba but escaped for 100 days. After a defeat at Waterloo he relinquished all power for exile on tiny St. Helena)

[4]*The ancient work will be accomplished,*
And from the roof evil ruin will fall on the great man:
They will accuse an innocent, being dead, of the deed:
The guilty one is hidden in the misty copse.
(Century 6, Quatrain 37)
The great man will be struck down in the day by a thunderbolt,
The evil deed predicted by the bearer of a petition:
According to the prediction another falls at night,
Conflict in Reims, London, and pestilence in Tuscany.
(Century 1, Quatrain 27)

(US President Kennedy assassinated by a bullet fired from the roof top. Oswald shot and assigned guilt; grassy knoll; Jean Dixon's warning; Robert Kennedy shot at night time; students' riots in France and England; flood in Florence.)

[5]*One day the two great leaders will become friends,*
Their great power will be seen to increase:
The new land will be at the height of its power,
To the bloody one the number [is] reported.
(Century 2, Quatrain 89)

(Predictions regarding the end of the Cold War between Russia and the US.)

Paracelsus

Another of the key figures during the Renaissance is Paracelsus. Born in Einsiedeln, Switzerland in 1493 (a year after Christopher Columbus set foot in America) and christened Theophrastus Philippus Aureolus Bombastus von Hohenheim, he rejoiced in his third name. His father – an illegitimate offspring - practised medicine; his mother – suffering from manic depression - committed suicide when he was nine years old. While still a youth Paracelsus became aware of many of the conflicting currents of his age. History suggests that his childhood wasn't exactly enjoyable.

Picture G. Paracelsus. Bombastic Bombastus.

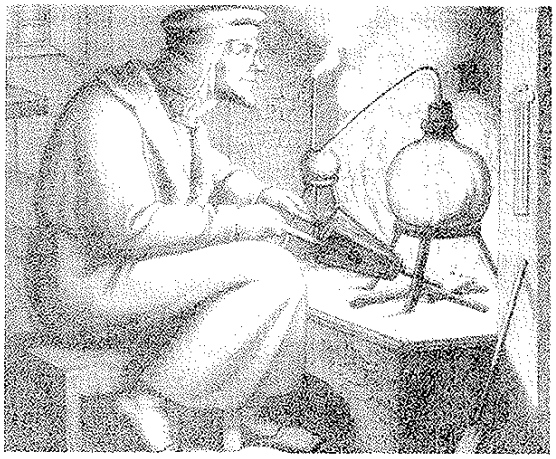
At the age of fourteen the boy left home to begin a long period of wandering. Reports of his education are contradictory. Some state that he had University education, while others state that there is no proof that he ever took a medical degree. Most books, however, agree that he was city physician, permitted to lecture at the University of Basel, although he had no official appointment with the medical faculty there. He is reported to have picked up enormous practical medical knowledge by working as a surgeon in a number of the mercenary armies that ravaged Europe in the seemingly endless wars of the period.

Almost immediately after he assumed his position, Paracelsus became a figure of contention. He heaped scorn on the conservative physicians of the University remarking that "even flies would disdain to sit on them except to make their dirt". During the St. John's Day bonfire, he pitched Galen's works and Avicenna's *Canon* to the blaze, while upholding the works of Hippocrates and no doubt, those of himself. This was followed by a disastrous lawsuit and he left Basel in haste, even leaving behind his manuscripts. The final years of his life found Paracelsus leading a nomadic existence, moving from town to town. As in Basel, he often he had to leave his manuscripts behind as he fled to escape the wrath of his irate contemporaries. He wrote that he visited most of the countries of Central, Northern, and Eastern Europe.

From a positive viewpoint however, it must be conceded that Paracelsus had brilliant insights and comprehension in the treatment of mental disorders. He concluded that man had equal measure of animal instincts and godly spirits and that the former had to be suppressed in order to attain fulfilment. This is remarkably similar to the description of the *Id* and *Ego* in modern psychoanalytical systems. Freud and later psychoanalysts state that *Id* is the unconscious part of the mind that consists of natural instincts, urges and drives that are repressed. It includes "internal events" which stem from the influence of heredity. *Ego* is a defence mechanism that is partly conscious and contains the capacities to calculate, reason and plan. In contrast to the *Id*, which relates to internal events, the *Ego* is occupied with the external world and it regulates and controls the instincts provided by the *Id*. *Super-ego* is the connection between the *Id* and *Ego*. It is the mind's link to reality and society and contains the influence of what is learned from other people. The *Super-ego*, unlike the *Id*, is not intuitive from birth, but acquired from childhood. Feelings of guilt are said to be one of its manifestations. Paracelsus was convinced that several diseases were only manifestations of underlying mental illness and advised treatment of the soul rather than the body. He maintained that human intelligence and reasoning power remained lucid in insane individuals. To elucidate his hypothesis, he pointed out the keen logic seen in the rantings of the paranoid, although they are always based on imaginary or false premises. This reminds me of a joke that exactly proves Paracelsus' point. A man driving a car suddenly loses control of his car as one of his wheels flies off. He manages to get back the wheel, but all the four retaining nuts are lost. As he sits by his car wondering what to do, he sees a man standing in the gate of a lunatic asylum nearby, motioning him to come over. The man walks over and the inmate of the asylum advises him to remove one nut each from the remaining three wheels and use them for the fourth. Thoroughly mortified, the man feels like kicking himself for not having thought this himself and says to the inmate "You are so normal, you shouldn't actually be in there!" For which the inmate replies, "I am here for being crazy, not stupid, man!"

In his unrelenting quest for knowledge, Paracelsus hacked out new paths through thick scholastic underbrush. In an era governed by herbal remedies, Paracelsus applied alchemy to transform raw metals into new remedies. Tin, silver and sulphur were all experimented upon. Paracelsus appears to be the first man to conceive the idea of test tube babies. He claimed that a homunculus could be created by placing human sperm and horse dung into a retort and baking it for 40 days. (Picture H). Though ridiculous in materials and methods, he had, nevertheless, envisaged the concept.

No figure in the noble history of medicine has been more controversial than this man, who is conjectured to have



Picture H. Paracelsus incubating a homunculus. It is unlikely that he successfully *conceived a baby* in the flesh this way, but was the first to *conceive the concept* of test tube (retort?) babies.

given the word 'bombastic' to literature. This is erroneous, but nevertheless, appropriate. His assumed name Paracelsus meant "better than Celsus," (who was a great Roman encyclopaedist) and I guess no further explanation is required of his pretentious and conceited nature. He also went to the extent of modestly ranking himself the Saviour of the 16th century. None of the books I consulted for this manuscript had a kind word for him as an individual. He was contemptuous, cantankerous and caustic in his attitude towards his peers. In his lectures, he ignored Latin (the language of the learned) and used vernacular German, which at that time was 'a language purportedly fit only to address horses'. He comes across as an angry man who antagonised many of those he met - even those who tried to be helpful. However, as a contemporary of Nicholas Copernicus, Martin Luther, Leonardo da Vinci (and a host of other Renaissance heroes), Paracelsus did play a part in shattering medieval thought, inspiring revolutionary thinking and being instrumental in the birth of the modern world. During his lifetime he was called by some the "Luther of Medicine" and it is reported that the scientific debates of the late sixteenth century were centred more frequently on the innovations of Paracelsus than they were on the heliocentric astronomy of Copernicus. His interest in alchemy earned him the title 'father of pharmacology' in spite of his limited contributions to pharmaceutical science. We need therefore, to acknowledge his contributions and give the iconoclast a decent (if not dignified) place in Medicine's Hall of Fame. Paracelsus not only lived a life true to his reputation, but also perished infamously in a drunken tavern brawl. Paracelsus is surely a character whom I would have loved to have met, but hated to have messed with.

Renaissance Humanism

Renaissance was a period where scientists strove for perfection. Over a period of time, the ancient languages had become corrupted and many translations were in crude language and did not convey the original meaning. Renaissance authors desired to replace the barbarous Latin of the Middle Ages with Latin that was stylistically pure. For this purpose, they travelled in search of old manuscripts that might have survived in isolated monasteries. They also studied Greek so that they might make pristine translations of the ancient literary treasures. This search for the work of ancient authors was felt first in literature, rhetoric and history, but by the late fifteenth century there was an increasing interest in the sciences and medicine. Astronomers and mathematicians sought an accurate text of Ptolemy's *Almagest* and both the observations and the mathematics of this text were to form the foundation for Copernicus' *De revolutionibus orbium* published in 1543. In medicine, the works of Hipprocates, Galen and Dioscorides were newly translated from Greek. The recovery of the medical writings presented medical terminology in the elegant Latin of the first century AD. To the Renaissance humanists, the discovery of new texts seemed as exciting as the discovery of the new lands being made by contemporary explorers. However, the recovery of ancient classics and their translation was not limited to the works of Aristotle, Galen, Ptolemy, and Dioscorides. In addition to the works of many lesser figures there were new areas of study made available to Renaissance scholars. Important among them was the recovery of the *Corpus Hermeticum*, a group of treatises supposedly written in Egypt by Hermes Trismegistus. Hermes was one of the great figures of alchemy and even today we speak of a hermetic seal in chemistry.

In short, by 1500 the impact of the newly recovered texts was leading in two directions. On the one hand the natural philosophers and physicians of the schools had developed an increased respect for Aristotle, Galen and other ancient authorities. On the other hand, the recovery of the Corpus Hermeticum and other more mystical texts placed an emphasis on natural magic, the relationship of man to the macrocosm, and sought divine truths in the study of nature. The first path led to truth through traditional medicine and a reliance on mathematics and the physics of motion for our understanding of nature: the second led to a more mystical and religious basis of knowledge and turned to chemistry as a key to man and nature alike.

Renaissance Herbs

During the Renaissance, many of the great herbals were written, compiled and for the first time in history, printed. *Bancke's Herbal* was the first printed herbal published in 1525. A year later, the *Grete Herball* was printed by Peter Treveris and had a high reputation among the earlier English herbals. William Turner (1510-1568) became the first Englishman to study plants scientifically and came to be regarded as "the father of British Botany".

He produced *Turner's Herbs* in 1550. The *Aztec Herbal*, published in 1552 is the earliest treatise on Aztec pharmacology. Its authorship is attributed to Martin de la Cruz, an Aztec doctor. It was discovered in the Vatican library in 1919 and has become known as the *Baliano Codex*..

The *Pemptades* written by Rembert Dodoens, a Belgian botanist, in 1554 (1517-1585) became the basis of the English herbal known as *Gerard's Herbal*, written by John Gerard (1545-1612) of greatest English herbalist trio, Turner, Gerard and Parkinson. Gerard was a well-travelled surgeon with a passion for gardening. His garden supposedly had over a thousand plants. His herbal is largely based on the early *Pemptades* by Dodoens, but Gerard added a great deal from his personal observations and altered the classification of plants. He believed firmly in the efficacy of herbs to treat not only physical diseases but also those of the mind and spirit. This belief, incidentally, is shared by the world's greatest and ancient civilisations. Gerard also describes methods of 'aromatherapy' involving the inhalation of volatile oils, the absorption of these through the skin into the circulatory system. Even to this day, amateurs calling themselves "herbalists" are reportedly plagiarising material from Gerard's *Herbal*.

A distinguished Spanish physician, Nicholas Monardes, published a book on drugs, in which he included those which were now being brought from America and the Far East. Wealthy Italian importers brought in cinnamon bark from India, resinous balsam from Peru and the most exciting tobacco from America. Jean Nicot considered this a miracle herb and brought seeds from Portugal. It was named *nicotina* after him. Its leaf was applied over cancerous ulcers; its powder was snuffed to cure headaches; it was also smoked to cure asthma.

Syphilis

Close on the heels of plague and leprosy, the malevolent medieval epidemics, came a disease which earned itself the name the "Scourge of the Renaissance" - syphilis. With an unworthy mode of transmission, it is still worthy of a full biography. No one really knows where it came from, but being a sexually transmitted disease, it serves as a sensitive tracer of human contacts, relationships and morality throughout the world.

In 1530 there was a nobleman from Verona called Hieronymus Fracastorius. He was a man of many talents and was a poet, astronomer and a doctor with a passion for pathology. He also features among the world's pioneers in epidemiology, since he was the first to recognise typhus fever. In his book *De Contagione* published in 1546, Fracastorius mentions the possible existence of invisible "seeds of disease which multiply rapidly" which proves that he had some inkling about bacteria long before researchers proved their existence. He published a medical poem called *Syphilis, sive Morbus Gallicus*. According to his poem, a shepherd boy Syphilus (*susphilein* means swineherd) offended Apollo and was punished by the affliction which was named Syphilis. This mythical attribution created some diversion since until then, it was strongly believed that it was America's gift to Europe. But it is a fact that the disease spread in epidemic proportions only after Columbus' return in 1493. Some of his sailors reportedly passed it on to the 'liberated' ladies of Naples and this resulted in an outbreak in Naples in 1494. Later, when the French soldiers captured the city, the ladies faithfully transferred it to them to take back to Paris. In three years' time, syphilis had spread to Germany, Russia, Holland, Switzerland, Hungary and Scotland. Sea voyagers carried it to India, China and Japan and left it as their calling card at every port they berthed.

Soon the disease was so widespread that no one could trace its aetiology. The English blamed it on the French. The French blamed Naples and the Italians (calling it the Neapolitan disease). The Russians accused the Poles. Indians and Japanese knew for sure that the culprits were the Portuguese voyagers. There was generous mudslinging from all quarters and I suppose they all had some justification each in their accusations.

During that time, people described syphilis as a 'gentleman's disease' and discussed it proudly among peers (considering it a prized souvenir of their lecherous conquests). This is evident by the fact that a man named Ulrich von Hutten, a syphilitic patient himself, jotted down his observations on the manifestations of the disease and published it dedicating it to the Archbishop of Mayence. However, on the sly, people were seeking cures, which were not quite available. Physicians and pharmacists were experimenting on various drugs and chemicals. Guaiacum was the first drug offered for syphilis and was considered the miracle drug of the Renaissance. Guaiac wood, like the disease itself, was imported from America, which tallied well with the public belief that the Almighty provides the cure of an ailment at its place of origin itself. But its popularity was short-lived, as soon people were quick to realise its ineffectiveness in curing syphilis.

Picture 1. The stove-house and its syphilitic tenant. One of the caretakers prepares hot towels, while the other brings in glowing coals.

Where guaiacum left, mercury took over. Syphilitic pustules were smeared with mercuric ointment. In severe cases, the patients were asked to live inside a stove-house for a month without food (Picture I). The stove was kept hot by glowing coals and as if that was not warm enough weather, the occupants were constantly covered with freshly warmed towels. Most of them suffocated, had a heart attack, starved to death or died of heat exhaustion. Which makes one wonder whether this was a clever ruse to get rid of syphilitic patients!

During the syphilis epidemic, since traditional medicine did not have a sure-fire cure, Renaissance quacks saw an opportunity and were quick to take advantage of the situation. They played on human psychology to attract patients. They assured them that there was still hope for all those forsaken by qualified physicians and hopeful patients flocked to them by the dozen. The quacks were true to their word and often it was only hope that they received and nothing else! Particularly gullible were the syphilitic patients who eagerly bought quicksilver (mercury) ointments and medications. Quacksalver became the name for these peddlers of quicksilver, which has now been abbreviated as 'quack' to denote any unqualified medical practitioner who deals in wondrous cures.

Renaissance quacks were ready to perform everything from dental extractions to cataract removals, but moving bowels with potent laxatives seemed to be their forté. The quack's flag clearly sends across the message to the educated and illiterate alike. (Picture J)

Picture J. A Renaissance quack performing a dental extraction. Observe his flag and guess what his speciality was!

Ambroise Paré

Ambroise Paré (1510-1590) was of French descent, but nothing certain is known of his geneology. His father is believed to have been either a cabinet-maker or a barber-surgeon and valet to the Duke of Laval. He is reported to have had school education, but never went to University. After apprenticeship with Vialot, Master Barber-Surgeon of Vitre in 1523, and later to another barber-surgeon in Paris, he became house surgical student at the Hotel-Dieu in 1533, studying anatomy by dissection until 1535. He was licensed as Master Barber-Surgeon in 1541. In 1554, he passed an examination by the College of Surgeons as Bachelor of Surgeon and licensed as sworn surgeon. His deep knowledge of anatomy stood him in good stead in all these endeavours.

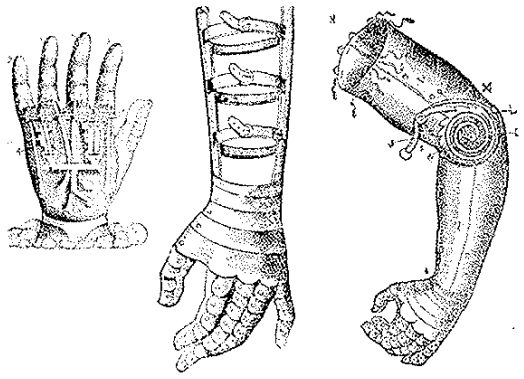
Picture K. Ambroise Paré. Father of Modern Surgery.

Soon, Paré realised that surgery had been inert for the past two centuries. Stooping down to pick up the knife from where Guy de Chauliac had dropped it, Paré started salvage efforts of his profession. As an army surgeon, he was touched by the misery undergone by wounded soldiers. In one moving incident, it is said that he watched three wounded warriors being slit at their throats, in an act of euthanasia. Although, he consoled himself that in a similar position, he would also pray for such a merciful end, he resolved to do his best to mitigate the misery, by curing the wounded and comforting the dying soldiers. Paré took into his personal custody the next severely wounded man who came his way and served him as physician, surgeon, pharmacist and cook. The man, given up for dead, recovered and the whole camp rejoiced. Jubilant fellow warriors collected a purse for Paré and presented it to him. A modest Paré then declared his historic maxim, " *Je le pansait; Dieu le guarit* " which translates as " I dressed him; God healed him."

However, for Paré, God's services were easier to obtain than fresh bandages to dress war wounds. During the war at Hesdin, Paré is said to have deployed the serv-

ices of four fat prostitutes to wash the soiled bandages for re-use. Allegiance to their profession, however, must have kept them distracted as Paré, in despair, records that "they had to be kept at the job with the stick". Insufficient water and soap added to his woes.

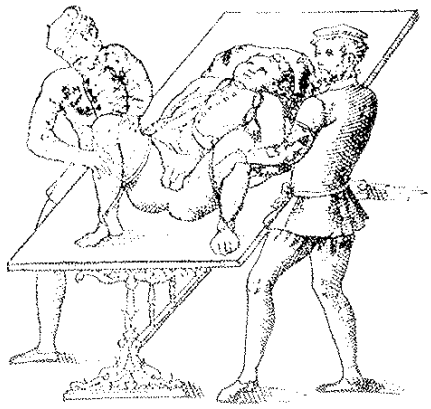
In those days, doctors routinely cauterised gunshot wounds, which were considered poisoned by powder burns. Cautery was done by pouring a boiling mixture of oil and treacle into the wounds or scalding with a red-hot iron. Most soldiers died due to the horrors of cautery rather than the gunshot itself. Paré discovered that gunshot wounds were not in themselves poisonous and did not require cautery. This observation was accidental, since one day the oil supply ran out and he was forced to extemporise. He fashioned a 'digestive' (which was a concoction of egg yolks, rose oil and turpentine) and experimentally applied it to the wounds. The experimental 'guinea pigs' recovered comfortably while the cauterised unfortunates were in great pain and feverish. He published his observations and impressions in his first treatise, *La methode de traicter les playes faites par les arquebuses et aultres bastons a feu* in 1545. The treatise brought him immediate fame. After leaving army service in 1552, Paré went into private practice and practised surgery for a while. In 1562, he happened to treat the Duke de Vendome successfully, who strongly recommended Paré to the King, commending highly on his surgical skills. The King ordered his premier physician to record him as a Surgeon in Ordinary to the King. He held his position at court under the next three monarchs right until his death in 1590.



Picture L. Artificial limbs designed by Paré.

Paré had a reputation for kindness, but his consuming curiosity never allowed him to pass up any opportunity to use human subjects for his scientific tests. He once challenged King Charles IX that the bezoar stone (hairball found in the intestinal tract of animals) was not an effective antidote for poisons as popularly believed. The King's cook had recently been caught red-handed for stealing two silver plates and was awaiting the gallows. The condemned man was recruited 'volunteer' for the experiment and given the bezoar stone and a poison. Unfortunately for the cook, Paré was right.

Paré made several other useful contributions. He re-introduced the internal podalic version in cases where labour was difficult in order to avoid a Caesarian section. Although risky, it gave a better chance of life for the mother and child, especially in obstructed labour with no chance of delivery by any other means.



Picture M. The lithotomy position first described by Paré.

Paré left a powerfully reactivated surgical tradition at his death at a ripe old age of 80. By that time, apart from having served four French kings, he had won recognition from the College of St. Come and discovered new methods of treating wounds. He had described sound methods for setting fractures and draining wounds. He had designed artificial limbs (Picture L), surgical instruments and lightweight leather trusses for hernia, which replaced cumbersome iron models. He was the first to link aneurysms to syphilitic aetiology and painful micturition to prostatic pathology. He was also, perhaps, the first to describe the classical lithotomy position for the removal of bladder stones. (Picture M) The humble barber's apprentice who worked his way from the bottom up to become the greatest surgeon of the 16th century (and later elevated to the position of "Father of Surgery") had many publications, which were circulated throughout Europe. They were to have considerable influence during his life and well into the following century.

The Royal Colleges

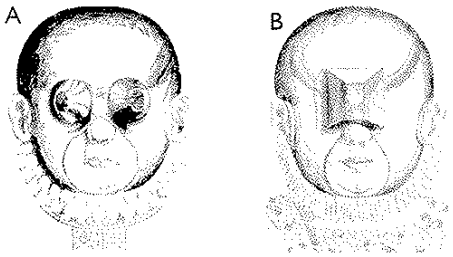
It didn't take long for the intellectual blizzards sweeping Europe to hit England. Dedicated scholars of high calibre went back to study ancient literature, in order to revive the healing arts. A doctor named Thomas Linacre was quick to gain fame with his immaculate translations of Hippocratic works, which included the first English version of the Hippocratic Oath. The medical profession gained prestige and Linacre felt

that this respect needed to be safeguarded. His apprehensions were well founded, as there were many masquerading mountebanks in the medical ranks. He obtained permission from King Henry VIII to form a body of physicians to supervise the practice of medicine in London. All doctors were examined for their competence before they were admitted to the society and allowed to practice. Graduates from Oxford and Cambridge were, however, exempted. This supervisory body, formed in 1518, soon emerged as the Royal College of Physicians in 1551. It represents, till this day, excellence, dignity and professionalism in medicine.

Not to be outdone, the barber-surgeons made a pact in 1540 with the King's sanction. The surgeons had formed a small exclusive guild much earlier than the physicians, but soon realised that they were too small in terms of numbers to make an impact on society. The barber's guild was politically strong and so they joined forces with them to gain strength. The United Company of Barber-Surgeons was thus born with Thomas Vicary as its first president.

Renaissance Ophthalmology

Ophthalmology was surprisingly, one discipline which never caught on in the West and Bettmann states that a 600 BC Hindu in India with a cataract was better off than an European of 1500 AD with the same affliction. Susruta, affectionately called the 'Hippocrates of India' had perfected the technique of couching a cataract in the sixth century BC. Twelve centuries later, technology transfer occurred when a Persian physician took the technique to the Middle East. Although the Arabs adapted it around 7 AD, it remained degenerate in medieval Europe, where nomadic peddlers and tooth drawers operated on cataracts in public market places for a meagre fee of seven cents. Usually the veil of blindness was lifted



Picture N. Strabismus masks for squint correction: A - For convergent squint. B - For divergent squint.

for the patient for a period, before he went blind following postoperative complications. The itinerant mountebanks however, went on unchallenged practising quack ophthalmology, until a man called Georg Bartisch brought about its renaissance. He was a court oculist and had gained considerable experience in eye care. He knew his ocular anatomy well, thanks to Vesalius' textbooks. In his treatise *Augendienst* published in 1583, he comprehensively described care and cure of several eye problems. It can be considered the first step towards rational ophthalmology. He constructed special masks for convergent and divergent squints. (Picture N). The book, however, had one critical blind spot. By this time, spectacles had been invented, but Bartisch had scant regard for them and dismissed them as completely useless, emphatically declaring that "man needs two, not four eyes".

Spectacular Spectacles

While we are in the topic of eyes and vision, it might be a good idea to consider the evolution of reading glasses. Recently, in a survey conducted by Edge (www.edge.org) scientists and other thinkers were asked to nominate the most important invention of the last 2000 years. Featuring among the offerings (alongside computers, clocks, numerals, erasers and delete keys) are the simple pairs of spectacles. According to psychologist Nicholas Humphrey of the New York School for Social Research, spectacles "have effectively doubled the active life of everyone who reads or does fine work – and prevented the world from being ruled by people under 40". By this invention, man has proved that people need not accept the body nature gave them and that physical limitations can be overcome with ingenuity.

Picture O. A Renaissance scholar using spectacles.

From Pliny's records we are led to believe that Emperor Nero was one of the earliest users and he reportedly watched the Roman circus through an eyeglass. However, there is no mention about eyeglasses until the 13th century when Roger Bacon recommended reading lenses for the old. Renaissance scholars used spectacles extensively (Picture O). Johannes Kepler, (the man who enunciated laws of planetary motion) did a study of optics and was the first to realise that light passes into the eye through the lens converging in the form of a cone. He then understood that if the focal point fell behind or in front of the retina vision would be blurred. The mystery of how spectacles improved eyesight was hence solved, but the terms myopia and hypermetropia were subsequent and more recent designations.

Renaissance attitude

In spite of the great advances in Medicine during the Renaissance, it was a paradox that people, being people, still regarded the doctor with an emotional attitude rather than an rational attitude. The drawings of Dutch artist Hendrik Goltzius (based on couplets by Euricius Cordus*) declare the eternal truth that the doctor is loved or hated depending upon the patient's condition. In sickness, the patient exalts his doctor as God (Picture P). Once healed, the doctor is demoted to the status of mere man. When it is time for payment of fees, the doctor is equated to a diabolical devil.

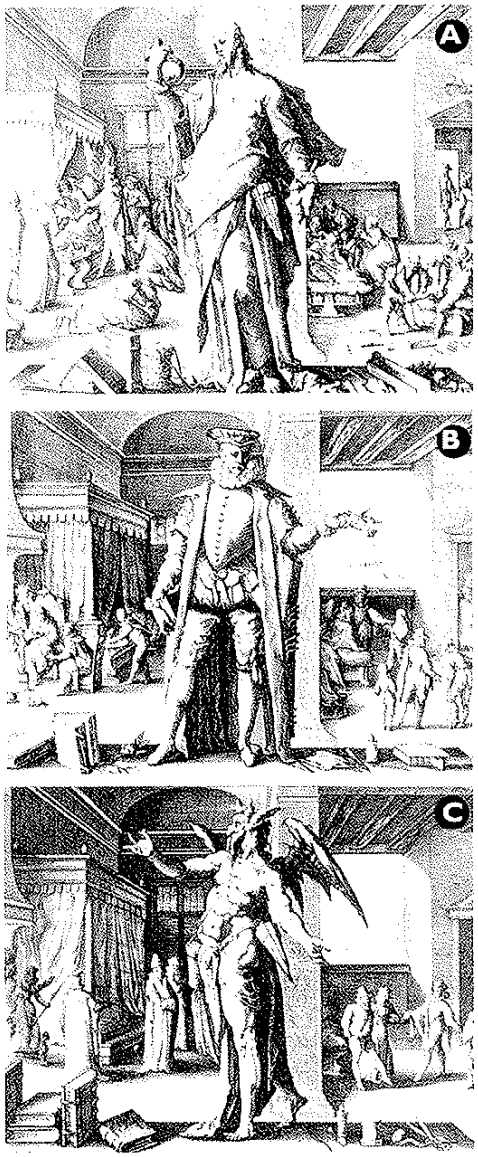
> * *God and Doctor we alike adore*
> *When on the brink of danger, not before.*
> *The danger past, both are alike requited*
> *God is forgotten and the doctor slighted.*
> - *Euricius Cordus*

And speaking of the devil, during the 16th century, it was widely believed that madness was created by the devil himself and mental disease was considered an outgrowth of witchcraft. Insanity was one disease for which Renaissance physicians had no answer and they prudently excluded it from medical domain. This left the deranged in the hands of exorcists and witch burners. People kept their eyes peeled for demonic manifestations in others, which could be something as innocuous as a bad dream. So severe was this drive of rounding up demented people (mostly women) that at one point even those who related their nightmares were condemned to death. It is said that even fathers did not hesitate to squeal on their own daughters, should they act strangely. The smart ones, perhaps, kept their bad dreams to themselves.

Epilogue

By the end of the sixteenth century, medieval thoughts and philosophy had almost entirely been discarded. In a sharp contrast to the medieval period that was static and practically brain dead, the Renaissance era was dynamic and versatile. The development of a special relationship among the sciences, especially anatomy, optics and mathematics gave Renaissance much of its unique character. None of the scientific theories – existing or new - was taken for granted. Even the writings of ancient authorities and the translations were subjected to independent verification to prove the validity of assumed truth. Ancient languages were learnt in order to appreciate the true meaning conveyed in ancient texts. Experiments became an integral part of scientific research whereby hypotheses were either proved or disproved.

The Renaissance era also saw many great feats being achieved. Gutenberg's movable metal type printing flagged off the season by permitting dissemination of



Picture P. The vacillating viewpoint of the patient regarding his physician. A - A God during sickness B. Mere mortal when cured C. A diabolical devil during payment time

knowledge at drastically reduced costs. In 1492, Columbus discovered America. The Royal College of Surgeons, Edinburgh was chartered in 1505, followed by the Royal College of Physicians, England in 1518. In Sep 6, 1522, Ferdinand Magellan's ship *Victoria* completed its epic voyage around the world, which remains the millennium's first and greatest sailing adventure till date. (However, protracted sea voyages of the Renaissance era left sailors without the benefit of Vitamin C in fresh fruits and vegetables and this saw the emergence of scurvy). The discovery of sea routes to India and America created new potentials for exploration and exploitation. Establishment of trade

routes to distant lands and local industries saw the formation of money economy. Population statistics and demographic studies became organised when in 1538, King Henry VIII directed that government authorities maintain records of marriages, christenings and deaths. Copernicus described the revolution of planets around the sun in 1543. In the same year, apothecaries were legalised by an Act. Physicians and barber-surgeons formed regulatory bodies. Renaissance was a time where maintenance of standards for the health care professions was given great consideration. In 1593, there was even an Act against overcrowding in dwellings in London. Lenses were known for a long time, but Renaissance inventors reassembled them to produce the telescope and the microscope. In Netherlands, Hans Jansen and his son Zacharias combined several lenses and designed the first compound microscope in 1590. These preparatory works were the prelude to several remarkable discoveries by Harvey, Descartes, Bacon, Boyle and Newton in the seventeenth century.

(Next: Seventeenth Century Medicine)

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