

Lecture 18 – Life sciences: biology and medicine

Our two subjects tonight are surprisingly disconnected, because although there was biological theory, it was often add odds with medical practice. There was a tension between the two.

Biology

I mentioned in an earlier lecture that Aristotle and his successor at the Lyceum, Theophrastus, did important work in biology. It would be fair to say that Aristotle founded the science of biology. Before Aristotle, people wrote about farming or they wrote about herding, or they wrote about herbs and their applications. But Aristotle was the first natural philosopher to dedicate substantial effort simply to studying living things for their own sake. His most notable works in zoology are *History of Animals* and *Parts of Animals*, but he also wrote others. (“History” here has its original meaning of “study”.)

Aristotle is notable for the precision and accuracy of his observations. Some of his observations of animal behaviour were not repeated again until the 19th century AD, for example, octopus and cuttlefish mating technique. (The male has a limb, an actual arm, that takes the place of a penis during mating.) He seems to have performed original research, employing both dissection and vivisection, but he also relied upon the observations of others.

Aristotle also addressed the problem of classification. He could hardly avoid classifying, since he was cataloguing living things, but he gave careful consideration to the problem and discussed it at length. He distinguished two main groups of animals based upon whether or not they had red blood. He noted that only the red-blooded animals had backbones. He had, therefore, made the distinction between vertebrates and invertebrates which is still fundamental to zoology. (Although recently there has emerged a challenging theory that the central nervous system evolved independently on two separate occasions.)

Even more fundamental than the problem of classifying animals is deciding what is an animal what is not. Aristotle discusses this in a philosophical essay, *On the Soul*:

Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should lie. Thus, next after lifeless things in the upward scale comes the plant, and of plants one will differ from another as to its amount of apparent vitality... Indeed, as we have just remarked, there is observed in plant a continuous scale of ascent towards the animal. So, in the sea, there are certain objects concerning which one would be at a loss to determine whether they be animal or vegetable...¹

So Aristotle's general take was that the natural world was arranged in a hierarchy, with non-living things at the bottom, plants next, then animals above that, and finally Man at the top of the heap. But his student and successor Theophrastus disagreed. Theophrastus examined and catalogued plants just as carefully as Aristotle had catalogued animals, and Theophrastus showed that plants have organs and capabilities that animals lack. Hence plants are not lower than animals in a hierarchy, they are just different from animals.

The two main botanical works of Theophrastus are *History of Plants* and *Causes of Plants*. The latter is concerned with causes in the Aristotelian sense. The proximate cause of a plant is its parent plant. The final cause of a plant is the use to which someone puts it.

Theophrastus also investigated the problem of classification (but for plants, not animals) and he

1 Aristotle, *History of Animals*, VIII, 1. Trans. D. W. Thompson, Oxford, 1910. Cited in Clagett, p. 67.

discussed at length the pros and cons of various schemes. He finally settled on a scheme which, while not perfect, seemed serviceable to him. In this scheme he already distinguished between plants which sprout a single leaf from the seed (monocotyledons) and plants which sprout two leaves from the seed (dicotyledons). This is still an important distinction in modern botany.

There were other writers about biology in antiquity, but for the most part they copied from Aristotle and Theophrastus. Among the most influential biological works in the middle ages were *On Plants* by pseudo-Aristotle (1st century BC), *Materia Medica* by Dioscorides (c. AD 40-90), and of course Pliny's *Natural History*.

Pre-Classical Medicine

Some medical treatments are not only ancient but precede the human species.

Various animals treat themselves with herbs, for example elephants will seek out particular plants to eat if they have intestinal parasites, and the treatment seems to work. In addition massage seems to be instinctive, or that variant that dogs have which is licking the injured part with their tongues. Recently there was a case of a man who had declining blood circulation in one of his toes and was expected to lose the toe. He was cured by his dog, which insisted on licking and licking the toe for hours every day.

Human medical care goes back to prehistory. The bones and tools tell us that certain medical procedures were carried out successfully. This included:

- dental work, including bridges and artificial teeth
- tattooing
- minor cosmetic surgery such as removing warts
- setting broken bones
- amputation and cauterization
- trepanning – making a hole in the skull

Trepanning was used after an injury was sustained to the head. One purpose of trepanning is to relieve pressure in the skull. Swelling of the brain is a very serious complication of head injury, and in antiquity trepanning was the only treatment. The other use of trepanning was to make the skull more resistant to cracking. This is similar to temporary repairs that are done to steel ships. The ends of the crack are drilled out to make a larger-diameter hole, which spreads the stress around. This in turn stops the crack spreading. Some recovered prehistoric skulls appear to have been trepanned for the same reason.

In addition we know from the earliest literature that they already knew how to sew up wounds.

There is an existing Egyptian papyrus (the Edwin Smith papyrus) which is the oldest medical textbook known. All literate societies value medical knowledge and preserve records of it.

In China and India there is a tradition of medicine which goes back to antiquity. China has acupuncture, which is based upon the theory of Chi energy. People used to laugh at acupuncture until it was shown that the traditional acupuncture points correspond to locations on the skin with decreased electrical resistance. So although it is still not understood by science, it is accepted as a medical treatment and paid for by OHIP. India has ayurvedic medicine which is less accepted here. You may hear about people who drink their own urine every day, because they think it's a healthy thing to do. That's one small part (the most notorious part) of ayurvedic medicine. But ayurvedic medicine embraces an entire medical tradition, which in some ways was remarkably advanced. For example,

doctors in India were performing nose reconstructions (rhinoplasty) as early as 500 BC, in response to the practice of punishing criminals by cutting off their noses.

Greek medicine

The Greeks studied and adopted Egyptian medical practices, as they did in so many other fields.

The opiate of Zeus's daughter bore this canny power. It had been supplied her by Polydamna, mistress of Lord Thon, in Egypt, where the rich plantations grow herbs of all kinds, maleficent and healthful and no one else knows medicine as they do, Egyptian heirs of Paian, the healing God.² Notice the reference to herbs, which are among the chief tools of a traditional healer. And opium, which was well known both as a pain-killer and as an addictive drug.

Medical research was terribly hampered in Greece because there was a religious prohibition against tampering with human bodies. In the *Iliad*, when Achilles drags the body of Hector around behind his chariot he is not just having a tantrum; he is violating a central taboo of the culture. So it was not allowed to conduct what we would consider a normal anatomy class. You could not dissect a cadaver or even part of one. This wasn't only Greek; the prohibition apparently extended to most cultures in the Mediterranean. So they didn't really know what a human body looked like on the inside. On occasion they got a glimpse when somebody was sliced open in battle, but just a glimpse because the burial customs required that the dead be buried very quickly. A glimpse is not enough; you need to examine a large number of bodies, and cut them apart at leisure, to sort out the many twisting and tangled connections of the blood system and the nervous system.

And they did not have the technology or the interest to conduct biology experiments upon animals. In consequence while they knew the basic set of organs, because we share them with other animals, they did not understand the bigger picture of how those organs worked together. They did not understand that the beating of the heart circulated blood through the body. They did not understand what the liver was for, what the lungs were for, or any of that basic stuff.

There were two basic theories of disease. One was the “evil spirit” theory and the other was the “pollution” theory. Disease was caused by evil spirits, such as the ones cast out by Jesus, or by the intervention of gods such as Apollo who would strike people down with his invisible arrows. The pollution theory on the other hand said that disease was caused by impure food or air or some sort of contact with another source of pollution. In the pollution theory all disease is a type of poisoning.

Of course if you believe in the “evil spirit” or divine displeasure theory then when somebody comes along who can cure sickness you are liable to elevate that person to divine status. This is probably what happened to **Asclepius**. He was most likely a real person, but his reputation was so elevated after his death that he became a minor divinity. There was a temple of Asclepius on an island in the Tiber in Rome. The priests there ran a charity hospital. It was the law that if you brought a slave there you were abandoning the slave. If the slave recovered the slave was automatically freed. The gods had spoken.

Alcmaeon was a resident of Croton, but he was not a follower of Pythagoras. In fact scholars currently think that he was an opponent of Pythagoreanism. Unfortunately we know little about Alcmaeon himself. He probably published or taught in the early 5th century BC, although even that is uncertain.

Croton was a great medical center at the time, and much of what Alcmaeon had to say pertained to biology. He was the first philosopher to distinguish between sense perception and thought, and thus between the mental processes of animals and human beings. He was the first to recognize that the brain was the seat of sensory perception and also where thinking took place. He was the first on record to

² Homer, *Odyssey*, 229ff or 245ff, transl. R. Fitzgerald. In the coursepack, p. 89.

develop the theory of health as balance and disease arising from imbalance. But, he lived in a medical center, surrounded by doctors. We can't tell how much was original to him and how much came from medical practice.

It does seem likely that Alcmaeon was the first to suggest that during sleep the blood withdrew from the smaller blood vessels and concentrated in the larger ones. This theory was accepted by a variety of later philosophers.

Another important contribution of Alcmaeon was an argument that the soul was immortal. He posited that the soul accounted for movement of the body, and that the soul itself was always in motion. From this it was not a long step to conclude that the soul, since it never ceased motion, was immortal. This argument was later adopted by Plato.

The first school of medicine in Greece was set up by a physician named **Hippocrates** (469-399BC). Hippocrates wanted to put medicine on a rational basis. He felt that the chief obstacle to rational medicine was superstition. The Romans were very superstitious. Let me read you something from Cato the Elder's agriculture handbook. This is how to cure a broken bone.

A dislocation can be remedied with this chant. Take a green reed, about four or five feet long, split it down the middle, and have two men hold it against their hips. Begin to chant: *motas vaeta daries dardares astataries dissunapiter*. Continue until the two halves of the reed come together. Wave an iron knife over the reed. When the halves have joined and are touching one another, take the reed in your hand and cut it on the right and on the left. Fasten it to the dislocation or fracture, which will then heal. Continue to chant every day: *huat hauat huat ista pista sista dannabo dannaustra*. Or: *huat haut haut istasis tarsis ardannabou dannaustra*.³

So here you have a conservative Roman from the 3rd century BC advocating the practice of traditional magic rather than medicine. In addition there were many traditional temple doctors who performed the same sort of spell-casting. It was this sort of thing that the Hippocratic school had to contend with. And one of the ways they did this was to reject the "evil spirit" theory.

We laugh at the "evil spirit" theory, but in fact it is closer to the truth than you might realize. Suppose I say "There are supernatural beings, demons (*daimones*), which are out to get me. They are always trying to get inside my body and take over my body. They are all around on the table, on the floor, in my food, on my skin. And they want to kill me or dissolve me into pus." You would say I was insane. But let me remind you that in antiquity the word *supernatura* only meant "imperceptible". So let me repeat the same sentences with a few words replaced. "There are imperceptible beings, germs, which are out to get me. They are always trying to get inside my body and take over my biochemical processes. They are all around on the table, on the floor, in my food, on my skin. And they want to kill me or dissolve my cell walls so that I turn liquid (as a hemorrhagic fever does)." It's exactly the same thoughts expressed with different words. And we don't call it crazy, we call it germ theory.

Of course we don't believe all disease is caused by germs. There is disease caused by pollution. We recognize that working with arsenic, for example, is dangerous because if you breathe the fumes you get arsenic poisoning. That's a chronic disease which can manifest itself as cancer or liver failure or other things. The Hippocratic school of course recognized these things, because it was in keeping with their agenda. So people in antiquity were aware that there was occupational disease.⁴

But the Hippocratic school did not only have to deal with superstition. They also had to deal with philosophers who thought they knew better than doctors with hands-on experience. The Hippocratic

³ Cato the Elder, *On Agriculture*, 160. In Shelton, p. 424.

⁴ Farrington, author of *Greek Science*, denies that they knew anything about occupational disease. But they did, and we know they did because the medical writers wrote about it. Farrington was a Marxist and he was trying to prove a misguided argument about slavery.

school was very pragmatic. But the philosophers propounded from their ivory towers.

For example, the Pythagorean **Philolaus of Tarentum** believed that there must be four principal organs of the human body. And he nominated the genitals as the seat of the power to reproduce, the navel as the seat of the power to grow, the heart as the seat of the power to move, and the brain as the seat of the power to think. And the rest – lungs, liver, digestive tract and so on – he considered less important. His purpose was not to help doctors heal people but to help philosophers determine man's place in the universe.

A more harmful influence came from the Empedocleans. Remember it was Empedocles who came up with the four elements Earth, Air, Fire and Water. So the Empedocleans proposed that disease arose from an imbalance of the elements or rather of the four vital fluids, the humours. Black bile was supposed to make you melancholic, yellow bile made you choleric, blood made you sanguine, and phlegm made you phlegmatic. This theory was attractive to the Hippocratean school because it sounded rational. So they adopted it. And it trapped medical theory in a dead end right through the Middle Ages. It is this theory that was responsible for the practice of bleeding.

But as I said medicine was largely empirical. Let me read out some medical advice regarding broken bones. First from Pliny the Elder, not a doctor it's true, but a scholar of science.

A quick remedy for broken bones: the ashes of the jawbone of a boar or pig. Or lard boiled and then packed around the broken bone mends it with amazing rapidity. For fractures of the ribs, goat's manure mixed in wine is particularly recommended.⁵

Strains and injuries received from a blow are treated with wild boar's manure which has been collected in the springtime and dried. This same treatment works for chariot drivers who have been dragged or run over or badly bruised in any way, even if the manure is smeared on while still fresh. Some people think that it is more useful to boil the manure in vinegar. They claim also that this manure can heal ruptures and sprains, if it is ground to a powder and mixed in a drink, or dislocations if it is mixed with vinegar. Quite respectable people drink the powder mixed with water, and they say that the emperor Nero used to refresh himself with this drink because he wanted to prove to the professional horsemen that he was a real chariot driver.⁶

And you will note once again the use of antiquity's miracle substance, manure, as a cure-all. But the reference to the dung of animals collected in the spring is not completely silly. During rutting season the dung will be chock full of hormones which *might* have a medicinal effect.

It is interesting that even today traditional Arab healers also prescribe dung. But they gather and dispense the dung of wild donkeys. Donkeys, as you know by now, are a mountain-dwelling species. Wild donkeys graze in high mountain pastures that are not readily accessible to people. And herbs grow in those pastures. So the donkey dung is a source of otherwise inaccessible herbal medicines. And in fact dung from wild donkeys is now being analyzed in modern laboratories in the hope of discovering useful medicines.

Although the Hippocratic school was not the only medical school, it had a huge influence on the practice of medicine. Even today doctors still swear by the Hippocratic Oath. I want to bring your attention to this part:

I will not cut, not even indeed those with stones, but I will give place to men who are doers of this action.

In other words the Hippocratic school trained physicians, not surgeons. Surgeons were trained elsewhere. This split between physician and surgeon is still recognized, at least in name; in Canada today the self-governing body for practitioners of medicine is called the College of Physicians and

⁵ Pliny the Elder, *Natural History*, 29.65. In Shelton, p. 90.

⁶ Pliny the Elder, *Natural History*, 28.72. In Shelton, p. 90.

Surgeons of Canada. However in antiquity you could train in both professions, and some people did.

It seems there were a lot of surgeons in antiquity. K. D. White notes that many kits of surgical instruments have been found. Indeed I myself have seen quite small collections of ancient artefacts sporting a set of surgeon's tools. From this we can conclude that there was a great demand for their services. However we shouldn't read too much into it. Probably most of them did a range of things that we wouldn't think of as a surgeon's job, such as removing warts. The most common major surgery would have been Caesarean section, but while this often saved the baby it almost always cost the mother her life (it wasn't normally done unless the alternative was to lose both mother and baby).

Surgical technique was developed by experimentation on animals, just as we do today. Pliny notes that in his day splenectomy (removal of the spleen) had been successfully performed on animals.⁷

There are a couple of other individuals we should note from later in antiquity.

Cornelius Celsus (fl. AD 30) translated a work called *On Medicine* by someone called **Titus Aufidius**. Actually he didn't just translate it, he plagiarized it, and the plagiarism was only recently discovered (not every scholar accepts it). But clearly, whether it was written by Celsus or Aufidius, it belongs to a school of practice founded around 50 BC by a physician named **Asclepiades** (not Asclepius). This book was tremendously influential through the Middle Ages and right up until the modern era. It counsels sparing use of medicines. Instead the practitioner is to rely upon diet and conservative measures such as bed rest. One thing that he recommends is starving a fever. There was nothing unique about that; Pliny mentions it too. But when Aufidius says starve the fever he really means it. First the physician is to deprive the patient of water for at least a day. And he is to deprive the patient of food until the fever breaks or the patient is so weak from starvation that he is in danger of dying. It is a fact that in many cases fever, which is part of the body's immune reaction, kills patients rather than the underlying disease. So ending the fever early could save the patient. It is conceivable that these brutal measures cause the body to temper the fever or end it sooner. I don't know that any studies have been done. Nowadays doctors just cool the patient with water or ice packs to keep the temperature within a safe range.

Galen (AD 129-199) wrote over 100 works that survive to this day. Heaven only knows how many he wrote that haven't survived. Certainly he wrote so prolifically that he felt it necessary to produce a catalogue of his own works. However this was stimulated mostly by publishers passing off the work of other authors off as his. He was very popular. He wrote on many subjects, not just medicine, but his medical works had the longest-lasting influence. Celsus and Galen were the two textbooks for medical students right up until the modern era. Galen performed dissections of monkeys which greatly expanded the knowledge of primate anatomy, without violating the taboos of the day.

Galen also performed an important experiment to disprove the theory of **Eristratus** (c. 290 BC) that the veins were filled with air in the living body and only filled with blood after death. That seems like a foolish theory but it was based upon the widely-held belief that air (*pneuma*) had some special life-giving power. It took a very carefully executed experiment to disprove this theory. However Galen's own theory of blood circulation was almost as wrong. Galen believed there were three separate blood systems, the vegetal, the animal, and the intellectual. Each of these contained increasingly purified blood. Animal blood could do things vegetal blood couldn't because it was better purified, and similarly intellectual blood could do things animal blood couldn't because it was even better purified. This emphasis on purity goes right back to Hippocrates, except that Galen elevated the pollution theory of disease into a purification theory of evolution.

⁷ Pliny the Elder, *Natural History*, 11.80.

Theory of Reproduction

The ancient Greeks, indeed the whole ancient world, did not understand how human reproduction works. Of course they knew how to make babies. But they did not understand what was really going on. They thought that having sex was just like planting a seed in the soil. In fact the Latin word *semen* is not only the word for male ejaculate, it is also the ordinary word for a seed. It's the same word because they thought that's just what it was. They thought that the baby was entirely the product of the father and all the mother provided was a fertile environment in which the father's seed could germinate.

If you think about it from their perspective it makes perfect sense. The Greeks were practiced horticulturalists when they arrived in Greece. And they knew that a woman could not get pregnant unless she had sex with a man. If the baby came from her own body, like a seed from a tree, then she ought not to need a man. (They knew nothing of pollination. They thought seeds just budded from the plant like leaves and branches do.) And they knew that seeds did not necessarily germinate even if they were planted in soil. Some types of seeds need certain types of soil, other seeds need other types of soil. So too with the semen of a man. It can become a baby when he plants it in the womb of a woman of child-bearing age, but not in a woman past menopause or a girl prior to puberty. Finally, they could see for themselves that when a baby is born it has a stem and a root extending into the womb - we call the stem an umbilical cord and the root a placenta.

So it all made sense. It made so much sense that this theory of reproduction spread throughout the whole Old World (and maybe the New World too, I don't know). It was the accepted wisdom, the best science of its day, in Europe, in Africa, and in Asia. You see it in Greek literature in which men are referred to as the "givers of life". And you see the very same phrase in the Bible - men are the givers of life. Not women. Not the ones who give birth and suckle babies. But the men.

(Alcmaeon was the sole dissident. He believed that the seed which created a human child was contributed by both the mother and the father, and that the child took the sex of the parent who contributed more seed.)

The early Greeks revered life. They revered the people who had given them life. They sacrificed to their ancestors, not as gods, but in order to feed them and preserve their ghosts. The smoke and steam rising from the sacrificial pyre were thought to provide nourishment to their ancestors. But according to their science, only their fathers, their fathers' fathers, and so on were truly their ancestors. Mothers didn't count, you didn't inherit your life from them.

So the Greeks (and their forebears in Asia) made it the special job of the husband to carry out the sacrifice to the ancestors. It wasn't just his sacred duty, it was the reason he lived. In a traditional society the family doesn't exist for the individual, the individual exists for the family. The son was conceived and raised in order to carry on feeding the ghosts of the ancestors.

And land was bound by a sacred tie to that chain of ancestors. Early in Greek history it was actually illegal for a family to buy or sell land. The ancestors were buried on the family land. It was not only a family farm, but a family cemetery and a family church as well.

And the law in those early days decreed that women could not under any circumstances own land. If a man died leaving a widow, she could not inherit. If a man died leaving no widow but a daughter and no son, the daughter could not inherit. The land went to the nearest male relative of the deceased. And only male relatives on the father's side, unless there were none at all, and then it could go the his mother's side. But it could not go to his wife or his daughter. No matter what⁸

⁸ Later in antiquity these laws were softened. For example, under the Roman Republic a woman could not own land except via a male guardian, but the guardianship was often just a formality. Later the Roman emperor Augustus introduced a law that any mother of three or more children could inherit and possess land on her own without even the

From their perspective, believing as they did that life was conveyed only by the male, the prohibition of inheritance by women made sense. It wasn't about hating women, it was about carrying on a sacred obligation. In fact younger brothers were treated much the same as women. Only the oldest brother inherited and became head of the family. The younger brothers could marry but they did not own anything, even their own labour. It was all under the power of the head of the family. Because he alone held the family priesthood and had the sacred responsibility to keep the ancestors fed with sacrifices.

This scientific theory, by the way, did not pass with the Classical era. There was no technology to disprove it during the whole of the Middle Ages, so people still believed it. It was not until the 1600s that anatomists dissecting various species noticed that the females all had ovaries. And they discovered the human egg cell - it is large enough to be seen with just a magnifying glass. A debate began. Which gives rise to the baby, the semen or the egg? The debate raged. Finally in the 1690s the Royal Society asked the pioneering microscopist of biology, Anton van Leeuwenhoek, to investigate. And it was only then that Science learned of the sperm cell. And of course it isn't hard, with a microscope, to observe fertilization. And then their minds were blown. Because this was something completely new, something unprecedented; two separate living organisms fusing into a single one.

We often see single organisms splitting into two or more. A tree bears a whole lot of seeds, then drops the seeds and each seed is a new and separate being. Or you can take a cutting, a piece of a plant, put it in water, wait for it to grow roots, and now you have two plants where originally you had one. You can even cut an earthworm in half and if the worm is lucky the two halves will crawl away and each grow into a separate worm. But there is no common experience of separate living beings fusing into one. The closest thing would be when a vintner grafts the stem of one vine onto the root of another. But when the grafted vine bears fruit, and the seeds are planted, they are seeds of the vine that supplied the stem only. They do not inherit from the root. Sexual reproduction is unique, weird. Until just 300 years ago it was simply unimaginable that each of us is the union, the fusing, the blending of the life in our mother and the life in our father.

Before I leave this subject, I should mention that I don't think the scientific misunderstanding was the sole or even the main cause of patriarchy. It explains some strange laws within a particular society, early Greece. But I believe patriarchy as a whole can be explained by the fact that men are more expendable than women. If a village or a tribe loses half of its men, the remaining men can father lots of children by multiple mothers and within a generation the population is back where it was. They are in some danger because of their shortage of men - the men who were lost were not superfluous as fathers or as providers - but with luck they can tolerate that loss and recover quickly. But if they lose half their women they are going to take multiple generations to rebuild their numbers. In antiquity women were always the reproductive bottleneck. So men got the dangerous jobs, including being a warrior. And in most societies, historically, the warriors have ruled.

Fertility control

Despite the practice of early marriage for girls, in antiquity the high death rate among children lowered the effective fertility rate. For example Cornelia, the mother of the famous Gracchi brothers Tiberius and Gaius, bore 12 children, but only 3 of those children lived to adulthood. This was a woman of noble birth living in a wealthy household. But epidemics hit everyone, and killed mostly children and old people. However killer epidemics did not hit every year or even every decade, so sometimes there were plenty of children – too many. And other times there weren't enough. On average about half of children died before reaching adulthood. Which is why the age of majority in most cultures is 19, 20, or 21; that's about when you get over the vulnerability to childhood diseases.

legal fiction of a male guardian.

Incidentally, epidemics are much more of a problem for people living in cities. Cities are a breeding ground for disease. People who dwell in isolated communities did not used to have to worry much about epidemics. Nowadays of course even isolated communities are not truly isolated, but they used to be. So among the Inuit, for example, there were few epidemics, and that's why the traditional age of majority in Inuit culture is only ten.

And then of course individual couples or families have different circumstances. Some couples can't afford children, or can't feed any more than they have. Others can afford children but find themselves unable to conceive. So in antiquity, as today, there was demand both for decreasing fertility, that is preventing conception, and for increasing fertility. And there were technologies to do both. We have books describing medical techniques (all written by men) and they do describe both fertility-enhancing and fertility-decreasing treatments.

To encourage conception the medical treatises suggest picking the right time in the menstrual cycle for intercourse. And this is a technique that does work, as far as it goes. It is hardly foolproof. They also suggest other practices such as ensuring that the woman is in a good mood and that she has eaten, so he is not hungry, but has only eaten a light meal. While these practices no doubt enhance the sexual experience they are unlikely to assist conception.⁹

To decrease fertility there were contraceptive practices. The most common was to employ some variant of an intra-uterine device. Incidentally right down to modern times camel herders in Arabia have used pebbles as intra-uterine devices to prevent their female camels from conceiving. The pebble irritates the uterus so that implantation of the fertilized egg fails.

There were condoms as well. There is no written record of this but one has been found by archaeologists digging through a Roman garbage dump. Archaeology is such a glamorous profession; you get to root through garbage and if you're lucky you find a used condom. This particular condom is tied with a bit of silk so it must have been expensive. I imagine it was made to be washed and reused, not disposable. In any case it is unlikely to have been very effective either at contraception or at disease prevention because it was made from cloth, so it was by no means impermeable.

And there were herbal contraceptives. There was a particular plant, Silphium, that was highly prized because it provided reliable contraception with few side-effects. Unfortunately it could not be domesticated and in the 3rd or 2nd century BC the plant was over-harvested to extinction.

Once a woman is pregnant she may still miscarry. The old wives' tales saying pregnant women should not exercise and so on were already about. I say old wives' tales because we now know that's nonsense. But at least some doctors believed it. We have a treatise called *Gynecology*. It was written by a prominent physician named **Soranus** who lived in the first part of the 2nd century AD and who practiced in Alexandria and in Rome. Soranus goes so far as to recommend vigorous exercise as a way to procure an abortion. But he also discusses chemically-induced abortions. And, although he strongly advises against it, surgical abortion.

Childbirth was dangerous, as is well-known. Doctors employed midwives, who had traditionally assisted in births. But it was a struggle for the doctor to impose his approach upon the midwife.

We label someone “the best midwife” if she is knowledgeable about theory in addition to handling actual cases, and particularly if she is trained in all branches of therapy (for some cases require special diet, some require surgery, some must be treated with drugs) and is able to prescribe hygienic rules, to observe both general and individual symptoms, and to discover from them what

⁹ It has been shown recently that rape, with no medical intervention, results in fewer conceptions than would be expected. It is therefore possible that the mother's mood or attitude may make a difference to the likelihood of conception. However, there are several other possible explanations.

needs to be done... she will be calm and unruffled in crises, and able to give a clear account of the procedures she is using. She will provide reassurance to her patients and will be sympathetic... She will be prudent and always sober, since she is never sure when she will be summoned to a woman in danger. She will be discreet since she will share in many secrets of life... She will not be superstitious and will not overlook a possible remedy because of a dream or an omen or a ritual or a vulgar superstition.¹⁰

If a baby was born crippled, for example with a club foot, many poorer families could not afford to raise the child. They had two choices. They could expose the child, which means abandoning the child in the forest to die. Or they could try to get somebody to adopt the child. We know that in medieval Europe it was common practice for club-footed boys to be given over for adoption to a blacksmith, because a blacksmith doesn't have to get around much. He needs upper-body strength but not much mobility. I suspect that this also happened in antiquity, although there is no direct record of it, because the god Hephaestus (who is the god of metal working) is often depicted as clubfooted and/or hunchbacked. Other gods could change their appearance at will but poor old Hephaestus could not. So I think that's where this comes from. People don't like to abandon their children. They would rather have the child adopted.

Selective breeding

Although people in antiquity did not understand how reproduction really worked, they did practice selective breeding. When you are breeding crop plants you have to consciously select them for desirable qualities. If you aren't planning ahead your natural impulse is to eat the best grains, the biggest and most delicious ones. But they didn't do that. It is clear that they set aside the best ones to sow for the next crop. Nowadays scientists are busy sequencing genes and they can show the effects of human selection upon crop plants. Most plants have been substantially altered. The grain crop plants all started off rather like grass, with small seeds and a large plant. Nowadays as a result of selective breeding they have much larger seeds and more of them, and they have stubbier stems to hold up the heavy head of grain.

Domesticated animals have also been selectively bred. The most obvious is the dog, which was originally nothing but a domesticated wolf. The range of dog breeds is enormous and some of them have remarkable abilities, such as the border collies which instinctively know how to herd sheep. But horses and cattle have been selectively bred as well, in both cases resulting in much bigger animals. Pigs have been bred to not have big tusks and bad tempers, as wild boars do. And so on.

And people selectively bred *themselves*. Perhaps not in the Classical era, but certainly during the middle ages. The aristocratic families selected their children's mates according to a plan of selective breeding. You can see this in Victorian novels, when someone behaves in a bad way the aristocrat sniffs and says "No breeding". When they were talking about breeding they were referring to the same selective breeding that they practiced on cattle. Except they practiced it on themselves.

This self-selective breeding has also been done in the New World. The Incan empire did not have wheeled vehicles and it did not have horses, so they sent messages by runner. The runners would run hundreds of miles along narrow mountain trails carrying the messages to the far corners of the empire. But the runners all came from the same place, a small cluster of villages. To this day those villages stage running contests among themselves. And if one village loses too many contests then the other villages marry their children into that village to restore its genetic base. And it works; they can still run extraordinarily long distances.

¹⁰ Soranus, Gynecology, 1.2.4. In Shelton, p. 93.

Bibliography

Clagett, Marshall. *Greek Science in Antiquity*. Collier Books, New York, 1963.

Shelton, Jo-Ann. *As the Romans did*. Oxford U. Press Inc., New York, 1988.