Chapter 5

Pythagoras, Alkmaeon and Hippasos

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1.   The problem

Pythagoras was the most famous philosopher before Plato. There is quite a large body of ancient material that refers to him, and claims to tell us about him. But very little of it constitutes evidence that we can rely upon for a historical biography. Pythagoras founded a community which (almost certainly) included an intellectual "school." That community spread out and formed similar communities in many places. The political communities were broken up; but the school-tradition did not die, and the associations of scholars and "believers" were continually refounded.

The worst difficulty that we face is that (from the very beginning) the "disciples" did not have what we think of as a biographical (or historical) attitude toward their "Master" — or toward their own work. The Master did not even have a normal biographical conception of himself. He believed that he had lived many times already, and would live again (perhaps many times) in the future. So his followers thought of him as living on; and everything that they believed to be both true and valuable (or important) they ascribed to him. "*He* said it" became simply a way of expressing absolute faith in the truth of what was affirmed. To make matters worse, the early school was probably rather secretive about their "truth." For a long time they kept it to themselves. No doubt, the Master could and did write things down; and so did his educated followers — though most of his religious devotees were probably illiterate. But until heretics arose, who wanted to claim

their own discoveries for themselves, nobody *published* anything properly. As a result, there is not very much about which *we* can say (with reasonable probability) that "*He* said it."[i] In order to do something like justice to him, I must of necessity do some guessing, partly based upon what his predecessors thought, or his younger contemporaries said, about (or against) him. But I shall be as clear as I can about the evidential basis for my assertions (and my hypotheses).

2.   The charismatic prophet

Pythagoras, son of Mnesarchos, was born on Samos somewhere about 570 BCE. Apollodoros puts his *akme* in 532/1, during the "reign" of the tyrant Polycrates in Samos; and it was at about this time that Pythagoras emigrated to southern Italy, where he became the dominant political leader (or his group became the leaders) of the city of Croton.[ii] The Pythagorean political domination occasioned resistance, which eventually became violent. Pythagoras himself had to move to Metapontum, where he died (somewhere about 490 BCE?).

In his younger days he had been a traveller; probably he met, and associated — perhaps closely — with the "theologian" and wonder-worker Pherecydes of Syros.[iii]

The testimony, even for this minimal biography, is late. But there is enough early evidence to guarantee that the dates and places are approximately correct. Herakleitos (who was perhaps twenty-five years younger) knew the name of Pythagoras' father, and the fame of his many-sided "inquiry" and his learning (22 B 40; B 29, B 8).[iv] Xenophanes — who was a contemporary of Pythagoras within a decade — pokes fun at his belief in the transmigration of souls (21 B 7). Empedokles — probably born a few years before Pythagoras died — speaks of his wisdom and learning with great admiration (31 B 129);[v] and Herodotos — born ten or fifteen years after his death — knows him as a considerable sage. Herodotos also seems to confirm (in a rather discreet way) the report of Isocrates that Pythagoras "went to Egypt and studied with the Egyptians" (A 2, cf.

A 1).[vi] We can plausibly guess that he left Samos some time before he went to Croton, and that his travels included Egypt.

The Pythagorean habit of silence makes it very difficult to know what the Master himself believed and taught.[vii] Later followers agreed that no one could say anything about his teaching for certain; but he accepted women in his inner circle of students.[viii] What is best attested about Pythagoras' teaching is his belief that the soul was immortal, and that it passed from one body to another — and from human to animal bodies. Xenophanes says in one of his poems that Pythagoras stopped someone from beating a dog with the claim that he could recognize the voice of a male friend. The belief of his community seems to have been that all animal life is akin. Consequently it was an ethical duty to be universally kind to animals; and, in particular, we ought not to kill and eat them. (But there is no reliable evidence of complete vegetarianism in the early Pythagorean communities. Probably the view of Pythagoras was that it was legitimate to eat the animals that the Gods had appointed for sacrifices. The community observed various ritual taboos about diet — notably abstention from beans — and perhaps the Master was a complete vegetarian.)[ix]

By Plato's time the tradition was that Pythagoras could recall his own earlier human lives (and perhaps animal existences too).[x] He had been Euphorbos (wounded by Menelaos in the *Iliad*), Hermotimos and Pyrrhos (a fisherman of Delos) before he became Pythagoras.[xi] It seems certain that Pythagoras did believe in, and teach, the immortality of the soul (which is not strictly entailed by a belief in transmigration, but consorts readily with it).[xii] This would account for Empedokles' enthusiastic praise of him; for Empedokles was also a convinced believer in transmigration and immortality.

Later followers apparently believed that their memories could extend to previous existences if they exercised them devoutly. Whether the Master taught this, or whether he thought of himself as divinely privileged in a unique fashion we cannot say. Indeed, if we take a rational-symbolic view of the story that Xenophanes made into a joke, we may not want to say that Pythagoras really *believed* in his "memories" at all. They expressed his own sense of universal kinship; and his stories

made valuable myths for ordinary illiterate followers, both religiously (for their own "salvation") and politically (for their acceptance of his authority). Herakleitos took this view, and condemned Pythagoras as an outright hypocrite.[xiii]

The community shared a whole system of customs and taboos laid down by the Master — or later authorized in his name. Most of these are of little philosophical (or moral) interest. But the "way of life" was what united the community; and in particular, all property was shared. The proverb "friends' things are common" was probably Pythagorean in origin.[xiv]

Pythagoras certainly had followers of more than one type. When the political power of his "party" was broken, and the followers were scattered, there would have been a group that went with him to Metapontum; and other groups that went to other places. The discretion of Herodotos in not naming those who believed in transmigration has been thought to indicate the presence of a Pythagorean sect at Athens who must not be needlessly offended.[xv] What was common to all the "Pythagorean" communities was their religious beliefs and practices. Herodotos says that "the observances which are called Orphic and Bacchic are in fact Egyptian and Pythagorean" (A 1: *Histories* II, 81).[xvi] This is correct because Pythagoras thought of our ordinary lives as the sojourn of Orpheus in the Underworld. He integrated the Orpheus story into his conception of "philosophy" as the worship of Apollo. The God of Delphi — whose shrine formerly belonged to the Earth Mother — was the true Lord of both worlds; and Pythagoras himself was "the Hyperborean Apollo" — Apollo of the North (A 7).[xvii]

The "polymathy" of Pythagoras that Herakleitos jeers at was largely an interest in religious mysteries and beliefs of an esoteric kind. Pythagoras believed that he was divinely inspired; and he thought that there had been other inspired prophets before him (and quite probably that he was "identical" with some of them). Philolaos later taught that "the ancient theologians and prophets also bear witness that because of certain punishments, the soul is yoked to the body and buried in it as in a tomb" (44 B 14).[xviii] Since we know that Empedokles believed something of the same sort, we can be sure that the saying *Sɵma, sema* (the body, a tomb) goes back to the Master, and that *he*

confirmed it by reference to some earlier source (or sources) of religious wisdom. Ion of Chios says that he wrote some hymns in the name of Orpheus — so the boundary between "Orphics" and "Pythagoreans" was always unclear (36 B 2).

3.   The "mathematician"

Herakleitos says that Pythagoras engaged in "inquiry" and that he had "many kinds of learning"; and in view of the later history of the school it is clear that the Master's inquiry and learning was of two main kinds. He was interested in the kinship of all animal "life," and he was interested in numbers. The two interests came together in his own "religion" because number represented for him the presence of God (or of life in its divine purity).

Probably the Master himself set the pattern of interpreting ritual injunctions morally and philosophically — though the resistance of the bean-prohibition to rational interpretation shows that there was more to it than that. Certainly he propounded philosophical *riddles* — such as "What is the Oracle of Delphi?" "the *tetraktys*" (58 C 4).[xix] We do not know how far Pythagoras' own "inquiries" about the numerical presence of God in nature went; even Plato did not know this — and he did not much care, because for him too, it was the carrying forward of the inquiry that mattered (A 10).[xx] We have a body of fairly reliable evidence about what Pythagorean mathematical "inquiry" was like when Plato came into contact with it. In fact, our evidence is good for one generation earlier than that, because the Pythagorean astronomer Philolaos wrote a book; and Plato owned and studied it.[xxi] What we have to do, therefore, is to identify (tentatively) the elements in this pre-Platonic tradition which can plausibly be supposed to go back to the time when there were only Milesian ideas available for the Pythagorean "inquirers" to react to. What follows is all guesswork. I hope only that it is as plausible as some of the guessing we have done already. It is better, in my opinion, to do some guessing than to write as if the historical Pythagoras was only a religious seer who gained political authority and influence by stories of wonder-working and miraculous claims about his memories.[xxii]

Even those who think that Pythagoras was only a sage who collected wisdom from all the religious sources that he could find (Hesiod, Pherecydes, the Orphics, etc.), will grant that his sources would have included Anaximander and Anaximenes; and further that he was a "number-mystic"; for otherwise, the later emergence of a school of mathematical astronomers who reverenced him as their founder would scarcely be intelligible. There is no sign of the puzzling doctrine that "Things are numbers" until we reach "the people called Pythagoreans" about whom Aristotle wrote his book.[xxiii] But the reverence for number as "what is most powerful," and for the "Tetraktys" (a triangular dot-representation of the numbers one to four), as the holy thing by which one should swear one's most sacred oaths, is more primitive. Whether Pythagoras himself established a table of ten pairs of "opposites" is quite uncertain. But the table was certainly part of an early dogma.[xxiv] Some of the pairs belonged to older religious beliefs; and some to Ionian science. The whole community could learn the canonical list (and pick up a strong prejudice against left-handedness through it, for example), just as they could learn (and ritually observe) reverence for the Tetraktys. What we must take to be originally Pythagorean, if we are to identify a primitive stage for the later astronomical theory, is the Tetraktys and the basic opposition between *peras* (Limit) and the *apeiron* (the Boundless which we must now learn to call the Unlimited).

On this basis, let us make a bold guess: Anaximander was probably dead, and Anaximenes near the end of his life, when the Samian sage got hold of their books and turned their theories inside out. It is not the Boundless — the "Unlimited" — that is divine, he said, but the Limit that controls it, and brings it into numerical order. The One is God; and the One-Two-Three-Four is God revealed to us. Anaximenes is almost right about the divinity of Air (or Breath). But he has things backwards. *God's breathing* is the ordering of the world. The One takes the invisible boundless Air into itself, and so constructs the world. The One is the "seed" of unification and order. But the Boundless (or Unlimited) side is what is *not* God, what is out of control. Pythagoras probably called the Boundless, "the Empty" (or "Void"). But he only meant that it is not *visible*; and this is just what (I assume) Anaximenes had said about the divine Air.[xxv] The Boundless of Anaximander encompassed us all around, but was nowhere present to us. The Air of Anaximenes encompassed

the world, and exerted observable present control over all of us mortal living and breathing things. The Air of Pythagoras is a boundless Void which the fiery life-principle (both divine and mortal) breathes into itself and so converts into observable and definite being. After Pythagoras, it was necessary for Empedokles to demonstrate that the invisible atmospheric air was not mere emptiness, but something just as real as earth and water. Anaximenes did not feel himself to be under any such obligation. (He was looking for a Boundless invisible power which he already knew to be "real.")

With this general view of Limit and the Unlimited (or of the fiery One and the cold Void) firmly fixed in their minds, the Master and his philosophical followers set out to look for the evidence of God's presence in our world. One of the directions in which they searched was music: "the ringing of bronze when struck was," he said, "the voice of a *daimɵn*" (58 C 2).[xxvi] "There seems to be no reason to doubt," says J.E. Raven, "the tradition that Pythagoras himself discovered — probably by measuring the appropriate lengths of string on a monochord — that the chief musical intervals are expressible in simple numerical ratios between the first four integers."[xxvii] This is just as much a guess as my hypothesis about Limit and the Unlimited above. Only it is not "bold" because even the most resolute sceptics have long accepted it. Raven is repeating the orthodox views of Burnet, Taylor and Cornford. The earliest evidence only indicates that Pythagoras was convinced that the most familiar intervals were mathematical ratios. Herakleides Pontikos reported as follows: "Pythagoras, so Xenocrates says, discovered that the musical intervals also owe their origin of necessity to number, because they consist in a comparison of one quantity with another. He further investigated in what circumstances the intervals are concordant or discordant, and in general the origin of all harmony and disharmony."[xxviii]

This careful statement, which comes from the early Academy — and therefore from Philolaos or Archytas — may perhaps indicate the sort of experimentation that could be done with a monochord — or by making and testing Pan-pipes. Philolaos and Archytas had the whole mathematical theory of the octave worked out (we can infer this fairly safely from Er's vision in the Myth at the end of the *Republic*). But they knew that the Master himself had started things off with the general thesis that numerical ratios were the origin of concordant or harmonious sounds.

According to Aristoxenos — a student of Aristotle's who was friendly with the "last Pythagoreans," i.e. those who still survived as communities in Tarentum, Thebes and Phleios after Philolaos died — Pythagoras "diverted the study of numbers from mercantile practice, and compared everything to numbers" (58 B 2).[xxix] This seems to imply that he was impressed first by the possibility of giving everything a numerical (monetary) value; and perhaps he conceived of the "just price" as the foundation of (or at least as fundamental in) all human justice. Aristoxenos implies that it was this commercial insight which gave birth to the project of discovering the true "measure" of everything. He also claimed that it was Pythagoras who introduced weights and measures among the Greeks. This is an absurdly inflated claim; but we can readily believe that Pythagoras standardized the system in use at Croton (A 12).[xxx]

Aristoxenos consorted with a group who had given up "ritual Pythagoreanism." Probably, he is following a "rationalizing party-line," when he claims that the comparison of *everything* with numbers began from economic and commercial observations. But economic life was another important aspect of the "polymathy" of this sage whom Plato rightly regarded as a would-be philosopher-king.

On the basis of his musical and economic observations, Pythagoras probably taught, as a matter of faith, that "the whole heaven is a *harmonia* and a number" (*Metaphysics* 986 a 1). The divinity of Fire, and the concept of "harmony," was what Herakleitos inherited from Pythagoras. But Herakleitos turned the Pythagorean theory inside out again — just as Pythagoras had done with Anaximenes — by taking proper account of the *destructive* power of Fire. His "harmony" was an intellectual concord of sensible discords. The divine Fire of Pythagoras was the creative One which generated the whole order of the numbers — and *in primis*, the One-Two-Three-Four — by *breathing in* the surrounding Air (or Void) of Anaximenes in a musically harmonious way.

Pythagoras may have been the first to call the world-system a *kosmos*; but perhaps one of the Milesians did that, and his school made Pythagoras the first *honoris causa* (A 21).[xxxi] There was not

enough astronomical theory available to him, for us to suppose that he got far in the effort to work the *harmonia* out. Anaximander had produced a model that was largely determined by the number *three*. But the boundary between his world-system and the Boundless — however it was determined — provided the necessary *fourth* "measure." So Pythagoras could take over Anaximander's cosmic order — and Parmenides supplies us with a plausible reason for believing that that is just what he did. The "Way of Opinion" shows us the *Pythagorean* doctrine that Parmenides first learned.[xxxii]

Allegory and science were intermingled in the discourse of Pythagoras about the *kosmos*. He gave new mythical names to the stars and planets; and he made a moral allegory about earthquakes, while offering a naturalistic theory of the rainbow (58 C 2).[xxxiii] His teaching was preserved largely in riddles by which mythical (or cultic religious) phenomena were given physical or moral interpretations. Thus, he asked "What are the Isles of the Blest? Sun and Moon." "What is the Oracle of Delphi? The Tetraktys" (58 C 4).[xxxiv] "What is most just? To sacrifice." "What is the wisest? Number."[xxxv]

According to a tradition that may go back to Dikaiarchos — another friend of the "last Pythagoreans" among Aristotle's pupils — Pythagoras taught the doctrine of the "eternal return." Porphyry reports his view thus: "that past events repeat themselves in a cyclic process and nothing is new in an absolute sense" (A 8a).[xxxvi] In Porphyry, this is sandwiched between the doctrine of general transmigration, and that of the kinship of all living things — both of which the Master certainly did teach. But if he taught a religious dogma from which this "eternal return" could logically have evolved later, it was no more than an inspired guess. Later on, in the time of Philolaos, it was well understood that there was an "eternal recurrence" of everything in the heavens; and this may have been surmised earlier by a generation whose astronomical theory was much more primitive.[xxxvii]

Mathematics was certainly at the centre of the Master's interests. It is safe to say that he made some investigations both in arithmetic and geometry. Probably he discovered that by adding the odd numbers in sequence one obtains the sequence of squares; and this led to the distinction

between the odd and even numbers as "square" and "oblong." (The formation of the *Tetraktys* shows that the complete series of whole numbers is "triangular.") In geometry, Pythagoras certainly knew what Thales had already discovered — and his school loyally credited it all to him. Kallimachos says he "was the first to draw triangles and polygons/ and to bisect the circle."[xxxviii] Certainly Thales bisected the circle (physically); and he knew that one could get a right-angled triangle by drawing it in the half-circle. The carpenters of Pythagoras' time knew that a triangle with sides 3, 4, 5 was rectangular; they made their set-squares in that proportion. Given his interest in "square numbers" this would have been Pythagoras' "proof" for the theorem that bears his name. How far he may have got with "polygons" we can fairly estimate once we have shown that the tradition that has come down to us about Hippasos is trustworthy (see below). But it ought to be clearly stated that only Hippasos and Archytas were important mathematicians among the early Pythagoreans that we know of. The Pythagoreans did not "create" Greek mathematics.

Much of the "numerology" that we find in Aristotle's reports about the later generation no doubt originated in the collecting and inventing of religious mysteries by the Master. Thus *five* (the sum of 2, the first *even*, *female*, number, and 3, the first *odd*, *male*, number) was the number of *marriage*. (Also 5 is the hypotenuse that "marries" 3 and 4 in the simplest arithmetical right-angled triangle.) Older superstitions about *seven* were plentiful — and the Master surely collected them. This is only important to us, because we must not think of religious faith and rational studies as separate in the minds of the early Pythagoreans. Archytas — the best mathematician, and most reasonable political leader among them — wrote a book *On the Decad* (i.e. the *Tetraktys*). Much of what Aristotle tells us about the presence of numbers in Pythagorean life comes either from him, or from Philolaos (who was willing to make the Earth itself move, and to postulate another one like it, in order to get the number of the cosmic spheres up to ten).

4.   Ethics and Politics

Plato speaks of Pythagoras as bequeathing a "way of life" to his followers (*Republic* X, 600ab). We have no reliable evidence about this that goes back beyond Philolaos and Archytas (whose works Plato knew). There is no reason to doubt that the tradition which they passed on to him goes back (in all essentials) to the Master. But I shall deal with it later because our evidence all belongs to the later time (see Chapter 12).

Pythagoras himself was a *traditionalist*. He sought to *purify* the customary life that he found; and he appealed to the authority of earlier prophets and sages. We can see this by considering the dictum of Philolaos: *sɵma sema* — "the body, a tomb" (44 B 14).[xxxix] If there is anything in the Pythagorean doctrine that Plato learned that goes right back to the Master, it is this aphorism. But there is a problem about it, because the implication is that the immortal soul can escape from the body, and either be united with God, or be in communion with God in a "higher" world of being. This proto-Platonic conception transcends the hylozoic standpoint of the Milesians, and of our most reliable early reports about Pythagoras. The God of Pythagoras is the "soul" that is *immortally* embodied in the *kosmos*; whereas the immortal individual soul is *perpetually* embodied in a series of finite living organisms.

Yet it was certainly "Orphic" doctrine that one could join the company of "the Gods"; and Pythagoras may well have accepted *that*, without having a physical theory about it; or he may have believed (and taught his inner circle) that by right living we can pass from the wheel of perpetual becoming to a share of some sort in God's immortal embodiment. This was, very probably, what Philolaos himself believed. He will have held the view that we find in Plato's *Timaeos* — that every liberated soul has its own place among the fixed stars.

The other principal ethical doctrine of Philolaos coheres quite well with the doctrine of mortal embodiment as a divine *punishment*. For someone who believes that "the body is a tomb," suicide becomes rationally attractive as a possible line of escape. But Philolaos taught that suicide constitutes desertion of the post that the Gods have assigned to us. Plato lets Sokrates instruct the supposed disciples of Philolaos, Simmias and Kebes, about this; and Sokrates also says that it is a

"secret doctrine" (*Phaedo* 62b). This means, I take it, that it was the "secret doctrine" handed down from the Master, and never published until Philolaos put it in his book; or perhaps not even there — for Plato himself may have heard it orally from students of Philolaos.[xl] (In my opinion, all of the evidence points to the view that the ethical doctrines of Philolaos come directly from the teaching of the Master. But this cannot be conclusively shown. For the moment the reader must be patient.)

Pythagoras was certainly deeply involved in politics. Diogenes Laertios preserves the tradition that he "established laws for the Italian Greeks [of Croton]." There has to be some truth in this, because a political revolution followed, in which his adherents were driven out. But by that time, Croton had become a dominant power in the whole region, and there were other "Pythagorean" cities. So Pythagoras himself found a refuge at Metapontum. A much greater upheaval occurred in the time of Philolaos. After that it is only at Tarentum that we find a Pythagorean philosopher-king who was acceptable to his community: Archytas. The tradition about Archytas reports that he operated in the framework of a democratic constitution. Probably he was a "mathematical" Pythagorean; and it seems that he did not attach crucial *political* importance to the religious traditions of the school. If he wrote a book about the Decad, then he was certainly a *pious* Pythagorean himself.[xli] But the religious exclusiveness of the Pythagorean "party" would have been one abiding reason why their political influence tended to provoke violent reactions. Eventually the political spread of their influence was decisively checked everywhere except at Tarentum; and "the last Pythagoreans" — certainly the last that we shall have to be concerned with — were small groups of exiles in mainland Greece, at Thebes and Phleios.

The tradition that Pythagoras "first used the term 'philosophy' and called himself a 'philosopher'"[xlii] needs cautious interpretation. The word was certainly current in the Ionian tradition. But the Pythagoreans took it to themselves in Italy; and this may very well have been because the Master said that no man is truly "wise" (*sophos*). We can only be "lovers of wisdom" (*philosophoi*).

In another story (which comes, through Cicero, from Herakleides Pontikos)[xliii] Pythagoras explains the title "philosopher" to Leon, tyrant of Phleios, thus:

> Life, he said, is like the gathering at the Olympic festival, to which
> people flock from three motives: to compete for the glory of a crown,
> to buy and sell, or simply as spectators. So in this life, in which we
> arrive, having left behind another life and nature, some enter the
> service of fame and others of money, but the best choice is that of
> those few who spend their time in the contemplation of nature, as
> lovers of wisdom, that is, philosophers.

As told here, the story has definitely been "Platonized."[xliv] But it goes back to the "last Pythagoreans" certainly. Whether it goes back to the Master himself (nearly a hundred years earlier) we cannot say. But if it is not true, it is indeed a very happy fiction. For the Master was a "whole man." He lived all three lives to the full; and we need not be in doubt about which one he preferred.

5.   Alkmaeon

Alkmaeon of Croton was called by many later Pythagorean writers a member of the school. But it is fairly clear that Aristotle regarded him as an independent thinker, and that he was right to do so. According to what is probably an interpolation in the text of Aristotle's *Metaphysics* Alkmaeon "lived in the old age of Pythagoras"(A 7).[xlv] Some scholars think he was contemporary with such later Pythagoreans as Philolaos. But since what we know of his views fits fairly well into the early context, we may as well accept the testimony that we have, and deal with him here.

There was a medical tradition at Croton before Pythagoras arrived[xlvi] — perhaps even a "school." Alkmaeon was a medical man; and he had something of the humility of the empiricist. Certainly he took the difference between divine and human knowledge more seriously than

Pythagoras did in his own case. For his book began: "Alkmaeon of Croton, son of Peirithous, said this to Brontinos, Leo and Bathyllos: About matters invisible, the gods possess clarity, but humans may <only> judge . . ." (24 B 1).[xlvii]

This is rather more precise than the familiar opposition between divine knowledge and human ignorance that we find in the poets, because of the restriction to "matters invisible." "Human judgment" about the invisible has to be by reasoned inference from the visible. Alkmaeon put no faith in the mathematical mysticism (or supposed insight) of the Pythagoreans. Aristotle (who wrote an essay — now lost — against Alkmaeon's views) tells us that he said that "most human things go in pairs" (i.e. most judgments are relative ones involving a pair of opposites) but that he did not say how many important pairs there were (as the Pythagoreans did, with their table of ten pairs of opposites). Alkmaeon apparently instanced "white/black, sweet/bitter, good/bad, large/small" (A 3).[xlviii]

As we might expect, his medical theory was based on this insight:

> Alkmaeon says that what preserves health is isonomy among the powers — wet and dry, cold and hot, bitter and sweet and the rest — and that monarchy among them produces disease; for the monarchy of either power is destructive. And disease arises through excess of heat or cold; it arises from a surfeit or deficiency of nourishment; and it arises in the blood, the marrow, or the brain [for example]. Sometimes it arises in them from external causes too — from waters of a kind, or from a place, or from fatigue or compulsion, or from things like that. Health is the proportionate blending of the qualities (B 4 — Aetios).

His use of the political analogy ("isonomy" or legal equality) here, indicates Alkmaeon's "democratic" sympathies. Orthodox Pythagoreans would probably have identified health with the

"monarchy" of the wisdom-loving principle. But if Alkmaeon was not much in sympathy with Pythagorean politics, he agreed with their psychology. He thought that the life-principle was immortal, like the moving principle of the heavenly bodies; and he seems clearly to have accepted the doctrine of the community of all mortal life.

But also, Alkmaeon distinguished clearly between human and animal existence. He discussed sensation at some length; and Theophrastos — who would have known both his book and Aristotle's critique of it — tells us that he assigned only sensation to the other animals, but claimed that the power to put sensations together ("understanding" as the translation puts it) is distinctively human (A 5).

The "putting together" of sensations is possible because all of the sense-organs are connected in some way with the brain. Theophrastos complains that Alkmaeon said nothing about the sense of touch. He concentrated his attention upon the sense-organs in the head (A 5).[xlix] But he realized that thinking was quite distinct from sensation; he did not try to reduce it to sensation, or create a simple continuum between sensation and thought (such as we find in Empedokles). We can work out his theory of touch, by inference from his theory of sleep. In Aetios we read: "Alkmaeon says that sleep is brought about by the retirement of the blood to the larger blood-vessels, whereas waking is their rediffusion (A 18)."[1] He did not hold (like Empedokles) that we *think* with our blood — thinking was the special function of the *human* brain. But clearly he held that our general sensibility depends on the omnipresent blood.[li]

Alkmaeon's most famous saying was "the reason why men die is that they cannot join the beginning to the end" (B 2).[lii] This statement, which has puzzled some students, puts human mortals firmly in their place between the lower animals and the Gods. The heavenly bodies, which go round in circles, are Gods whose conscious life is self-completed because they do "join the beginning to the end."[liii] Mortal humans have an incomplete thought-consciousness, because although their souls are immortal "self-moving" principles, they do not live in a conscious circle, so they cannot be directly aware of their own immortality. The cycles of the soul's existence do not close knowingly;

so we have no memory of the last time that we were born and died. Other animals have only sensory consciousness, and no continuous self-identity in thought at all.

In view of Alkmaeon's documented interest in the unification of sensory consciousness in the brain, we need hardly hesitate to project his theory of the bottom level of life: plants have *no* consciousness, and no separate identity at all. Thus, for Empedokles to claim that "he" has already been a bush is absurd, because a bush cannot be (or have) an "I"; and it is only in fairy-tales, like Homer's story of Circe transforming the sailors of Odysseus, that a human being can become a pig.

Alkmaeon's speculation about the immortality of the soul is all conducted in the context of the Pythagorean doctrine of transmigration. He believes that every life-principle is self-moving, and consequently perpetual and unceasing. The human soul establishes its own individual identity "for itself" in its thinking consciousness. That consciousness is broken off by death; but as *thinking* consciousness it is also broken off every night by sleep. Death is a more radical break, because the immortal moving principle will only gradually come back to thoughtful self-consciousness in a new body. What Pythagoras claimed about remembering his previous lives is conceptually possible — though we cannot "judge" it to be very *likely*. But if his soul passed into plants and animals between his life as Aethalides and his Trojan existence as Euphorbos, then he would only remember that as a break or interval — like a deep sleep.[liv]

Although Alkmaeon's theory justifies the community and continuity of all life, there is no clear evidence in the surviving reports that he realized that only the common reservoir of life-energy has to be regarded as immortally self-moving. Aristotle comments upon his saying that "men die because they cannot join the beginning to the end" that it is "clever if we take it that he is speaking in a general sense and not *precisely*" (*Problems* 916a). So it seems that Aristotle was not sure quite *how* Alkmaeon meant it. The later Pythagoreans, who thought that the whole world order had to go round in a circle quite *precisely*, took the saying in its "precise" sense. That was what their own theory of immortality required. Probably Alkmaeon was not troubled about the problem, because he did not believe in the actuality of Pythagoras' supposed memories. We can hardly imagine him as a

brash young man asking the Sage: "But who were you before Aethalides? . . . and before that?"[lv] Perhaps, however (as Guthrie supposes) he did draw the necessary conclusion about the soul's immortality quite explicitly in its *general* sense; and in that case, I ought to have said that his speculation is conducted in the context of the Pythagorean doctrine of the community of all life (rather than in the context of transmigration).[lvi]

The reports about Alkmaeon's astronomy, indicate both how primitive it was, and how "Pythagorean." The Sun is flat, and the Moon is spherical, but goes through phases because it has only one bright side which gradually turns away from us and then returns after its eclipse; but the heavenly bodies are divine living things that move themselves. Hence the planets can move "backwards," even though they are making periodic circles (A 4).[lvii]

6.   Hippasos

Hippasos is a shadowy figure, about whom we have little reliable information (none of it being early). But if we accept the tradition that he sympathized with the democratic opposition in the revolt that drove the Pythagoreans out of Croton for the first time (18 A 5)[lviii] — when the Master went to Metapontum (which is where Hippasos himself came from) — then he was probably active philosophically before 500 BCE. Thus he belongs to the same generation to which we have tentatively assigned Alkmaeon.

This is important in the first place, because of the light that his views throw upon the probable views of Pythagoras and the first generation of the school. Hippasos is regularly coupled with Herakleitos as one who believed that the divine life is Fire. Since (as far as we know) he did not depart from the philosophical doctrines of the school, this gives us a firm indication that the original Pythagorean One (which breathed in the Air or "Void" — as Pythagoras probably called the Boundless) was a hot or fiery life-force (A 7, A 8).[lix]

Hippasos also said that the "change of the *kosmos* occurred in a definite time, and the whole was perfectly limited [*peperasmenon*] and ever-moving (A 1)."[lx] This certainly suggests that Pythagoras *did* guess that there was a "Great Year" period for the *kosmos*. "Limit" (*peras*) has *complete* control of the world-order.

Hippasos did experiments that aimed to show how the ratios of the *Tetraktys* were musically present in the physical world. Pythagoras believed that the basic concords were arithmetical ratios. Hippasos tried the sounds produced by metal discs of appropriate thicknesses, and of vessels filled with different proportions of water (A 12, A 13).[lxi]

Hippasos is important, in the second place, because he appears to have rebelled both against the rule of silence (if there was one!), and against that of anonymity. It was he (not the Master) who discovered how to construct the dodecahedron — which consists of twelve pentagons; and he published this fact.[lxii] When he died in a shipwreck, the believers thought that his death was a divine judgment upon him. We can get some idea from this story, of how far the mathematical work of the Master progressed. A method for the construction of the regular pentagon was worked out while Pythagoras was alive — but this was done by a disciple; and in his geometrical studies of the pentagon, Hippasos was able to show, for the first time, that arithmetically "incommensurable" magnitudes exist.   The tradition is unanimous that he went on to demonstrate the incommensurability of the diagonal of a square (A 4).[lxiii]

Finally this notorious rebel became the focus of a myth produced by the breakup of the brotherhood. When there began to be "mathematical" Pythagoreans who did not observe the religious customs and taboos, the orthodox *Akousmatics* — who had always existed, because not all "Pythagoreans" were intellectuals — began to say that the Master had not really been a *mathematikos* at all, and that the first real mathematician was the traitorous Hippasos (A 2).[lxiv]

This myth is very convenient for the scholars who want to believe it, because we have very little reliable testimony about the *scientific* interests of Pythagoras, while we have some

unimpeachable evidence about his religious views. But it is an outrageous libel, that ought never to have been given a moment's credit in view of the reverence for Pythagoras (and for his semi-divine status as the mouthpiece of all truth) evinced by the best of the later Pythagorean "mathematicians" such as Philolaos, Archytas, and Plato. An important mathematician Pythagoras certainly was not; but an important *philosopher* (not just an eccentric religious fanatic) he very probably *was*.[lxv]

Notes

i.   The secrecy of the first generation of Pythagoreans may have been exaggerated — see note 14 below. But both Plato and Aristotle already treat Pythagoras as a legendary figure (compare *Republic*, 600ab, 14 A 10; *Metaphysics*, 986 a 30, A 7 and *Rhetoric*, 1398 b 14, A 5. See also Apollonios — A 7, Barnes, 85 — who retails some of the stories Aristotle collected). Plato expresses great reverence for Pythagoras and treats him as a model of the Philosopher-King.

ii.   The biographical tradition — deriving in this respect from Aristoxenos — claims that his father Mnesarchos was a gem-engraver. If we could accept the hypothesis of C.T. Seltman that Pythagoras was directly responsible for the beautiful new coinage of Croton (which appears at about the time of his arrival there), then we would have clear evidence of another direction in which his "polymathy" was exercised. See Guthrie, I, 174-7. But Seltman claims too much, because the earliest coins are not from Croton, and they were stamped about twenty years before Pythagoras arrived in Italy — see C.J. de Vogel, 1966, chapter IV. The Pythagoreans did, however, play an important part in the economic life of the whole region — see p. 000 [80, at note 30].

iii.   Pherecydes may have been anything from ten to forty years older than Pythagoras (see 7 A 1, A 1a, A 2; 9 A 1). If the earlier date is right, then Pythagoras could have buried Pherecydes on Delos (as Aristoxenos reports, A 8) before he went to Italy.

iv.   Diogenes Laertios cites Herakleitos, fragment 129 as proof that Pythagoras wrote many books which Herakleitos knew. But it is only safe evidence for Pythagoras' fame. What

Herakleitos knew about Pythagoras, he did not approve of; and there is no clear sign that he had written evidence to go on (but see further, note 18).

v.   Empedokles does not *name* him — so some ancient sceptics tried to claim that he was referring to Parmenides — 31 A 1. But this is chronologically quite impossible.

vi.   Herodotos, IV, 95-96 (Barnes, 83-84) and II, 123; see also A 4, Isocrates, *Busiris*, 28-29 (Barnes, 84). In II, 123 Herodotos discreetly refuses to name the Greeks who are supposed to have adopted the Egyptian belief in the transmigration of souls "as if it were their own invention." (Everyone in his literate audience would have known that he meant Pythagoras for one. The Orphic sages — if there were any as early as 500 BCE — would also have been in his list. But Herodotos was mistaken anyway. The Egyptian priests did *not* believe in transmigration.

vii.   It is doubtful that we ought to speak of a *rule* of silence. Some sort of "wisdom-collection" was probably "published" (in a very limited way) quite early — cf. Brontinos 17 A 4 and chapter 7, note 5 below. But Pythagoras probably distinguished between how one should speak and write for the literate, and how one should talk to the masses (see Aristoxenos in Diogenes Laertios 8:15).

viii.   For this we can fairly rely upon the testimony of Porphyry and Iamblichos, (8a and 17). 8a — which comes from Dikaiarchos — tells us of one woman-student, Theano, who became famous — see Barnes, 86; and 17 may perhaps have come from Aristoxenos.

ix.   Beans were probably forbidden by "Orpheus"; and vegetarianism was "Orphic" (see M.L. West, 1983, 14-16). Human souls do not enter into sacrificial animals (Iamblichos, *Life of*

Pythagoras, 85). Aristoxenos claims that Pythagoras himself particularly enjoyed the animals sacrificed to Dionysos and the Mother and Daughter. But he may only have taken a ritual taste (see W. Burkert, 1972, 182-183). On ritual abstention from beans and other dietary taboos see especially 58 C 3 (Aristotle fragment 195). Empedokles also preached abstention from beans; and from his attitude to the shedding of blood, we can perhaps infer that to be a complete vegetarian was the mark of true philosophical insight (and intellectual dedication) among the Pythagoreans. (The variety of explanations offered for the bean-prohibition shows that the thoughtful members of the community could not understand the "commandment" — and their observance of it in spite of this shows that it did indeed originate with the Master. He issued many other instructions of a mystical-irrational kind — to which the faithful probably made differing additions in different places. So when the spirit of *a priori* rationalism triumphed among the "Mathematicians," there was plenty for the "Akousmatics" to be offended about (see for example Porphyry in 58 C 6 — Aristotle fragment 197).

x.   In the version of the Pythagoras myth told by Herakleides, Pythagoras does not "remember" being a plant or an animal. He is divinely informed that his soul has at times "passed into" plants and animals. One can suppose that he said "Between such and such lives I was an oak tree." But it is hard to give sense to "I *remember* being an oak tree" (or even "a dog"). Further discussion can wait until we get to Empedokles (who does claim in his very own words that he "has been . . . a bush and a bird and a silent fish in the sea" (31 B 117).

xi.   14 A 8 — Barnes, 86-87. Diogenes ascribes this report to Herakleides Pontikos (a fellow-student with Aristotle in the Academy).

xii.   Sokrates points out in the *Phaedo* (87cd) that a tailor may outlast many of the cloaks that he makes, but he perishes like them in the end. (Life in a new body is here compared to the use

of a new cloak.)

xiii.   But it is much more likely that Pythagoras *did* believe in his "memories," and that he had the shaman's "out of body" experiences to justify them. The School later taught that there were *three* kinds of conscious being: Gods, men and "beings like Pythagoras." (They certainly believed that there had been others like him, and that others might become like him.)

xiv.   See the fragment of the Sicilian historian Timaeos cited in KRS passage 271 (p. 227).

xv.   See K.-R. 334.   There is a later tradition about the division of the school into "mathematicians" and "akousmatics" (Porphyry — A 18; Guthrie, I, 192). But in its origin this can only have been a distinction between the literate and the illiterate members in the sort of community of which Plato speaks. *Everyone* observed the customs and taboos called the *akousmata*. This "way of life" was what bound them all together — and soon it began to vary as between communities in different places. Only later — specifically in the generation of Aristotle's student Aristoxenos — do we have evidence for "scientific" Pythagoreans who regarded the *akousmata* about diet etc. as mere superstition — see Guthrie, I, 189-90 for the evidence.

xvi.   M.L. West (1983, 16) says: "Bacchic rites are one thing we do not associate with Pythagoras." This is true, but it is one of our general mistakes (which ought to be obvious, when we are faced with the title *Bacchae* for the book of Philolaos).

xvii.   Aristotle Fragment 191. Aristoxenos said that "Pythagoras got his ethical doctrines from the Delphic Priestess" (14 A 3; cf. Diogenes Laertios 8:21). It is "the Bride" (Persephone, Eurydice) who is in the Underworld; and it is the doctrine of the lower — or "ethical" —

life that comes from there. But even women — when they are not being mothers — can be philosophers. Apollo at Delphi is properly represented by a *priestess*; but it is Pythagoras who is the Sun God himself on Earth. See further, Chapter 12, note 49. (For the association of Dionysos with Apollo at Delphi, see M.L. West, 1983, 150-152.)

xviii.   The reference to "the old *theologoi* and *manteis*" has been made into a ground for rejecting this Philolaos fragment as spurious. Instead, we ought to take it as evidence of how Pythagoras regarded himself as a mouthpiece of perennial wisdom. The evidence of Plato (*Gorgias* 493a) shows unimpeachably that the doctrine was "Sicilian [i.e. Empedoklean] or Italian [i.e. Pythagorean]" *before* Philolaos put it in his book. To doubt the authenticity of *this* fragment is an excess of scholarly caution that leaves one open-mouthed in amazement. (Among "the old *theologoi* and *manteis*," Orpheus was perhaps the most important. The "prison" metaphor probably came from whatever "Orphic" traditions were available to Pythagoras. Ion of Chios (36 B 2) says that Pythagoras ascribed certain writings to Orpheus. (In this connection we hear of writings of Pythagoras published by Kerkops and Brontinos. It is possible to be *too* sceptical about "Pythagorean books." Ion of Chios — c. 490-422 BCE — had *some* sources after all — and so did Herakleitos.)

xix.   Iamblichos adds "which is the *harmonia* in which the Sirens sing." This may have been added by Philolaos; but it seems clear that he was only continuing a tradition of allegorical interpretation established by the Master.

xx.   *Republic*, 600ab. What matters to Plato is that Pythagoras was a *philosopher* who inculcated a way of life on the basis of loving commitment. The "Pythagoreans" whom he knew had common *intellectual* interests; the opposition that he sets up between Pythagoras and Homer implies that he firmly believed that the original Pythagorean "way of life" had been based on those same mathematical concerns.

xxi.   Philolaos has his own chapter later on (in his proper place). Diogenes Laertios gives several versions of how Plato got his book. One of them said that Plato "copied the *Timaeus* out of it" (44 A 1).

xxii.   This view — which was proposed by W.A. Heidel — has been argued very powerfully and exhaustively by Walter Burkert. His position is now accepted (far too completely) by almost all other serious scholars.

xxiii.   Compare *Metaphysics*, 986a, 987b. The doctrine is stated several ways. I take the claim that "the whole heaven is a *harmonia* and a number" to be the oldest form.

xxiv.   By the time of Philolaos the canonical table was as follows:

Limit	Unlimited
Odd	Even
One	Many
Right	Left
Male	Female
Resting	Moving
Straight	Crooked
Light	Darkness
Good	Bad
Square	Oblong

(see Aristotle, *Metaphysics*, 986a). The side on which Good appears is "the column of goods" (*Nicomachean Ethics*, 1096 b 5).

   An older table was proposed by Guthrie as valid (hypothetically) for Parmenides (1965, II, 77). Ameinias (who taught Parmenides) was a member of the school in the time of the Master (and so was Parmenides himself probably).

xxv.   See especially 58 B 30 (notably Aristotle fr. 201), together with Aristotle: *Metaphysics* 1091
       a 13 (58 B 26), and *Physics* 213 b 22 (58 B 30 again).

xxvi.   Aristotle, fragment 196. It became the ambition of Hippasos to understand this voice.

xxvii. K.-R, p. 229 — see Guthrie, I, 222 (cf. I, 220-221 for the views of Burnet, Taylor and
        Cornford).

xxviii. Porphyry commenting on the *Harmonica* of Ptolemy. (How much Pythagoras himself
        discovered, even Herakleides did not pretend to know.)

xxix.   From Stobaeus — see Guthrie, I, 177.

xxx.   See Guthrie, I, 177. Compare note 2 above for the probable concern of Pythagoras with
        economic life.

xxxi.   From Aetios — compare Guthrie's valuable note, I, 208.

xxxii. The best indication of the sort of astronomical theory that Pythagoras himself might have
        developed is to be found in Parmenides' "Way of Opinion." This probably contains the
        Pythagorean theory that Parmenides learned in his younger days. (The influence of
        Anaximander is very much in evidence in the Way of Opinion. But if the reader thinks that
        we must accept the only direct testimony we have about Anaximander's placement of the
        Fixed Stars, then we have to suppose that Pythagoras took over the view of Anaximenes

about that.   Identification of the Fixed Stars as the comprehensive level of the cosmic harmony was certainly essential to his view.)

xxxiii. Aristotle, fragment 196. The rainbow is reflected sunlight, whereas echoes (like the ringing of bronze) are the voices of "mightier powers." Some of the star and planet allegories mentioned by Aristotle may have originated with Philolaos. But I think it is clear that in his *Bacchae* he was only continuing the tradition established by the Master. (If my interpretation of the doxographic report about Philolaos' cosmic order is correct, it is clear that the habit of mixing allegory with scientific theory occasioned considerable confusion for more pedestrian minds. See Chapter 12, p. 000 [===] below.)

xxxiv. If he actually taught that "The tetraktys is the harmony in which the Sirens sing," then the traditional view that he established the basic musical ratios is largely confirmed. But that may have been what Philolaos added.

xxxv. This time I suspect that the addition "and next wisest is he who assigned names to things" may have been made by Plato.

xxxvi. See Guthrie, I, 186.

xxxvii. The testimony of Eudemos (reported by Simplicios — Barnes, 88) should probably be referred to the time of Philolaos or later. But the "eternal recurrence" doctrine (together with the "history of the earth" in the way in which it was formulated by Xenophanes) may very well have inspired Parmenides' "Way of Truth." Since Parmenides almost certainly began as a "Pythagorean" of sorts, his Way of Truth definitely points to the presence of the "eternal

recurrence" doctrine in the early views of the Pythagorean school.

xxxviii.   *Iambi*, fragment 191 — Barnes, 85.

xxxix. Clement of Alexandria — see Guthrie, I, 310; Barnes, 222. Compare Plato, *Cratylus* 400 bc, *Gorgias* 493a, *Phaedo* 81b-82c.

xl.   That the pupils of Philolaos — from whom Plato himself must, on this hypothesis, have learned the doctrine — are represented as not knowing it, is a paradoxical way of expressing the fact that the doctrine was not in the book actually published by Philolaos. Someone who actually had the book would have been able to work this out from what "Sokrates" says. For us, who do not have the book, it only means that Plato's testimony is a very *elastic* entity.

xli.   Of course, this book may have been a later forgery. But Aristotle had *some* written sources other than the book of Philolaos; and we can be sure that Plato brought back to Athens everything Archytas had written. A book on the Decad is perhaps a more plausible source for much of what Aristotle reports — and an inspiration for the work of Speusippos — than the cosmic astronomy and theology of Philolaos. (But no certainty is possible.)

xlii.   Diogenes Laertios, I, 12. (The earliest witness is Herakleides Pontikos — see below [at note 43]. For a good discussion see de Vogel, 1966, 96-102.)

xliii. *Tusculans* V, 3, 8 (Guthrie, I, 164).

xliv.   That "other life and nature" from which we have come, is the world that Er son of Armenios

sees in his vision at the end of the *Republic*.

xlv.   *Metaphysics*, A 5, 986 a 27. W.A. Heidel suggested, very plausibly, that the source of this scholium which has crept into the text was Porphyry's *Life of Pythagoras*, chap. 104 (see Furley and Allen, 1970, 354).

xlvi.   See Herodotos, III, 125, 129-137 for the career of Democedes. But see especially III, 131 which implies that Croton became famous through Democedes, but had its medical school before his time.

xlvii.   (Diogenes Laertios). Kallimachos catalogued the Library at Alexandria by this method of quoting the first sentence. If we may trust the tradition about Brontinos, this opening confirms the early date of Alkmaeon, since Brontinos is spoken of as one of the Master's own circle (and sometimes as husband of Theano, the famous female Pythagorean — see D.-K. 17 and Guthrie's note [I, 344n]).

xlviii.   *Metaphysics*, 986ab. Among these only "good/bad" makes it into the canonical Pythagorean table — see note 24 above.)

xlix.   See Barnes, 91; or Guthrie I, 347. In A 10 the report of Chalcidios strongly suggests that Alkmaeon discovered the optic nerve by actual dissection. He studied the formation-process of the embryo, and noted that the head is formed first (A 13 — *Aetios*).

l.   See Guthrie, I, 349.

li.   "General sensibility" actually covers the "thinking" that Empedokles was referring to (or at least that is a plausible interpretation of his dictum).

lii.   See Guthrie, I, 351; or Barnes, 90-91.

liii.   For the divinity of the heavenly bodies see 24 A 12 (Cicero and Clement of Alexandria — Guthrie, I, 350).

liv.   I am referring here to the report of Herakleides Pontikos (see note 10 above).

lv.   Zeno might have done it, if he had been born in time. But, of course, the Master would never have allowed such a conversation to happen. (Alkmaeon *did* believe in the perpetual circular motion of the heaven as a whole — A 12; Aristotle, *On the Soul*, 405ab.)

lvi.   Guthrie, I, 354-357: "There is no hint that Alkmaeon believed in transmigration" (354). What Alkmaeon believed depends (probably) on whether he was born before 510 BCE or after 480. (In the earlier generation he would have only the Pythagorean "revelation" to think about.) Plato formulates Alkmaeon's "proof" of the immortality of the soul as self-moving brilliantly in the *Phaedrus* (245c-e); and he articulates the necessary consequence as "transmigration" in his myths (especially the Myth of Er). But Plato understood how incredible the doctrine of "perfect circle recurrence" in history is; and his emphasis on personal moral responsibility in the Myth of Er logically *guarantees* (in my opinion) that Plato did *not* regard *precise* recurrence as a necessary truth of thought. For Plato, individual immortality (and "transmigration") is a *myth* — a morally useful *fiction* — and nothing more. (And even if he was forty years older than Sokrates, Alkmaeon may have been as much of an *agnostic* about *individual* immortality as I take Sokrates to have been.)

lvii.   From Aetios (see Guthrie, I, 357). I have "improved" on the source-report slightly, by taking the dark "phase" of the Moon as an "eclipse." (The primitive character of Alkmaeon's astronomy is fairly strong evidence that he was a contemporary of the *earliest* Pythagoreans.)

lviii.   From Iamblichos depending upon Apollonios. In my view it was *political* apostasy that originally stood against Hippasos in the eyes of the Pythagorean faithful. We can be fairly sure that he wrote and published *something* on his own account, because his views are reported *independently*. This may very probably have been the *Sacred Account* that is mentioned in Pythagorean sources as a *political* attack on the Master (18 A . . .). (Huffman [19 , 15, n. 25] accepts the report of Diogenes Laertios [8.84] that Hippasos wrote *nothing*. But this may only mean that whatever he published was regarded by the orthodox Pythagoreans as the work of the Master.)

lix.   Simplicios has allowed his interpretation of Herakleitos — itself mistaken — to infect his account of Hippasos. The best witness is, of course, Aristotle (*Metaphysics*, A 3, 984 a 7.) Hippasos also said that the human soul is fiery (A 9). But he did not say that it was a *harmonia* — so we should assume that *that* development came in the generation of Philolaos.

lx.   A 1 (Diogenes Laertios). Unless we grant that this was *also* the teaching of the Master, we must take it that Alkmaeon was probably *younger* than Hippasos.

lxi.   This is the first attempt at "controlled experiment" of which we know; but, of course,

Hippasos was only seeking to discover the range of a theory that was "confirmed" already (and accepted as "true" on *a priori* grounds). The famous story of how Pythagoras discovered the concords in the sounds created by "harmonious blacksmiths" is a fiction that could have arisen out of some experiment with Hippasos' discs (which would actually have shown that the weight of the hammers does *not* make the required difference!).

lxii.   His presence in our doxographies is fairly good evidence that he did write a book (and that *eventually* it was published). But the tradition about this is hopelessly corrupted, because forgers later went to work to support the myth that he was a rebellious heretic.

lxiii.   From Iamblichos (see Barnes, 215). The plausibility of the (late) tradition that Hippasos discovered "incommensurables" has been shown by K. von Fritz (1945, in Furley and Allen, 1970, 382-412). The story that Hippasos was divinely punished for revealing this, is an example of Pythagorean *superstition* in the post-Platonic period. The Master himself, who was interested in the truth about everything — including disorder — would never have countenanced such nonsense.

lxiv.   From Iamblichos (see Guthrie, I, 192). Notice that in the story, the Mathematicians accept the Akousmatics as true Pythagoreans. The rejection starts from the other side — and it does not appear to be as old as the division of the Brotherhood into the two sides.

lxv.   Walter Burkert (1972) is quite right when he says that we cannot *prove* that Pythagoras had a natural philosophy (as well as a religious "message"). But he cannot "prove" that Pythagoras did *not* have one either. The fact that the Master did not *publish* anything in prose, does *not* prove that he did not *write* anything in that medium. We are not concerned with "proof" but with *likelihood*; and it is not *likely* that the account of things given by the

Akousmatics is entirely true, while that given by the Mathematicians is simply false. The option of choice (which Burkert accepts) is itself a *false* one.