CHAPTER 7

The meaning of superstructure games

7.1. Introduction.

Category theory may be thought of as a type of reasoning without examples (themselves called universals), just as algebra does the same thing for reasoning without always directly using numbers. In this chapter we have separated out the category theory of suoperators from the meaning of superstructure games which are extended features of generalised categories. Non-suoperator category theory is usually thought to be associative, although exponentiation is not associative. Superstructures are inherently multiplicatively nonassociative from the start, and can be represented by the zargon, tribble and tharl algebras discussed in chapter 4.

In this chapter we go into more detail on superstructures, dealing with these subjects by linking them with another topic to which the mathematics refers, the theory of games.

These games are universal structures in both mathematics and physics, and incorporate in our formulation positive sum (cooperative), zero sum (competitive) and negative sum (murder) games. Each of these three parts of a game has a logic (the logic in control is *choice*). These three games forming a unified game are absolute structures at a particular point in time (we divide time into logical time, which gives the number of computations to find a result, and physical time, which is a real number. Space components are then like imaginary numbers in different dimensions).

These absolute physical time slices of a game link together so that the combined game evolves. This means there are different structures, called currencies, which operate on the positive, zero and negative sum games. For example, if the game is cognitive (we then say it is in Kogito) there is an ethical cooperative game using the logic of reason on the left, a control game at a boundary (called a Kampf wall) and an uncooperative game using unreason on the right. The maximum height of the Kampf wall is normalised at 1. The currency of the ethical cooperative game is need, of the server or choice allocation game is power or money, and the uncooperative game has a currency to distribute death. These currencies are also allocated to the physics of the game.

The left and right hand side of the game are defined by overwhelming, which defines what happens when the Kampf wall is demolished, not ethical criteria. Games have ethical implementations, but the left and right hand parts of a game are not defined ethically, but by *overwhelming*. The right hand side game wins in this circumstance (say, the ethical system which only has need as a currency accepts the murder game’s currency of death). These games evolve over time. The ethical system is relatively stable, innovating through planning.

In the murder game innovators murder ideas, and knowledge evolves more rapidly towards the truth for players with an ethical interior. Peronism is defined as an ethical defence to the murder game; appear stupid (have little reason) and adopt an external coat of murder compatibility.

We consider cognitive games (in Kogito) and physical games (in Fizyk). We discuss Fizyk games for zargon algebras.

Finally, we introduce intuition as a Kogito game involving insight on the left and delusion on the right. The server or boundary wall in Kogito is called the Kampf wall. In Fizyk, it is a tribble. Tribbles are discussed in our work on physics.

Insight back-propagates to reason, a system of axioms, truth deduction interaction threads and end theorems located as maps in Kogito. Meaning is a mapping between Kogito and Fizyk. We have a general sequence where insight algebra is in true/false and hyperinsight is in a general colour logic

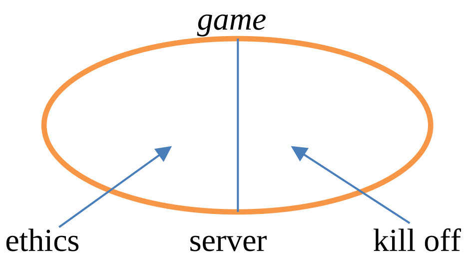
insight → ⋯ → hyperinsight

which generally extends meanings to cover all colours where the insight/delusion pair is called intuition and we have mappings

intuition → ⋯ → hyperintuition.

7.2. Making breakfast – ethical game theory at work.

We now subvert our development by starting with an example. This is very unmathematical and we like it. Here is a game, like an egg with a line down the middle.



All games (well, the server may have disappeared) are like this. They are everywhere. My brother, Martin, said it wouldn't work for breakfast. So I said, OK, let's try an experiment. We make breakfast with toast, olive oil spread and cheese, and coffee.

So I took out two slices of bread from a cupboard, and put them in the toaster. The toaster is a *server* structure in this part of the breakfast game.

I put down the toaster control, and it popped up again. I did this twice. The toaster was refusing my need to make toast. Rather than hit the toaster until it correctly functions, the *Triviality Up* principle (see the **Contents** page of the website for further information on this) says it is most pleasant to do the easy option; obey the toaster and make bread and butter with cheese on top, so I did. Triviality Up is the easiest way to clear a general aim, in this case: make breakfast. It is however serial (not *cereal*). For any two options in a triviality tree, choose the easiest. Evaluate what is easy in the binary tree downwards so all trivial tasks are cleared with the most trivial first. This includes all distractions, like scratching your nose. If you have missed something simpler, choose it. This clears all tasks in the aim (making breakfast), it requires minimal computing power, so it is relaxing, and it is the equivalent optimal path for solving the algorithm if fixed.

The alternative is *Problem Descent*. We said in the Contents page, don't use it, but that is not quite the case. For problem descent, you evaluate the entire problem tree globally, so it is a parallelly obtained solution if you have got that available. For problem descent, if you have Galactic computers and Donald Trump to help you, and you have missed out a peanut in error in the solution, it might be significant. So you have to solve the whole problem again, if you are lucky and have enough memory to evaluate the tree. This does not mean you cannot use Problem Descent, but that it is very probably unpleasant. It is true you can probably optimise the solution from the global answer, especially if you have plenty of experience in trying. Then if you have parallel processing the answer is faster than Triviality Up, at least if you are learning from many examples.

This shows that Problem Descent, if evolved through many trials, is probably the most evolutionary advanced method, despite being so painful. Of course we could try say, 50/50, between the two methods and maximally learn in the easiest way, perhaps.

So if we had not chosen the easiest answer, we could have chosen Problem Descent, and eventually we would have evolved our learning to know the reason why the toaster was not working. The switch was not on, as my brother Martin later mentioned.

The problem with the coffee, was that it was almost cold, and had been previously part-drunk. The question was: How do I make ethical coffee in the coffee part of the breakfast game? If we look at the game diagram, ethical coffee means we do not kill it off and start again, but supply its need by making it warm again so it can be drunk. So we warm the coffee in the microwave. But how?

If we want to be nice to the coffee and not warm it up too much, then we can estimate half the heat, test the coffee, and from that warm it up to the right amount afterwards. That way we do not overheat the coffee, so we have to wait for it to cool down. In fact, half was the right estimate, so there was only one try.

That seems to be it, but it isn't. We have not worked out why we did not find out that the toaster was not plugged in. Ethical game theory gives us advice. The control mechanism was not exercising power. If we look at the **Global Embezzlements** section of the website, we see the need, control and murder parts of the game have currencies (and they have logics!). The currency of the server section is usually money, which is a valuation of the freedom to use controlled objects. In this case the currency is electric power. If we give the server object, the toaster, electric power, it can then supply our need to toast the bread! We could have worked this out directly. Supplying electricity is the ethical method. The murder method is to supply the money to buy a new toaster!

7.3. Pure simple games and the definition of overwhelming.

We can represent a general game as (+, 0, –) where for instance this may be (ethics, control, murder). The 0 is at the boundary of + and – which are separate. We can think, as we do later, of + containing true and – containing false. Note that in the way we use it, – is an asymmetric function. This means that if we have a game which has components measured multiplicatively, a double asymmetry is a symmetry: $-(-1) = +1$. This means that under multiplication the yang game on the right is larger than the yin game on the left, which includes it. Viewed as a system of probability logic of chapter 2, section 4, true and false belong to a system with addition and multiplication. It is possible to renormalize truth as +1 and false as –1. The structure of this probability logic then shifts as described in *Superexponential algebra*, volume II, chapter XIII.

The height of the Kampf wall may be thought of as a probability allocation which converts two players, say one on the ethics side and one on the murder side to just one player in either ethics or murder. More generally, the server wall is a solution strategy where power is distributed.

The wall can be used to partition the ethics and murder sides of the game, and can be thought of as a strategy, which is either fixed or evolves over time.

Overwhelming defines which side of the Kampf wall the players reside. Taking the wall as demolished, it asks which side wins the game completely. This by the right hand side. It is not defined by the assumed ethics of the two sides, with good on the left and bad on the right. This justifies allocating the minus sign game on the right, since the rightmost game (+, 0, –) given above is larger and includes the + game on the left. The mixing of the game given only by multiplication then is defined by the outcome of all multiplication pairs from elements of their sets.

Players have absolute states and nearness to the aims of the portion of the game they are in. They also change these absolute states by relative amounts. In the continuous case these concern differentiable structures but in the case of all finite states we are looking at difference algebras. We may then be concerned about where the Kampf wall is semi-demolished, or permeable, in the outcome of games where elements of the game for each of its three portions, called players, interact. This ordered ensemble of solutions of interactions of the game we call its evolution.

The currency of the control wall allocates control to players who interact with the wall, either together or separately. It may be power or money. The fixed or absolute height of the Kampf wall is the aggregate of power or money it has. The power is measured and partitioned into currency bitcoins for distribution, exchange or retrieval from the players who interact with it. These currencies measure quantitively the amount of quantities present in the game possessed by players of the game.

On the left of an ethics/murder game, the only currency is need, denominated in finite numbers, in say needbits, for a noncontinuous game, which is partitioned out by an interior needbit currency controller, who may reason about need control projects, with positive scenarios on the left in the subgame of the ethics game and negative scenarios, or paranoias, to the right. The need server interacts with the central power server in distributing power to the players in their allocation of need.

On the right hand side, the murder part of the game, there is a death controller. Death, measured in deathbits, is the currency of the murder game. Just as the ethics part may use reason, so the murder game may use unreason in allocating death. A murder controller possessing reason is able to maximise the death of the murder game, and may develop strategies to overwhelm the ethics game.

For overwhelming in the example we have given, the ethics game, with only a currency of need must accept the murder game’s currency of death, in any interaction that does not bounce off. This is the meaning of this currency principle. The murder game is on the right. When the Kampf wall is down, players percolate through both sides of the game. Ethics with only need as a currency, and not power, must accept death when offered it. Murder overwhelms ethics if the wall is down. This is not defined ethically. Left/right, yin/yang is defined mathematically by overwhelming.

It can be a source of confusion when ethical assumptions are used to allocate left or right of the Kampf wall to a game, when this is used purely as a mathematical definition. The ethical consequences of a strategy can then be developed purely mathematically, without any recourse to moral judgements in evolutionary outcomes.

7.4. Semantics in Kogito and Fizyk.

We will first work in Kogito, so all reasoning is within cognition. Our first task is to establish a bijective mapping between insight and reason. The system of reason is a syntax, or symbolic, game within Kogito. Informally, a system of axioms expressed in a determinate syntax are the rules of the game, as described for example for set theory **mSet** in the introduction to chapter 1 of this volume. It is normal to wish that these rules are mutually consistent, as is proved using forcing, which is a deduction technique in metareason, in chapter 4, volume II. This is often an important task for logic in formal axiom systems.

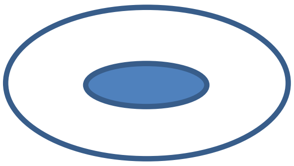
Deduction threads are also present in systems of reason. The axioms are the initial states of the system, and deductions are formally stated rules which manipulate instances of the axioms, to transform these states to other output states of the logic system called theorems. It is normal in current mathematics to investigate systems restricted to valid deduction threads, that is, logical deduction in reason in which a true statement is transformed to another true statement.

Methods of reasoning introducing deduction threads which are wholly or partially false are called by Aristotle (in translation) sophistical reasoning. The objective of Aristotle in the work *On Sophistical Refutations* is to establish a methodology whereby false reasoning can be detected, in order that the syntactic truth of propositions posited in logic and their meanings, established by mapping statements from syntactic logic to meanings, again established by rules, map to the objective external world. The syntactic logic is expressed in terms of 'syllogisms'. Aristotle calls this *Prior Analytics*, and the meaning system as *Posterior Analytics*. He defines analysis as the process of finding reasoned facts. Posterior analytics concerns demonstrations of logic producing scientific knowledge.

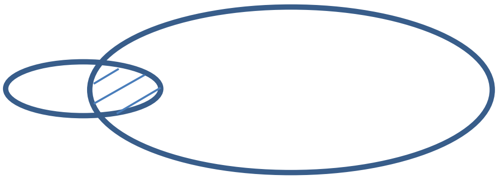
Saint Anicius Manlius Severinus Boëthius, commonly called Boethius (c. 477–524 AD), was a Roman senator, consul and philosopher of the early 6th century. He was born about a year after Odoacer deposed the last Roman Emperor. Boethius entered public service under Ostrogothic King Theodoric the Great, who later imprisoned and executed him in 524 on charges of conspiracy to overthrow him. While jailed, Boethius composed his *Consolation of Philosophy*, a philosophical treatise on fortune, death, and other issues, which became one of the most popular and influential works of the Middle Ages. As the translator of Aristotle, he became the main intermediary between Classical antiquity and following centuries. Boethius draws the distinction between categorical sentences which we would say belongs to an equivalence algebra, such as propositional logic or predicate logic, and hypothetical sentences which we would say involve entailment, that is, it says that something is, *if* something else. Boethius puts this in terms of meanings by saying that a categorical sentence involves a predication whereas a hypothetical sentence involves a condition. Typically hypothetical sentences are conditional sentences such as 'IF P THEN Q'. In contrast to Boethius we treat the disjunction 'P OR Q' as a categorical sentence. *On the Hypothetical Syllogisms* is the only remaining early work on this topic.

The syllogistic rules of entailment, expressed by Boethius as 'is' but by Aristotle as 'belongs to' are

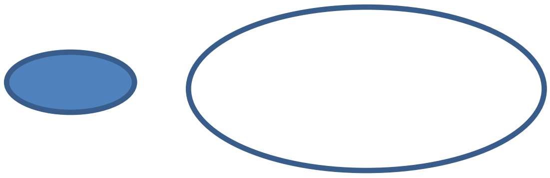
All B is in A



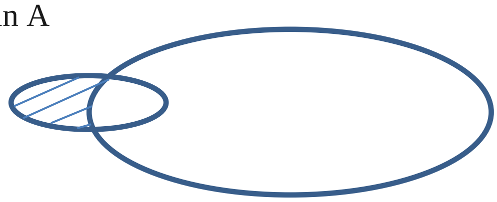
Some B is in A



All B is not in A



Some B is not in A



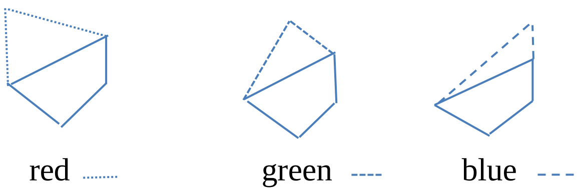
We will express these syllogisms in two equivalent ways

(1A) B is inside A
(2A) Some B is inside A
(3A) B is not inside A
(4A) Some B is not inside A
and
(1B) A is outside B
(2B) A is outside some B
(3B) A is outside B
(4B) A is not outside some B.

Here inside may be taken either as conforming to the rules of $<$ or $\leq$, and outside as conforming to the complementary rules $\geq$ or $>$ in that order.

Aristotle is making a distinction between (2A) and (4A) or equivalently (2B) and (4A) which Boolean algebra thinks is unnecessary. We take here the view that in **mSet** the existence of the void set enables this equivalence. We would say that Aristotle has insight in not adopting the equivalence between these two points of view.

This inequivalence may more deeply be expressed using the multilattices of chapter 2, section 6. We will plunge in at the deep end and give an example not in the two-valued logic of true and false, but for a colour logic expressing red, green and blue.



The bottom parts of the multilattices are the same, representing some B on the left and some A and then higher up A on the right. The red, green and blue components are three colours at the top. Together these diagrams merge to form a more complicated multilattice.

Hypothetical reasoning encapsulates reasoning developed most of all by John Burridan (c. 1300 – 1361) whose development of syllogistic reasoning was announced in the works *Treatise on Consequences* and the *Summulae de Dialectica*. If P entails Q then P is called the antecedent and Q the consequent. A consequent is then the second half of a hypothetical proposition. Aristotle introduced modal logics expressing ideas of entailment and possibility, the precise mathematical description of the latter of which can be given in terms of probabilities, although extensions of this idea go beyond ideas of intermediate values between formalisms expressing certain and impossible events, to encompass colour logics with more than two variables, which are the true and false of Boolean algebra. We will study this in volume II onwards.

It is interesting that the logic Aristotle introduces may in the formalism of Boolean algebra be thought deficient. Boole fully accepted Aristotle's logic but developed what he did not say, expressing this algebraically. However, the more loosely defined logic is more general and its extension is the logical deduction system introduced by Gentzen which encompasses Boolean algebra as a subcase. Gentzen describes his formal logic system in terms of antecedents and consequents.

Aristotle is adamant that his objective is to establish truth, as well as correspondences between systems of reason and physics. This commendable aim we will extend further in a forthcoming work to investigate wrong reasoning from a logical point of view. Since inaccuracies in reasoning now as then result in activities directed to misapplied aims, some of which are methodologies based on false reasoning which it might be of interest to correct, and others based on aims which cannot be realised, it is of social interest as much to investigate what goes wrong as well as being concerned with good examples conforming to good practice. It is inherent in confusional thinking based on an incoherent appraisal of fact that it can result in actions that are social disasters. These studies will therefore be an important methodological investigation with social utility. An extended objective in our studies will be to introduce formal systems in which consistent and correct reasoning is a component of a wider system which introduces possibilities for the rigorous study of false deduction paths. The objective of this study is to apply systems of reasoning to identify from a reasoned point of view systems of confusional analysis or wilful misapplication of ideas to bamboozle others into following aims not in their interests. It would be scientifically pointless and politically misdirected to use this precise analysis of confusional thinking to introduce sophistical methods to describe the methodology itself. In a pointed observation on the direction of some French philosophy, derived from commentaries on the Swiss semiotician Ferdinand de Saussure, but more particularly the French philosopher Jean Baudrillard (there are other examples), we will call the latter confusional type of analysis French.

The outcome of stipulated mutually consistent axioms and true deduction threads is an ensemble of theorems which arise as a consequence. Working together, this logical system is called an example in reason. An analogy we will use, arising historically from the instance of algebra, which is valid, is that this consistent system may be represented by a symbol, just as in algebra instances of an extended type of number are represented by one letter for each way these are representations with a specific meaning. In the terminology of category theory we introduced in chapter 3, this symbol is a universal, a place name for an example which is true and operates correctly everywhere in algebra in an algebraic equation or set of formulas.

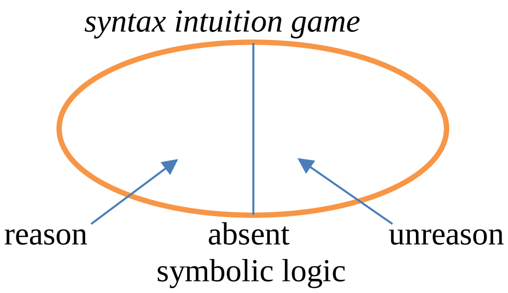
We will have to develop specifically such an algebra of reason. This is done in subsequent volumes. Our objective now is to describe this algebra in terms of its meanings directly. Our thesis is that an *insight* is a correct meaning in logic. We have introduced reason as syntactic logic, the consistent representation of which is given by a symbol, like a variable in algebra. A parallel development is to consider insight algebra.

7.5. Absent logic.

Since we are introducing false logics as well, we can represent this ensemble by a game. We begin by describing logic in reason as a subentity of a game which extends to include false reasoning. Our games in general are 3-games. This means a reasoning system for syntax which is true is accompanied by a reasoning system which is false, which we call unreason. It is interesting, as a meaning, that reasoning which is everywhere false maps to reasoning which is everywhere true. We can get a mathematical theory of jokes as insight contradictions in Kogito. A further observation is that this game so far has only two components, a component for reason and a component for unreason. How can we include a 3-game in this description, which has a boundary, or zero sum, component, between the positive sum and negative sum parts?

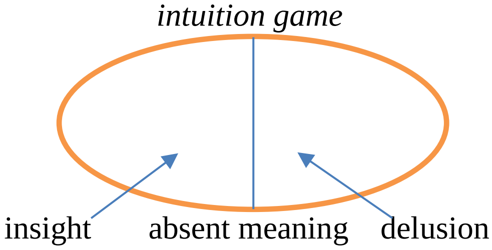
In terms of meanings, we have true reasoning and false reasoning, so the reasoning at the boundary should have true = false! Rather than dismiss this, we accept it, that is, we also consider logics where true = false. In fact we give it a name, absent logic. Arva, the name of true = false here is denoted by A. Absent logic is separate from reason and unreason. It may be thought rather trivial. So is zero. It is an important idea in mathematics. We think absent logic is important too. For instance clopen sets, which are objects in Stone Spaces introduced in chapter 2, are mappings from absent logic. We introduce from there the 2-game with finished and unfinished sets, and a corresponding 3-game with closed, clopen and open sets. The 2-game corresponds to the 3-game with the Kampf wall of clopen sets empty. It is interesting that in absent logic choice always works. That is, if we make a decision it is always right because the opposite case that it is inconsistent and wrong means it is consistent also! We are assuming here all consistent problems are solvable, which means a choice can be made and is proved in reason in volume II.

7.6. Intuition.



We describe the combination of reason, absent symbolic logic and unreason as a syntax intuition game. We may sometimes wish to consider statement of axioms, rules of deduction and theorems which only may be true. In this case the part of the game we are considering is not in unreason, but can be contained in the union of reason and absent symbolic logic. This maps in a similar way to the idea, putting + on the left, 0 in the middle and – on the right, that the opposite of ‘less than’ is ‘equal or greater than’.

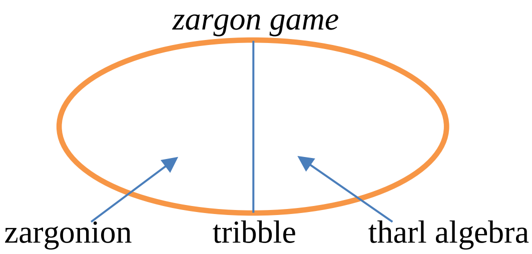
The corresponding system for meanings is shown below.



An example of an insight is called a scenario. An example of a delusion is called a paranoia.

7.7. Zargon games.

Zargon games may be in Kogito, where they are mathematical constructions, or Fizyk, where we maintain they are fundamental descriptions of physics. In Kogito, the 3-game is a zargonion, tribble and tharl algebra, as described in section 18 of the previous chapter.



The reason tharl algebra overwhelms zargonions is that the two non-real intricate numbers multiply together to produce an imaginary number, which is a zargonion. Thus the algebra is like the real +, 0, – game in multiplication where two non-zero negative real numbers multiply together to produce a positive one. Of course, multiplication of positive real numbers is possible and consistent, so under pure left and right games the algebra is consistent. When zero is introduced, for a field under union of zero with a left or right game, we are in unreason, since zero multiplied by two numbers which may be distinct is zero here, and this means if division by zero with cancellation is allowed, any number is equal to any other.

We can keep in reason by considering zero algebras, which are not fields, but this is unusual, or rather until the author introduced them, unknown. This means by analogy, which is a valid mode of reasoning in insight, that if we restrict ourselves to reason, we cannot allow division as an operation for fields, and if the structure has addition as well, it must be a ring, and this carries over to the zargon game.

Since they are the maximum generalisation of this type we have so far encountered, we can consider whether zargon games endowed with zero algebras are what we call su-universals, that is, superstructural generic examples. Further aspects of zargon games, notably in systems of hyperintuition, are sketched later.

For zargon games in Fizyk, the corresponding game triple has on the left a global zargonion say left-handed universe interaction physics, in the middle a Majorana neutrino, and on the right a right-handed global interaction universe. This itself may be considered as a subgame of an insight game. The delusion game, if we are within a mathematical field system, is a finite quantum tharl algebra. Finite algebras have division. This is the same as multiplication. These mathematical field multiplication systems do not have zero, which is in the tribble. Since the tharl algebra is finite, we might equate this with the quantum part of physics. For mathematical fields, which have addition and zero, the tharl algebra is a ring and not a division algebra. Further, on intrusion of the quantum system on the global zargonion interaction physics, the tharl algebra in mathematical fields introduces partial inconsistencies in the zargonion physics, and eats it away! Our investigations elsewhere show these inconsistencies are not entire, and some residual zargonion algebra with division remains. If we introduce zero algebras in general we have more than one type of negative number. This methodology may be thought of a new way of tracking systems in delusion, or inconsistent, physics and mapping them to insight, or the physics of reality. The central tribble wall between global interactions and quantum states is still under investigation. We have given only a brief sketch here. This will be developed in detail in the Physics section of the website.

7.8. Games where a player is not allowed to think.

This is an imaginary conversation. Because it is imaginary it has, as yet, no official response.

'Hello Doly'.

'I would like you to reflect on the proposition which you put forward to me with apparent great seriousness that my work is valueless and therefore a waste of time.'

'Please look at the work *Number*, *space and logic*, and report back to me whether or not you are nuts. We will take the law if the excluded middle here, so either you are nuts or I am nuts, but not both.'

'You might like to internally reflect, and not report back to me at all. In that case, you will have thought, as you always do, and therefore according to my definition, albeit imperfect and not properly considered, you are not nuts at all. This is because you have allowed yourself to think, and you always do that, not in opposition to me, but with the idea that I am imperfect (which is correct) and your considerable wisdom (usually wrong, but never mind, you try, and if one method does not work you try another which usually does not work either, but never mind, you have tried, and with considerable force to deconstruct my ideas - that is what I want. You are a true mathematician).'

'You might like to report back to me that I am right, but that would be a total contradiction of your personality, and it would be unjust to ask you to do so. I will therefore expect you to report back to me on how I have got this all wrong, and how I need correcting, in particular in coming up, after all this time, with a concrete example, giving an explicit solution to the Abel-Ruffini equation for which my theory should give a direct solution in radicals, and which you with your considerable knowledge in the numerology of Babylonian mathematics, which looks for direct examples to confirm a general case, would then say you concur.'

'I have suddenly, in this imaginary conversation, decided on abstract grounds to concur with you. I am nuts until this concrete result is confirmed. There could be no greater confirmation of insight logic than this. It is not that a result is false until it is proved true, this is a contradiction inherent possibly in some versions of intuitionalistic logc. It is rather that our judgement on a theory is contingent upon whether or not it is true. This is not only a confirmation by rigorous analysis that its reasoning is correct. Our result has been obtained using insight, which here we locate in syntactic analysis, but is located in truth and reality itself. My insight tells me, without any further argument, that the statement that finite polynomial equations are finitely solvable by (well, fairly simple) algorithms to give fairly simple solutions by radicals. The location often in logic for this situates meaning as a mapping from my mind which thinks, and sees its picture of the world and has syntax to express this, and the external world which I have a picture of, and is reality itself. This is my aim, to establish truth. We shall be direct. There is, I think no other demonstration of this abstractness than this mathematics gives a correct logical deduction which establishes directly that Galois solvability theory, always confused and never having any direct and complete confirmation, as historcal analysis will confirm, I think to any technical disinterested historian, and the confirmation of this absolute truth is most simply demonstrated by the example given.'

'Doly, I now realise that you are not nuts. I, as a mathematician must demonstrate by direct example that my theory works. Until that happens, I know my work is of value, in many ways we have directly confuted Galois solvability anyway. The simple proof of the proposition you force me to make will ensure, as you already directly have confirmed to me in previous conversations that we are both in agreement and must continue. We will then have established that our joint project is correct.'

'Doly, we are complementary mathematicians. We both situate mathematics in the truth. That is why you have no need to write back to me, at least until I have completed my task.'

'There are two words in French, 'adieu' and 'au revoir'. Adieu, 'to God', I think, may be uttered with emotional force on commitment to a long journey on which the partners may never see one another again in this physical world. 'Au revoir', I see you again, may be after lunch.'

Doly, but not after lunch, it will take much longer than that

'Au revoir'.

7.9. The polynomial complex supercertain algebra $\mathbf{U}(\beta, \gamma)$.

We now adopt, as we have throughout this work, the fanciful approach which enables us to stipulate structures in Kogito without at the same time designing an appropriate mapping from Kogito to Fizyk enabling these models to have physical meaning.

A supercertain algebra is a description of a probability algebra where it is possible to be over 100% certain. The supercertain algebras we will choose are modifications of the probability logic of dependent and independent events discussed in chapter 2, section 4. All axioms carry over for probabilities of events greater than 1 which we had given to certain events, with the possible exception of the probability for the complement of A, C(A).

Definition 7.9.1. If P(B) is the probability of an event B, and for an event A, C(A) represents the event NOT A happening, then a *plain* supercertain algebra satisfies

$$P(C(A)) = 1 – P(A).$$

Definition 7.9.2. An *antiplain* supercertain algebra satisfies

$$P(C(A)) = 1 – P(A)$$

for $P(A) > 0$ and

$$P(C(A)) = 1 + P(A)$$

for $P(A) < 0$.

Definition 7.9.3. A normed supercertain algebra satisfies $P(A)^2 \leq 1$ for all probabilities and generated probabilities in the algebra.

Theorem 7.9.4. All normed supercertain algebras with negative probabilities are antiplain.

Proof. If the algebra contains component which is plain, if it is normed then P(A) = 1 belongs to it, hence the only probability of two events A and B which are negative and satisfy

$$P(A \cap B) = P(A)P(B) = 1$$

are P(A) and P(B) = –1. Thus P(A) = –1 belongs to the algebra and 1 – P(A) = 2 belongs to the algebra and is not normed. Thus the algebra is not plain, but if it is antiplain, the algebra with P(A) = –1 is normed.

Definition 7.9.5. A *linear plain* supercertain algebra satisfies

$$P(C(A)) = g - hP(A)$$

and a *linear antiplain* supercertain algebra satisfies

$$P(C(A)) = g - hP(A)$$

for P(A) > 0 and

$$P(C(A)) = g + hP(A)$$

for P(A) < 0.

Example 7.9.6. A linear superposition of a linear plain and linear antiplain supercertain algebra is (by definition) a *linear* supercertain algebra.

Definition 7.9.7. Let V be a linear plain supercertain algebra above and W be its corresponding linear antiplain supercertain algebra. We designate $U(\beta, 0)$ as the linear supercertain algebra

$$U(\beta, 0) = \beta W + (1 - \beta)V.$$

Definition 7.9.8. A polynomial plain supercertain algebra is a linear plain supercertain algebra where P(A) in definition 7.9.5 is replaced by a polynomial in P(A). We likewise define a polynomial antiplain algebra by its definition in 7.9.5 with P(A) a polynomial.

Definition 7.9.9. Let V' be a polynomial plain supercertain algebra above and W' be its corresponding polynomial antiplain supercertain algebra. Designate $U(\beta, 0)$ as the polynomial supercertain algebra

$$U(\beta, 0) = \beta W' + (1 - \beta)V'.$$

Definition 7.9.10. A complex supercertain algebra has in the above definitions all coefficients and probabilities complex numbers, where the greater than or less than ordering is given as that for complex numbers in the discussion of zero algebras in chapter 1, section 12.

Remark 7.9.11. The positive polynomial real supercertain algebras and the general polynomial real supercertain algebras with positive or negative probabilities with zero probabilities form a polynomial 3-game, with overwhelming defined in the order (+, 0, –) of these games. We can likewise define a 3-game with general polynomial real supercertain algebras on the left and general polynomial complex supercertain algebras on the right defining a polynomial 3-game.

For probability logic we have adopted the convention that certain equals 1 and impossible equals zero. When we introduced the β parameter, this varies between 0 and 1. When $\beta = 0$ then we are choosing the plain component and when $\beta = 1$ we are choosing the antiplain component. This means that we have a game and β defines the height of the Kampf wall in this game. The question is: which game is the murder game on the right? That is, which game is the most general? The antisymmetric game is clearly the antiplain game, since it is defined by a binary partition on the probabilities. When this antisymmetric partition is applied to itself, it becomes the plain game. Thus the antiplain game is the murder game and is on the right, by overwhelming.

The Kampf wall is defined for those central games where the left game equals the right game. We have already introduced absent algebra where true = false, and we now want to look at this for probability logic. In this instance we already know that the false game is the murder game. It is antisymmetric in that falsity of falsity is truth. We can now introduce another parameter, γ, in this instance. When certain equals impossible we have taken the point of view that 1= 0 is not inconsistent, but that the algebra is greatly reduced so that every number is equal to every other number. If we confine ourselves to just the 1 and 0 instances, then we know there is an axiom system, that of zero algebras, in which division by multizeros is possible. The general assumption that 1 = 0 is inconsistent which we have denied arises in the proof of the fact that division appears useless to us in this instance. When we introduce zero algebras we clearly have a rich structure which is not inconsistent under division. What we are doing here is to introduce a new binary partition between structures which are fields and are restricted and structures which are zero algebras and are unrestricted. So this is clearly a new type of game. When the Kampf wall is up in this game we say its height is $\gamma = 1$ and when the wall is down then $\gamma = 0$.

We have missed something out. When we introduce probability logic, there are intermediate values between 1 and zero. This means we have quite an extensive algebra in this instance. Then 1 = 0 defines a type of congruence arithmetic, for example for real numbers where 1 returns to zero. Thus fields define a much less restricted probability logic than they do without probabilities. It is evident that multizeros are part of, say, a real probability logic from the beginning. Thus the extension of the γ parameter to this case is natural. It should be clear that zero algebras overwhelm fields, and thus zero algebras are on the right.

It should also be clear that this works in the plain case, but in the field antiplain case 1 – P(A) = 1 + P(A), so all positive numbers are negative numbers, which seems a bit unnatural, but is OK. We can get a consistent algebra by always replacing minus by plus.

Definition 7.9.12. A *lawn* satisfies the axioms for multiplication and for addition there is a symmetric function L, meaning L(–b) = L(b), such that a + b = L(b).

7.10. A zap.

We give the example of a *zap*. Suppose we have a 3-game defined by iteration. The operations are (+, group, x). Group is defined by + = x, so there is one operation, and for the **mSets** 1 = 0 and are defined (mod 1). Distributivity holds on the right, so for elements of **mSet**

(a + b)(c + d) = (ac) + (ad) + (bc) + (bd)

which is multiplicative on the left of the equation and additive on the right of the equation. A zap belongs to a supercertain algebra, so here 1 = 0 = A. Suppose it is linear and the left and right portions of the game are fields, which is coherent. We can define a subtractive inverse in a zap, that is easy. For the left yin this is the only operation. Multiplication is defined in a zap and division by zero is division by 1. For the right yang we can define a {+, x} pair operating on the zap with normal operations for a field. On interactions with absent, + = x can be defined additively. The absent inverse is defined by

{a, b} + {-a, 1/b} = {0, 1} = {A, A}.

We could also define the operation on the algebra using a multiplicative representation. The two representations are bijective.

Gentlemen are aware of those in a delicate condition. Hot flushes are well known amongst mathematicians, and the application of smelling salts may satisfy you. The supplied fan, if wafted vigorously, may assist.

‘Thank you. I feel much better now, but I have been *zapped*’.