The anthropology of time

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"It can be stated quite categorically that no society could function at the pre-operational stage, and to suggest that a majority of any people are at that level is nonsense almost by definition." Professor Gustav Jahoda (1980:116)

1. *Piaget's theory of time.*

It is one of the aims of this paper to show that it is in fact perfectly possible for primitive culture and social institutions to function effectively at a pre-operational level. I have chosen the anthropology of time as a case-study because time-reckoning is closely associated with social co-ordination in the form of calendars and other collective representations, (Pocock 1967) and therefore provides an appropriate test of Jahoda's claim. It has also been the subject of a substantial book by the late Alfred Gell, *The Anthropology of Time* (1992), and since this includes a critique of Piaget's *The Child's Conception of Time* (1970) and the chapter on time in my *Foundations of Primitive Thought* (FPT), it is worth discussing Gell's book here as an example of the sort of response that anthropologists have been able to make to the challenge of developmental psychology. But before we can usefully discuss his critique, it is necessary to understand what Piaget meant by the pre-operational and concrete-operational understanding of time, and how, in my book, I related Piagetian theory to time concepts in primitive society.

In the first place, Piaget does not regard cognitive development as simply a manifestation of biological maturation, but also as involving the active construction of a sequence of cognitive structures by accommodating to experience of the environment, assimilating that experience to existing cognitive structures, and equilibration, or a striving for consistency, between the two. As Piaget himself has said

> Indeed, if there were a continuous action of the internal maturation of the organism and of the nervous system alone, the stages would not only be sequential but would also be bound to relatively constant chronological ages, as are, for example, the co-ordination of vision and prehension (around four to five months) and the appearance of puberty. (Piaget 1974:301)

In fact, of course, as is well-known, apart from the time-gaps in the acquisition of different cognitive skills – the *décalages* – there is wide variation in the chronological

ages at which children attain the different stages, and I discuss the nature of the developmental process at some length in the first Chapter of FPT (27-32). Here I emphasise that the stages are the result of an active learning process, and that progression to the higher stages is not inevitable but depends on experience and the cultural milieu.

> Piaget, then, clearly recognizes that cognitive development is a dialectical process in which the active manipulation of objects, the demands of communication, argument, and collaboration in tasks, and the reconstruction of knowledge at the different levels of action, imagery, and verbal representation are essential components. (FPT:28)

After the sensori-motor stage, which lasts until around 2, with the development of language there begins the pre-operational stage, lasting until around 6. There is an early sub-stage, from about 2 – 4, dominated by egocentrism and animism, and a later, 'intuitive' sub-stage from around 4 onwards in which more reasoning occurs, until the stage of concrete operations begins, at around 6 - 7. Here the conservation of quantity, length, number, time, and so on develops, involving transitivity, reversibility, and decentration, lasting until around 12, and then, if cultural circumstances are appropriate, the development of formal operational thinking, which essentially involves hypothetico-deductive and experimental reasoning. Before discussing how these stages are related to the understanding of time, I shall set out the essence of the problem of the transition from pre-operational to concrete-operational time as simply as I can.

If we walk from our home down to the shops we pass a series of landmarks on the way, and their order or succession as we pass them is a familiar part of our life. Events, too, like the daily sequence of tasks from getting up in the morning, through the meals and various activities of the day, to going to sleep in the evening, also form a familiar sequence like the landmarks on a journey, and the same is true of the year and cyclical changes in the seasons and their related activities. It is therefore possible to understand process simply by using the time concepts of succession or sequence, and also duration, how long something lasts in relation to something else. A succession of months makes up a year, and a year lasts longer than a month.

It is because succession and duration, which are concepts of time, have direct analogues in our understanding of motion in space, and process in general, that we can call this elementary understanding of time 'spatialized', and speak of both locations

and events, for example, as near or far, long or short, and before and after, or we can talk of people taking 'a Gap Year'. (It is essentially a static mode of representation, as distinct from the mobile system of transformations that typifies the concrete-operational understanding of time.) In the final section I shall go further into the spatial nature of time in the collective representations typical of primitive society, but this spatial concept of time is one that we ourselves, as well as primitive peoples and pre-operational children, often use. For much of ordinary daily life it works perfectly well: someone with a pre-operational grasp of time will understand the following:

more time → more distance
more speed → more distance
more distance → more time

but these only apply when we are thinking about a *single* process, such as a man walking between his home and the market, or the yearly calendar. When we are trying to compare or co-ordinate two different motions, then the concepts of succession and duration are not enough, however.

At this point we have to introduce the idea of *simultaneity*, of two motions taking the same amount of time because they start and stop together, but may cover different distances because they have different speeds. In the case of a single motion, time and space have a simple correlation – the more time you take, the greater the distance you will travel – but when two motions are involved, it has to be understood that *differences* in their *velocity* mean that one thing can take less time to cover the same distance, or to cover more distance in the same time, than the other. Concrete operational time, then, involves the co-ordination of duration, succession, and simultaneity, and means that time can no longer be represented simply in spatial terms.

Piaget's central point about the understanding of time is therefore that it involves the co-ordination of motions in space, and in order to be able to do this it should now be clear why we need to develop a thorough understanding of the mutual relations between distance (S), time (T), and velocity, (V) – that is, speed in a particular direction. So, to discover how far an object has travelled we need to know how much time it took, and how fast it was going. If it travelled for 3 hours at 4 miles per hour, then it must have gone 12 miles: $S=TV$. To know how long something took, we divide the distance by the speed, so that 12 miles at 3 miles per hour takes 4 hours, and at 6 miles per hour takes 2 hours: $T=S/V$. And to know how fast something has gone, we

divide the distance by the time, so to go 12 miles in 3 hours is to go at 4 miles per hour: *V=S/T*.

The pre-operational child, however, has major problems with the co-ordination of these three variables of velocity, time and distance, in particular with the relation between time and velocity, because he supposes that there are simple co-ordinations between *two* variables, not three (as we saw earlier);

(a) If you go more quickly, you necessarily cover more distance (hence velocity is proportional to distance);

(b) If you cover more distance, you take more time to do so (hence distance is proportional to time);

(c) So if you go more quickly you therefore need *more time* to do so.

It is, of course, quite true that the greater the speed, the greater the distance covered, and it is also true that it takes more time to cover a greater distance, and if we were only considering a single object, like a man running along a path, this set of ideas would give the right answer, e.g. 'Will the man go further in two hours than in one hour?'. 'He will go further'. In simple situations like this, then, pre-operational reasoning will work – it is not completely wrong, but is only correct in certain circumstances. So, in the same way, children are aware that living things like people, animals, and trees grow bigger as they get older, and rightly conclude in many cases that tall trees are older than small ones. But this type of reasoning fails when it has to consider two trees like a yew and a *Leylandii*, which have different *growth-rates*, like two cars travelling at different speeds.

Here (c) comes unstuck, because it does not realise that going more quickly not only covers a greater distance than going slowly, but may do so *in the same time as* something else going more slowly, or in less time. So if the pre-operational child is shown two model cars, 1 and 2, start from two points A_1 and A_2 simultaneously, and travel on two parallel tracks towards B_1 and B_2 and then stop at the same instant:

1 A_1 ……..……B_1

2 A_2 ……B_2

he will think that car 1 went on moving longer than car 2 because he associates greater distance with greater time. To understand this problem involves, first of all, a grasp of simultaneity: of course, we can all see if two things happen together, if it starts to rain just as we set off on a walk, or if the sun is setting when we come home, but the

simultaneity of operational time involves two processes and judging when they both start *and stop* in relation to each other, which is essential for understanding the relation between time, speed, and distance. If car 1 goes faster than car 2 it will travel farther than 2 in a given period of time, but someone who is still at the pre-operational level in the understanding of time will think that they could not have stopped simultaneously. This is because to such a person the car that travels the longer distance must have taken a longer time to do so, while travelling a shorter distance must take less time, and they think this because they cannot take account of the different velocities of the two cars, and understand how greater velocity will cover a greater distance *in the same time* (or the same distance in a shorter time). A concrete operational grasp of time understands that the amount of time taken for the journey has to be calculated by dividing the distance covered by the speed at which someone travels. Without grasping this, the notion of time is therefore tied to distance and remains spatialized. This mutual relationship between velocity, time, and distance is a good example of operational thinking, because someone who understands it will also realise that distance covered is the product of the velocity and the time, and that speed is the distance divided by the time – a mobile system of transformations, as I mentioned earlier. In §3 I shall explain why the circumstances of daily life in primitive society do not promote the grasp of concrete-operational time by enough people to be expressed in their societies' collective representations of time.

2. *Gell's critique of Piaget and Hallpike on pre-operational concepts of time.*

Gell begins his book convincingly enough, and in the early chapters provides elegant refutations of the Durkheimian claim that the basic categories of thought derive from social models, and of cultural relativism, although he adds nothing substantially new to what I had said on these topics in 1979. When he comes to the chapters dealing with developmental psychology, however, (Chapter 12, 'Piagetian developmental psychology', and 13, 'Critique of the Piagetian approach'), one is struck by his very superficial reading of *The Child's Conception of Time* and of the relevant chapters in my own book, and the inaccuracy and, to be blunt, the technical ineptitude with which he expounds them. In the first place, he believes that the Piagetian stages of cognitive development are 'not the result of learning and experience', but innate and biologically determined:

> According to Piagetian theory, this cognitive achievement *is not the result of learning or experience* [my emphasis], though naturally the child must be furnished with the necessary observable models of processes taking place, real flasks full of water, and so on, but is the outcome of an endogenously controlled process of mental growth. (ibid., 99-100)

He says of the development of concrete-operations in particular, 'I find it implausible that the necessary ability is morphogenetically pre-programmed in the biology of mental developmental'.(ibid., 105) Again, having discussed Piaget's experiments on the understanding of time, he concludes, 'There is no doubt that Piaget is seeking to delineate cognitive universals of time, and it is implied, though not stated, that all children eventually attain to the operatory stage'. (ibid., 102). As we have seen, however, Piaget's theory of cognitive development is the exact opposite of what Gell claims it to be. Since I discussed this point at some length in my book (FPT, 27-32), and emphasised that Piagetian development is very definitely not based simply on biological maturation, but on *learning* as well, if Gell had actually read and understood these pages one is baffled to explain how he could possibly have reached the interpretation of Piaget that he did.

But having thus set off on entirely the wrong path from the beginning of his enquiry, by assuming that Piaget's stages are all innate, biologically determined, and cross-culturally universal, Gell is then inevitably forced to the next equally false conclusion: that Hallpike must have misunderstood Piaget. 'However', he continues,

> Piaget's work has been read in a very anti-universalist way by Hallpike in his work *The Foundations of Primitive Thought* (1979). Hallpike represents another variant of cultural relativism, not one that contrasts cultures as operating incommensurable, culturally defined 'world-views', but a kind of relativism based on a purported cognitive-development hierarchy. According to Hallpike, the ability to abstract 'time' as a computable aspect of all processes, in terms of duration, succession, and simultaneity, is an aptitude not necessarily possessed by members of pre-technological societies. (Gell 1992:102)

This last sentence is quite correct, but, of course, it is not Hallpike but Gell who has misunderstood Piaget, who certainly agreed that the later stages of cognitive development might be delayed, or not appear at all in the appropriate cultural circumstances. Referring to primitive societies, Piaget said:

> In particular it is quite possible (and it is the impression given by the known ethnographic literature) that in numerous cultures adult thinking does not proceed beyond the level of concrete operations, and does not reach that of propositional [formal] operations, elaborated between 12 and 15 years of age in our culture. (Piaget 1974:309)

Indeed, in an earlier work (1950:260-62) Piaget also said that that concrete operations, too, might not be universal in all societies, and that in primitive societies pre-operational thought might be the norm (Damerow 1996:5). In conformity with Piaget, I simply show, with the appropriate ethnographic evidence, that it is quite possible for many of the collective representations of primitive societies to require no more than pre-operational thinking by the majority of persons, in order to be maintained and transmitted over the generations in a perfectly effective way.

We shall see that Gell's basic criticism of Piaget is that his notion of concrete-operational time is highly specialized and 'pedagogical', and of very limited relevance even to modern industrial life, let alone to the understanding of pre-industrial cultures. But first we must examine what he actually says about Piaget's methods of enquiry. He begins Chapter 12, 'Piagetian developmental psychology', with a brief summary of his stage theory (to which I shall return in a moment), and then gives an account of his celebrated experiment involving water flowing from an upper into a lower flask.

The upper flask, I, is in the form of an inverted pear, (shown the wrong way up in Gell's drawings) and filled with green-coloured water. It is connected by a tap to a second flask, II, beneath it, which is a regular cylinder, but of the same capacity as I. The tap is opened at regular intervals and water flows from I into II so that the level in II rises in regular gradations. The child observing this process is given a cyclostyled drawing of the two flasks at each of these intervals in the experiment, and invited to mark in green pencil where the water level is in I and II at that time. At the end of the experiment the series of marked drawings is shuffled, and the child is asked to put them back in the order in which each one actually occurred. This initially proves impossible, and when the child has finally mastered it, the drawings are cut in two, so that the series of I and II are now separate. Putting these each in their correct orders is even more difficult, while co-seriating them both is only achieved by children as they master concrete-operations.

From what we have said so far about the operational concept of time, it will be fairly obvious that the experiment is set up so that the changing water-levels in I and II produce two simultaneous motions, of different velocities and covering different distances. At the beginning, the level in the inverted, pear-shaped I obviously falls more slowly than the level rises in cylindrical II, then the velocities of the two motions equalise for a while, while finally as I narrows, its level falls more rapidly than the rise

in II. The task of the child is to achieve the co-seriation of the stages of the two velocities, understanding that while they are often different, and travel different distances, they also occur simultaneously, and successfully to co-ordinate time, velocity, and distance.

Gell sets this experiment in the context of what he believes to be Piaget's scheme of general cognitive development. This, according to Gell, involves three stages (ibid., 97-8):

1, the sensori-motor, before the age of 2, when language has not developed and processes cannot therefore be classified at all;

2a, pre-operatory stage I (ages 3-6 approximately) at which events can be ordered in series, recurrent events recognized, and phases distinguished by 'punctual' time indicators;

2b, pre-operatory stage II (ages 7-11) when the child can co-ordinate series, but still fails to conserve duration;

3, the operatory stage (around 12), when the child can co-ordinate series in relation to an abstract duration which is consistently conserved, and also grasp 'reversible' operations, 'which form the basis of the notion of time employed in scientific calculation, physics, etc.'.

Apart from his reference to the sensori-motor stage as lasting until about 2, the rest of this description, as the reader will see, is almost entirely erroneous, quite apart from omitting the stage of formal operations altogether. This begins around 12 in our culture, and is actually when 'the notion of time employed in scientific calculation, physics, etc.' becomes possible. If Gell had attended more closely to what Piaget and his colleagues were doing, he would also have noticed that none of the experiments on time actually involves children at the sensori-motor stage at all, and indeed that none of the subjects is younger than about 5½. And since Gell believes that concrete operations are only attained at about 12, did it also not strike him as odd that none of Piaget's children is older than about 9½ either? To clarify all this confusion, we need to understand that in his experiments, Piaget deals *solely with the transition from pre-operational to concrete operational thinking*, and here he describes three stages of comprehension, Stage I, at which the children cannot seriate at all; Stage II, at which they learn to seriate the levels in the flasks separately; and Stage III, concrete operations, when they can co-seriate the drawings from both flasks. The age at which

this is achieved is roughly around 9 years, not 12 as Gell thinks, and he has clearly confused Piaget's three stages I, II, and III of the *particular* experiments with time with his four *general* stages of cognitive development.

Quite apart from all this, Gell is obviously confused about what concrete-operational thinking itself involves. For example, he thinks that the child who can co-seriate the drawings is still pre-operational, while the child at stage III, concrete-operations, still cannot see that 'only in the latter flask (II) will a fixed relationship be preserved between duration and changes in water level, while in the curvaceous flask [I] the relationship between changes in the water level and time will be variable'. (ibid.,100) If this were so, however, the child could not have attained the stage of concrete operations at all. Again, he says 'the operatory child thinks with abstract models (reversible operations), while the pre-operatory child makes use of concrete models (concrete operations)' (ibid.,102). But by definition, the pre-operatory child *cannot* make use of concrete operations – that is precisely why such children are called 'pre-operatory/pre-operational'. Certainly, the ability to grasp reversibility is one of the key aspects of concrete-operational thought, but the 'abstraction' of reversibility is not the same as that of *formal* operations, with which *concrete* operations are contrasted in Piaget's scheme of development.

It seems, then, that Gell has only the haziest idea of what Piaget is talking about, and this impression is confirmed by further detailed analyses that Gell makes of some of Piaget's empirical results. Let us begin with a short interview which Gell holds up as an example of 'the deficiencies of the Piagetian experimental procedure':

Experimenter: 'How long does it take you to get home from school?'
Lin (Aged 6;4) 'Ten minutes.'
Experimenter: 'And if you were to run, would you be getting home more quickly or more slowly?'
Lin: 'More quickly.'
Experimenter: 'So it would take you longer or not?'
Lin: 'Longer.'
Experimenter: 'How much?'
Lin: 'Ten minutes.'
(Piaget 1970:37, cited in Gell 1992:113)

Before we consider Gell's own interpretation of this interview, we need to note that it is one of many illustrations of the point we were discussing earlier: that pre-operational children think that greater speed = greater distance = greater time, which is why, if Lin were to run home from school, he would take ten minutes longer than if he

walked. Gell, however, does not understand any of this, and thinks he has found a transparent absurdity for which he can provide a far superior explanation:

> [Lin's] last two answers are so extravagantly wayward that they invite a second look. Why does Lin commit himself to saying that if he ran home from school it would take him the same amount of time (ten minutes) as if he walked (contradiction 1)? [Gell has misread the answer. Lin is asked *how much* longer, and replies 'ten minutes', meaning ten minutes longer than if he walked, not ten minutes in total.]…and then that it would actually take him *longer* to get home if he went more quickly (contradiction 2)? We cannot explain these responses by invoking an explanation in terms of inadequate conservation; what we appear to be faced with is a contradiction in logic; or we must suppose he is answering at random. (Gell 1992:114)

In so far as 'inadequate conservation' includes the fact that the child does not understand the *inverse* ratio here between speed and duration, then this is precisely what we should invoke, but Gell's failure to understand what Piaget is talking about leads him off in a strange direction of his own imagination. 'Let us note', he says,

> one extremely important fact, which is not stressed in the original account: namely, that the experimenter has invited Lin to consider a hypothetical case – what would be the case in a 'possible world' in which Lin runs home from school. This is a course of action he would doubtless not dream of taking in this (actual) world, since in this (actual) world all six-year-old boys dawdle on the way home from school. [Where does Gell get this peculiar idea from?] In other words, Lin and the experimenter are discussing a counterfactual conditional, what would be the case in another world than this one, one in which Lin is obliged to run home from school. Herein lies the key to what Lin says.(ibid., 114)

If Gell had turned over the page in Piaget's book, he would have found a similar 'counterfactual' suggestion, where the experimenter asks another child, Chap (7;4), 'How long does it take you to go home?' 'One hour.' 'And if you are in a hurry?' 'I go more quickly.' 'Does that take more or less time?' 'More time.' 'Why?' 'Because.' (Piaget 1970:38) It is obvious from this exchange that the idea of hurrying home from school is perfectly normal to the children, and requires no bizarre hypotheses about counterfactual, Alice-Through-The-Looking-Glass worlds where we have to run to stay in the same place. Let us return to Gell:

> Lin is being quite reasonable in his replies, given that they relate to another world, which he can imagine, in which it would be necessary for him to run in order to get home in ten minutes. The experimenter, meanwhile, thinks (incorrectly) that Lin and he are all the while talking about this (actual) world. (Gell 1992: 114)

While Lin and the experimenter both agree that in the actual world it takes Lin ten minutes to get home at his normal pace, the experimenter is also thinking about

> …a closely related, geometrically identical counterfactual world in which this journey time is reduced because Lin speeds up (he runs). Lin has defined the counterfactual world he is talking about differently. He is thinking of a counterfactual world with a different geometry, in which, *even if he runs*, it takes him ten minutes to get home…In the counterfactual world

> which he (Lin), but not the experimenter, has in mind, Lin is perfectly correct in asserting that he would get home quicker (at a quicker pace) than in the actual one, because he would be running, not walking. But the journey would 'typically' take longer, because it would be a longer journey, further to go, and typically taking more time, *because small boys do not always hurry on the way home*.[my emphasis] But this 'longer' journey would still take 'ten minutes' because that would be the journey time Lin was aiming to keep to. (ibid., 114-15)

Since, in Lin's 'counterfactual' world, he has admitted to *running* home, it is not clear why the traditional dawdling of small boys on the way home still has any relevance. As we saw, there is also no suggestion in the interview that Lin actually feels *obliged* to keep to any particular time, nor does Lin think that by running he will still only take ten minutes to get home. In view of these basic misconceptions, it is not surprising that Gell's exposition of Lin's answer is quite incoherent, yet he concludes, with great assurance, that

> It is the experimenter, not Lin, who is the naïve one. The experimenter has failed to notice the shift in implicit world-context introduced by the hypothetical 'if'. Lin picks up on this and elaborates an entirely coherent counterfactual world. The dialogue reveals little about 'co-ordinations of motions and velocities' and everything about the deficiencies of the Piagetian experimental procedure. (ibid., 115)

There is, of course, no evidence that Lin is invoking any sort of counterfactual world in response to the experimenter's questions, but this use of supposed counterfactual worlds to evade Piagetian evidence obviously appeals to Gell, for he uses the notion to reinterpret 'a misleading impression' of some of his fieldwork information from the Umeda which I quoted in FPT (351). This, he says, 'clearly bears analogies to the kinds of statements made by Piaget's "pre-operational" children, though Hallpike forbears to say so specifically'. (Gell 1992:115) The passage from his book *Metamorphosis of the Cassowaries* (1975) that I quoted, and which Gell repeats, is as follows:

> …when walking between two villages with a youth, I remarked to him on the rather leisurely pace we were keeping, suggesting that we might not arrive before dark. He (knowing perfectly well that there was no danger of this, as it proved) assured me that if we were to walk fast, the sun would go down correspondingly quickly, whereas if we stuck to our leisurely pace, the sun would do likewise. In short, lunar or other astronomical indices of time were not considered to be more accurately or rigidly determined [*sic*: 'rigidly or accurately determinate' Gell 1975:163] than any other events, a yardstick against which they could be measured, but simply on a par with human activities, the seasonal cycle, biological processes, the weather, etc., all of which hang together in an unanalysed way, but none of which was seen as the prime mover of all the rest. (Gell 1975: 163)

I 'forbore' to relate this specifically to Piaget's material, because I was at that point giving examples of how in primitive life it is very difficult, because so many aspects of

experience 'hang together in an unanalysed way', to develop clear collective representations of time measurement. Gell, however, continues as follows:

> While I stand by my original comments, I no longer think my informant's statement regarding the movements of the sun are evidence of their being true in quite the way I supposed. What my informant was really saying was that *if* (counterfactually, and transparently so to him, but not to me) there were a possible world in which it was necessary to hurry in order to get from village A to village B, *that would be* a world in which the sun moved much more quickly through the sky than it does here. Perfectly logical on his part: what he was trying to do was to straighten out in my mind certain properties of this actual world – a problem with which anthropologists' informants must wrestle eternally and often in vain – by pointing to the properties possessed by a non-actual world. (Gell 1992:116)

Gell actually has no more evidence here of a tacit appeal to a counterfactual world by his informant, than he did of a similar appeal by Lin, and none of my informants during my years of field-work ever referred to any counterfactual worlds. But by juxtaposing the material about Lin's interview with this very interesting piece of ethnography, he has brought out something that I should have noticed myself when I first read it. I suggest that what his informant was really saying can probably be explained most easily when we remember that pre-operational subjects assume that going quicker takes more time – that the clock goes faster, or that the sun sets quicker, in this case.

As I point out in my book, there is very little in the way of cross-cultural testing of Piaget's work on time, but there is an excellent piece of work by Magali Bovet (1975) on time conservation by non-literate Algerian peasants, which I describe in FPT (378-83). Bovet shows that indeed these peasants tend to find conservation of time difficult or impossible, but Gell tries to explain these results away, and his comments on one of Bovet's experiments will by now have a familiar ring:

> Two model cars are set to race one another following parallel courses round a circular track. They both leave the starting line and recross the same line to finish at the same moment. Bovet's Algerians tended to say 'incorrectly' that both cars travelled at an identical speed, ignoring the fact that the car on the outer track had further to go and hence had to travel faster in order to arrive at the finish line at the same moment as the car on the shorter track. But what it seems to me that the subjects are really saying is simply that the race, as a race, is a dead heat. If a track athlete gets boxed in and has to run very wide, consequently losing the race to another runner who has run a shorter distance and marginally slower, this is of no account in the awarding of gold medals. In the race-context, as opposed to the intended context of the experiment, the Algerian respondents are perfectly justified in what they say. What we encounter here is not a difference in mentalities, but in the cultural/symbolic context within which identical experimental materials are interpreted. (Gell 1992:113)

Gell's counterfactual world of track athletes competing in the stadium and getting gold medals even if they have run a marginally shorter distance is, however, as remote as the two cars experiment from the actual experience of these impoverished Algerians and their restricted way of life that Bovet actually describes (1975:19-23). We have no reason to suppose they have ever seen athletes competing in a stadium, or have any conception of the 'race context' which Gell casually ascribes to them, and it could therefore have no bearing on their response to the experiment. Gell continues:

> What emerges from Bovet's work is the immense difficulty his [actually her] subjects had in understanding the nature of the problems presented to them. Once having done so, they often had little difficulty in providing the answers, which were perforce more or less handed to them on a plate in the course of the laborious initial explanations. (Gell 1992:113)

It is certainly true that the subjects did find the problems very difficult to understand, but it is wholly untrue to say that they had 'little difficulty' in providing the answers. In fact, many of them had to struggle very hard or failed, not least because they had considerable problems in conserving length. Gell concludes from the fact that Bovet had to go into great detail to explain the problems to her subjects:

> That these [explanations] should have been so necessary in Algeria, while they are apparently much less necessary when the same experiments are carried out in Geneva, is all the evidence one needs to support the conclusion that it is the pedagogical milieu which is the real influence determining the outcome of Piagetian testing procedures, rather than a biological process determining the morphogenesis of general intelligence. (ibid.,113)

The rather more obvious and straightforward conclusion is that it is the differences in culture and general life-experiences between subjects in Geneva and those in the poorest and most illiterate parts of Algeria that are responsible for the outcomes of these Piagetian tests.

But thinking that he has nothing to learn from Piaget, Gell prefers to base much of the rest of his book on a discussion of two sorts of time, 'A-series' and 'B-series', derived from the philosopher McTaggart:

> We categorize events according to their being at any one time past, present, or future events. All events are one of these, but not unchangingly, since any event which has occurred, has been a future event up to the time of its occurrence, a present event as it occurs, and a past event thereafter. This differentiation among events according to criteria of pastness, presentness, and futurity McTaggart calls the A-series.
>
> We also categorize events temporally according to whether they occur before or after one another. Events do not change with respect to this criterion in the way that they do with respect to the criterion of pastness, presentness and futurity. This before/after series McTaggart calls the B-series. (Gell 1992:151)

The A-series is therefore about transition and change, whereas the B-series 'is just a row of events strung together, like the beads on a necklace' (ibid., 151), and the basic question is apparently whether the A-series or the B-series is the more fundamental: 'Is time based on the passage of events out of the future, into the present, and out again into the recesses of the past, or is time an unchanging relation of beforeness/afterness holding between dateable events, as in the B-series?'(ibid., 153) Gell emphasises that

> the A-series/B-series distinction is not only of parochial philosophical interest, but can be seen to have ramifications extending throughout the human sciences, including under that heading economics, sociology, psychology, geography, etc., as well as anthropology. Very roughly, A-series temporal considerations apply in the human sciences because agents are always embedded in a context of situation about whose nature and evolution they entertain moment-to-moment beliefs, whereas B-series temporal considerations also apply because agents build up temporal 'maps' of their world and its penumbra of possible worlds whose B-series characteristics reflect the genuinely B-series layout of the universe itself. (ibid., 154)

As a generalisation about the different ways in which we think about time, the last sentence seems, underneath the obscure phraseology, true enough, and I shall have more to say about the collective representations of time in a moment. But clothing his ideas in the philosophical jargon of A-series and B-series time does not do anything to make what Gell says new or challenging but only makes the concept of time a good deal harder to grasp. Anyone familiar with Piaget can see at once that all this philosophical self-mystification has come about because A and B-series times are trying to treat possible representations of *succession* in isolation from the other aspects of time, and the co-ordination of motions in space.

Piaget makes it clear, from the beginning of his book (and which I also quote in my own chapter on time in FPT), that time is not some isolated, abstract category of thought, but part of the structure of the universe, and of its processes that involve us:

> It is only once it has been constructed, that [operational] time can be conceived as an independent system, and even then, only when small velocities are involved. In the course of its construction, time remains a simple dimension inseparable from space and part and parcel of that total co-ordination which enables us to correlate the kinetic transformations of the universe. (Piaget 1970:2)

Since operational time inherently involves the correlations of motions at different velocities – or processes – time inherently involves change (A-series time), and change inherently involves succession, or the relations of before and after (B-series time). In other words, A-series and B-series time are both already accounted for in Piaget's

treatment of time. Gell's introduction of them here adds nothing to the discussion, and only serves to obscure it.

3. *Primitive societies and pre-operational time.*

Gell's basic position, therefore, unlike that of Jahoda, is that the Piagetian notion of concrete-operational time is of no relevance to ordinary life in the modern world, let alone in that of primitive society, because it is narrowly scientific and pedagogical in its scope. Having pointed out that a significant proportion of American physics undergraduates still think in pre-Galilean terms about problems in dynamics, he continues:

> For these reasons it is not possible to draw a firm dividing line between 'primitive' and 'modern' society with respects to concepts of time. The most one can say is that in certain societies technical advances have been made in the development of computational procedures requiring the introduction of a notion of homogeneous duration used in technical contexts. (Gell 1992:106-7)

Apart from such very restricted uses of operational, homogeneous time, he insists that in all societies

> …the more general purposes of social co-ordination continue to be served by a body of symbolic knowledge dealing with the entirely non-homogeneous, process-linked, time-reckoning concepts used in daily life. In this respect there is no difference in the general level reached by different societies… (ibid., 107)

I have always stressed that we, as well as primitives, can operate quite easily with the 'non-homogeneous, process-linked, time-reckoning concepts' of pre-operational thought. To me, one of the most disconcerting aspects of my own field-work among the Tauade was their lack of time-reckoning and any system of months or years, so that, since their number system was confined to single, pair, and many, there was no way of asking how long ago anything had happened. The only time co-ordinations available were those based on particular events, such as 'When my grandfather planted that pandanus tree', or those relating to European influence, such as 'When the missionaries first came to Kerau'. Despite the lack of time-reckoning among the Tauade, however, I was still able to communicate with them about the timing of activities, because we shared a common pre-operational grasp of time as a succession of events, as I said at the beginning of this paper. While they had no words for week, month, or year, they still had a word that can be translated as 'time', *lova*: *oilova*, 'this time', 'now'; *telova*? 'What time, when?'; *opolovan*, 'olden time'. But what they

really meant by *lova* was merely 'sequence of events', and *oilova* would more accurately be translated as 'this sequence of events', i.e. the sequence of events in which the speakers are presently involved. So when someone asked me '*telova* will you go to Port Moresby?', 'in what sequence of events will you go to Port Moresby?', I could reply 'after the plane has brought my letters to the mission', and what I said would be immediately understood.

Time conceived as sequence of events, as process, is therefore a practical means of social co-ordination in any type of society, and I agree with Gell that it is not necessary, even in our society, to have an operational concept of time in order to get to work punctually, or, no doubt, to boil an egg before setting out:

> No 'co-ordinations of motions with different velocities' fill the buses and trains with commuters during the morning and evening rush hours, and decant them at other hours into their work places, homes, and places of entertainment. These mass movements are not produced by individuals co-ordinating their activities on their own behalf, but simply by individuals following a socially established schedule. (ibid., 108)

The ordinary commuter needs only look at the departure board at a railway station to discover when his train will leave by the station clock, and from what platform, which are not very challenging intellectual exercises, and have nothing to do with concrete-operations. Gell therefore concludes that 'Homogeneous duration, outside the technical or laboratory context, is a myth' (ibid., 108). But he conveniently forgets that those train-timetables, those 'socially established schedules', so easy to follow on the platform, have to be designed in the first place by individuals with a very clear grasp of concrete operational time, who know all about the 'co-ordinations of motions with different velocities' of express trains, and commuter trains, and goods trains moving along different tracks at different speeds, and for whom 'homogeneous time' is certainly not a myth. While the passengers may go to sleep on the train, the engine drivers and signalmen do not consider homogeneous time a myth either, since they are also very busy co-ordinating motions with different velocities.

Again, Gell concedes that clocks measure homogeneous time, but while

> In one conceptual frame the sixty minutes between the hours of 3 and 4 pm are the same as the sixty minutes between 8 and 9 am, but symbolically, in terms of…the 'socio-temporal order', these two durations of sixty minutes are entirely incommensurable… (ibid., 108)

Tell that to a trade-unionist, who knows perfectly well that in terms of hourly pay, homogeneous time, the two different durations of sixty minutes are worth exactly the same. The trade-unionist also knows that an hour's overtime lasts exactly as *long* as an

hour of normal work: the only difference is that the *rate* of pay is higher. In other words, as soon as we enter the world of work in a modern society, one can see that in fact the concept of homogeneous, operational time is a pervasive aspect of our technology and social organization. One can only express astonishment that an anthropologist such as Gell, who has done fieldwork in Papua New Guinea with a people, the Umeda, who like many others in that culture-area have no calendar or other forms of time-reckoning, should claim that there is no difference between societies in the general level of time-reckoning concepts they use in daily life.

There is every reason why people in our society, constantly moving about by many different modes of transport, at a great variety of speeds, should both need and be adept in the use of concrete-operational time. They also have the use of a variety of quantified information, and measuring devices for making the necessary calculations, which were vastly less developed in the pre-modern world, and which in primitive societies do not exist at all. The idea of quantifying the *measurement of speed*, in particular, is historically quite a recent development, probably beginning in the sixteenth century with the casting of the ship's log and timing the passage of the knots in the line with a sand-glass.

In the far simpler technological and organizational environment of primitive society, by contrast, it is possible to rely on pre-operational concepts entirely, and only in a few cases will concrete-operational concepts of time be developed. In primitive societies, people are primarily aware of time through the processes of their ordinary life, and collective representations of time-reckoning are predominantly spatialized, that is, tied to sequences of events, while speed as such is irrelevant. One cannot compare the speeds of different sequences in relation to a common standard of time – chronologically - and the only thing that matters is the *order* in which events occur and their relative position to one another, so that they are like the static landmarks on a journey or a path. The series ABCDEFGHIJ could equally well stand for a path with landmarks or for a sequence of events, and what is important are things like *order* (A before D before H); *inclusion* (B between A and C); and *proximity* (H next to I and G, but not J or F). So J and A are far from E, while C and G are near, but there is no way of measuring how near or far independently of the series itself, since distance or length of time can only be specified in terms of the number of intervening elements in a sequence. This kind of space is called 'topological' space, and it provides a very good

model of primitive concepts of time as well, in which all the emphasis is on time as a sequence of events.

One of the major reasons that primitive time is essentially topological and dominated by succession is that it is basically qualitative, not quantitative and based on clocks and precise dates. That is, specific events are located only in relation to other events, e.g.: 'That village had not yet moved when my youngest son was born', or 'The Government came after I had been circumcised, but before I married'. Time *intervals* are also incommensurable with one another:

> For the Tiv time is divided by natural and social events into different sorts of periods, but since the events often belong to different logical series there is little attempt to correlate the different sorts of division of time. Tiv make no attempt to correlate moons with markets or either with agricultural activities or seasons. If one asks how many moons there are in a year, the answer varies between ten and eighteen; if one asks the number of markets in a moon, the answer varies between three and eighteen, and of the number of days in a moon, between ten and fifty. (Bohannan 1953:257)

So sequences of standard events do not form quantifiable series like the hours of a 24-hour clock: one cannot say that three twilights equal one morning, or that from first light to the going out into the fields is the same amount of time as from the coming back of the cattle until supper time. The same is true of divisions of the year, even if they are expressed in named months:

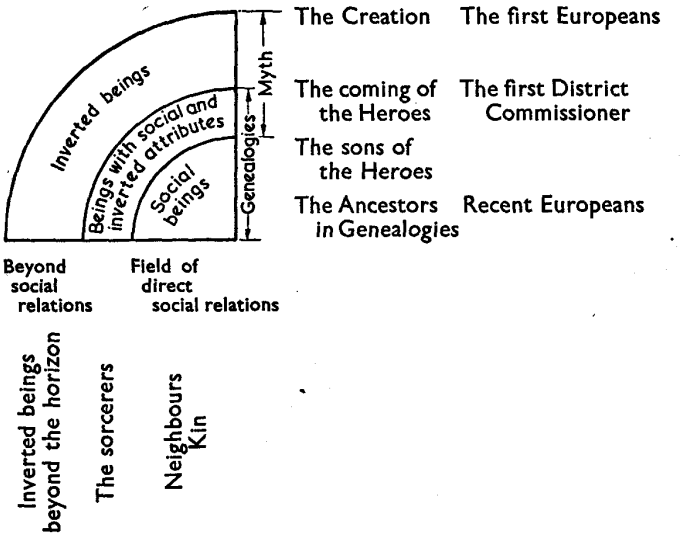
> [The Nuer] have very limited means of reckoning the relative duration of periods of time intervening between events, since they have few, and not well-defined or systematized, units of time. . . It is true that the year is divided into twelve units, but Nuer do not reckon in them as fractions of a unit. They may be able to state in what month occurred, but it is with great difficulty that they reckon the relations between events in abstract numerical symbols. They think much more easily in terms of activities and in terms of successions of activities and in terms of social structure and of structural differences than in pure units of time. (Evans-Pritchard 1940:103-4)

The time concepts of the Iraqw of Tanzania, for example, are basically topological. While they have words for years, months, and days, they only use these sequentially, not chronologically:

> They do not, however, use these standards of measurement comparatively to produce a general concept of uniform time, a chronology, that is, against which all events may be compared. Years, months, days, and hours are partitions of the flow of time, and in the way we use the term here, are topological. The creation of a uniform (e.g.Euclidean) space or a uniform time standard (e.g. a chronology) requires a logical act that the Iraqw do not perform. (Thornton 1980:171).

This spatialized conception of time occurs very widely, as among the Lugbara of Uganda, where ‘a man, his family and his lineage are in the centre of a field of social relations, which extends both in space and time’. (Middleton 1960:230)

Fig. 1



(from Middleton 1960:238)

Greater remoteness in time is comparable to greater geographical remoteness, and remoteness in both cases is correlated with strangeness, whether of the pre-human culture heroes, or alien monsters, as in Fig.1.Given such basic assumptions about space and time, it is easy to understand how some African peoples, for example, can say that vultures fly so high that they can see the future.

There are occasions, however, when a concrete-operational grasp of time would be relevant. The Konso, for example, have a luni-solar calendar, whose year of 12 months is necessarily 11 days shorter than the solar year of 365¼ days. This means that every 3 years or so, their calendar advances about a month on the solar year, but during my field-work the cycles of the lunar and solar years appeared to be properly synchronized. But while they themselves said that the months had always fallen in around the same seasons every year, this would have been impossible without some periodic correction. I was, however, originally unable to discover how they achieved this correction, and when I explained the problem to them they did not understand what I was talking about. Later, the solution to their calendar problem in fact turned out to be the familiar device of repeating a month if the dry season has not come to an end in the expected month.

But this in itself presents a further problem: if the solution is so simple why could no one explain it to me at the time of my first fieldwork? I think the answer is that I presented the problem to them in a way that they found incomprehensible. I had assumed that they had mental models of the lunar and solar cycles as distinct entities, 'revolving' at different speeds, and that they would have noticed over the years that the lunar cycle had a basic tendency to advance. But such an assumption in the case of non-literate peoples is quite unwarranted, as Leach (1954a:118) has pointed out. The Konso are quite unaware of what I conceptualised as two cycles, moving at different speeds, and are merely concerned that the rains should come by the beginning of a particular month, and if they do not do so, simply repeat the month that has just passed. (Hallpike 2008a:235-38) They are able to solve a problem in the correlation of two motions by the simple pre-operational technique of adding a month, which does not need any understanding of two cycles moving at different speeds.

Gregory Forth, on the other hand, in his study of time concepts of the Rindi in eastern Sumba, provides a good example of what does seem a genuine example of a concrete-operational grasp of time in a primitive society. The Rindi have institutional horse-racing on a circular track, and this involves a system of handicaps for horses of different sizes – and therefore speeds. In this system, the larger horses have to run farther than smaller horses, and therefore start at different points around the track, the largest ones in fact going almost twice as far as the smallest. While the race does not end at the same instant, because all the horses start simultaneously this handicapping arrangement, as he says, 'evidently entails the realization that larger horses will be able to run faster, and, more importantly in the present context, that within the same period of time, faster (i.e. larger) horses will be able to cover a greater distance', so that 'in the eastern Sumbanese horse race "distance covered" or "work done" appears indeed to be dissociated from "time elapsed" '. (Forth 1982:245) He does not claim that this is the dominant mode of time-reckoning in their society, but it is a good illustration of how familiarity with particular activities may involve the development of concrete–operational thinking. In other respects, however, he records that Rindi collective representations of time generally conform to the spatialized time typical of primitive society.

To sum up, then, because in primitive society time is generally represented in topological terms of different sequences of unquantified events, and of social

structures such as generations or age-sets, time is not therefore understood as a distinct dimension of measurement, and is conceptually hard to distinguish from the social and natural processes of ordinary life. And in a world of technological and organizational simplicity, without the need to co-ordinate different motions and velocities, only in exceptional circumstances will there be either the opportunities or the means to develop concrete-operational concepts of time. We can now see why it is therefore quite feasible for pre-operational thinking to form the conceptual basis for the collective representations of time in the milieu of primitive society, and Jahoda's claim that this is intrinsically impossible is definitively refuted by the ethnographic evidence.

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This paper is also pp.328-351 in C.R.Hallpike's latest book *On Primitive Society, and Other Forbidden Topics,* published by AuthorHouse, which can easily be ordered on line. Please click on the link below:

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