In the Midnight Hour:

Systems Theory and Dreaming

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The thesis begins with an examination of current problems in the nature and application of scientific method. Particular difficulties are encountered when dealing with experiences whose only criterion of existence are verbal reports and in those circumstances in which a complex array of variables are interacting to produce the observed events. Both of these difficulties are paramount in the study of dreams. It is suggested that Systems Theory offers an alternative and more fruitful method of investigating dreams in comparison to traditional scientific method.

Systems thinking provides the use of a substantive methodology for approaching the field of enquiry and a set of concepts for aiding the development of theory in that field.

Systems theory has been used to this effect as a critical tool in the appraisal of existing work in the psychology of dreaming. Dreaming itself has been construed as the outcome of a hierarchically organised multilevelled network of interconnecting processes which requires for its understanding a network of interconnecting models each focusing at different 'levels of resolution' and addressing limited domains of dream experience. This hierarchical process it is postulated can be found reflected in an hierarchy present in dream content - Dream; Scene; Recurrent images and Unique images. The hierarchical scheme is extended to include issues concerning the social construction and meaning of dreams(recall, interpretation etc). Several experiments exploring these ideas are reported and discussed with tentative suggestions offered as to how the set of processes operating at the different levels combine into a dynamic interplay.

In The Midnight Hour

Systems Theory and Dreaming

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With deepest love

For Jo

and for Merry

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PART ONE

Questions of Method

The success of science is not based upon rules of induction, but depends upon luck, ingenuity, and the purely deductive rules of critical argument.

Karl Popper

Logic does not apply to the real world.

Marvin Minsky

This lateral extension of abstract components of description is called abduction...Metaphor, dream, parable, allegory, the whole of art, the whole of science..all these are instances or aggregates of instances of abduction.

Gregory Bateson

Introduction

Many people believe the values of objectivity espoused within science are on a collision course with the inherently subjective aspects of human experience. Some like Laing(1982) see the current situation as a profoundly disturbing one. One need not follow this pessimism too far. An evolving philosophy seeking to connect the nature of scientific theory and method with our natures as human beings is becoming more apparent. Nowhere can this be seen more strongly than in those discussions centering on the implications of the New Physics(see for example Capra 1983a, 1983b, Davies 1984, Zukav 1984). What is particularly striking about these discussions is the consensus which physicists are reaching on the important role played by human conscious observers in the shaping of the physical world at both the macroscopic and microscopic physical levels. Crudely speaking there are very strong theoretical grounds for human consciousness being made implicit in any level of description of the physical world. The strangeness of the situation resides in the fact that physicists, having long since abandoned a purely reductionist approach to their work, and now increasingly drawn toward human consciouness as an holisitic concept witness their scientific counterparts in psychology busily trying to reduce consciousness to

some more fundamental level of description.

But in what way do developments in physics pertain to the application of scientific methods to understanding dreams? The answer to this question requires an examination of precisely what is meant by scientific method, the concepts of logic which lie at its heart and what it is that constitutes legitimate scientific activity.

The discussion within the following pages, it is hoped, will not only provide us with some answers to these questions but will also raise a dozen more, and in so doing, equip us with the necessary tools for embarking upon a project of establishing a radically new framework for dream psychology.

CHAPTER ONE: THE LOGIC OF SCIENCE

The Nature of Scientific Activity

According to Karl Popper(1957, 1963) what distinguishes science from pseudoscience or metaphysics is the criterion of falsifiability. Scientific statements are those which are in principle open to refutation, either by observation, experiment or apriori on grounds of logic alone. The crucial observations or experiments which will form the test of a particular theory are to be derived from the theory by the rules of deductive logic. Other attempts have been made to arrive at a coherent philosophy of science(e.g Kuhn 1962) but these have in the main either been subsumed within Popper's schema or else abandoned as inadequate. Given the widespread acceptance of Popper's views my comments upon orthodox scientific method will be focused on these. Popper does assert that because a theory may not be scientific it is not rendered "thereby unimportant , insignificant or meaningless(1963, p.38)". In fact it is logically demonstrable that the historical antecedents of any scientific theory(if it is traced back sufficiently far) will be ideas of just this quality. Therefore currently mythological or pre-scientific ideas may very well embody 'truths' which will eventually form a part of a later developed theory

which is testable. However rather than dwell too much

upon how Popper derived his ideas I intend to devote the

space which follows to a consideration of the weaknesses

in the falsifiability argument and the implications that

such weaknesses have for a psychology which is devoted

to deepening our understanding of dreams predominantly

by methods which adhere to this notion.

I

Popper elected to omit existential statements from

the class of statements considered to be scientific. In

some areas of psychology this would cause few problems.

However when we are deaing with dreams, a situation in

which as Malcolm(1959) pointed out there are no other

criterion that one has dreamt other than an existential

type statement, considerable difficulties arise. One

may hesitate for a moment and disagree, citing as

evidence that such a criterion does exist, the

correlation between REM sleep and dreaming. For the

time being I must emphasise that REM sleep is not a

criterion of dreaming. This argument will be dealt with

more fully when discussing physiological theories of

dreams later in the thesis(chapter 4), although for the

moment it will be stated that to cite REM sleep as a

criterion of dreaming is a conceptual error, deriving

from the confounding of one class of potentially

observable sequential events(the neurophysiological and

chemical processes)associated with REM sleep with a quality of experience, the dream, which belongs to an entirely different conceptual category(Roberts 1985). Ryle might call this a category error, Bateson one of logical typing. If we are to have a scientific theory of dreams it must be founded upon statements of precisely that character which Popper wishes to exclude. Some philosophers have got themselves into a muddle trying to sidestep this issue. Consider the following remarks of Malcolm;

> I do not understand what the first statement('Dreaming is a real experience') could mean other than that people really do have dreams-which is undeniable(1959 p.58).

> ..an error that philosophers, psychologists, physiologists and everyone who reflects on the nature of dreaming tends to commit(is that of)..supposing that a dream must have a definite location and duration in physical time(1959 p.75 brackets mine).

Malcolm appears to be unable to deny that we do indeed dream, but that in his opinion it makes no sense to assert that dreams last for a particular duration and begin and end at moments in time. It is true that we have no observable objective criterion to measure this with. Neither however do we have anything with which to observe and measure the durations of the events which we remember. It is clearly absurd to say that it makes no sense to speak of the events we ordinarily recall, as having no original duration in time. Yet the evidence

is no different than for the case concerning dreams.

For somewhat different reasons Dennet(1981) also seeks to oppose the view that dreams are experiences which occur during sleep. Dennet formulates a hypothetical process whereby "it is not like anything to dream although it is like something to have dreamt"(p.138). Dennet's model more properly belongs amongst the class of information-processing models which I will be considering later. At this point we shall merely note that philosophers seem to have difficulty in conceptualising dreams as experiences which occur during sleep, and that the subsequent reports of these experiences may form the basis of a suitably scientific theory. The psychology of memory has interestingly never been hindered by the fact that memories may be derived from experiences which people have.

Hofstadter(1980) makes the pertinent point that axioms in any schema define the meanings in the system of deductions to which they are axiomatic. For example the meaning of a 'straight line' is quite different in Euclidean geometry than it is in any of the various non-Euclidean geometries which abound. If an axiom is really to be found wanting then this will eventually show itself in the limited fruitfulness of the propositions to which it gives rise. If the hypotheses generated by a particular axiom are all immediately

falsified then we may have good grounds for abandoning it. As the proposal that dreams are experiences which occur to people during sleep has yet to be shown to be inadequate we are justified in continuing with it.

II

The issue of the logical derivation of postulates from a limited number of axioms or hypotheses brings us to the question of when exactly do we decide to abandon our premises and with it change the line of enquiry when we are using a particular theory? There are two answers one can give to this.

a. We may be forced to abandon a cherished belief when it gives rise to predictions which when tested for, produce results which are incompatible with that belief. This is in essence the hypothetico-deductive method. This certainly conforms a great deal with the manner in which scientific theories have been advanced and developed.

b. However the dissatisfactions with Popper's view centre on what we do when we do abandon a particular theory(O'Hear 1985). Faced with such a position Popper tells us we generate conjectures about what a more satisfactory theory is. We 'jump to conclusions'(1963, p.53). In trying to ward off the potential criticisms of those who still believe that science proceeds by induction, Popper raises the issue of how it is we jump

from the falsifying statement to the new theory. His answer is that we first jump to any theory and then begin testing this to find out whether it is any good. This however simply begs the question. We are given no idea as to how we can jump even to any theory. Popper's only answer to this, as is contained in the opening quote to this chapter is that we resort to luck and/or ingenuity. This is by no means untrue but it is surely an admission that the falsifiability criterion is not the last word on how scientists develop knowledge. Chalmers(1983) goes as far as to refute this very conjecture. He notes numerous prominent historical examples in which observations accepted at the time and which were inconsistent with the theory nevertheless did not lead to the rejection of that theory.

> In the early years of its life, Newton's gravitational theory was falsified by observations of the moon's orbit. It took almost fifty years to deflect this falsification onto causes other than Newton's theory. Later in its life, the same theory was known to be inconsistent with the details of the orbit of the planet Mercury, although scientists did not abandon the theory for that reason. It turned out that it never was possible to explain away this falsification in a way that protected Newton's theory(1983 p.66).

Does this mean therefore that we should accept that science does proceed by induction? There has been no end of criticism levelled against the induction theory. Not least by Popper himself. We may not be able to

logically prove anything by induction but there is no
doubt that it has been used by scientists for millenia,
and that without it there would probably be no science.
Popper(1963) claimed to have solved the philosophical
problem of induction. Ayer(1973) however points out
that that it is an inductive step to assume as Popper
does, that a theory which has passed a severe test is a
better guide to the future than one which has passed
only a modest test. An interesting problem! Hofstadter
as usual contributes some clear and stimulating thought
on this topic.

> (deductive awareness)..misses something of the
> human ability to spot similarites and compare
> situations-it misses what might be called
> analogical awareness-a crucial side of human
> intelligence. This is not to say that
> analogical thought processes cannot be forced
> into such a mold but that they do not lend
> themselves naturally to being captured in that
> kind of formalism(Hofstadter 1980 p.619).

What Hofstadter is saying is that when faced with
insurmountable difficulties from the perspective of a
particular theory or system we literally jump out of the
terms of reference of that theory; and furthermore this
activity necessary for the evolution of knowledge cannot
be captured in any known formal system of logic.

III

The conclusion that classical logic does not reflect
the nature of reality has also come from somewhat
different quarters. Just as human thought and

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intelligence has been found to operate outside of the restrictions of formal logic, so to have physicists been forced into the realisation that the rules of experience and symbols follow different pathways. Birkhoff and von Neuman(1936) constructed a logical proof that experience violates the laws of classical logic. This proof dependent upon the properties of polarised light need not concern us here(for those interested a simplified version of this proof is contained in Zukav(1984, p.295). Their work has given rise to the new discipline of quantum logic. This new logical calculus does not focus on independent objects but upon patterns of action and upon relationships between events. In short it focuses upon processes, and in so doing it attempts to describe some of the rules which experience follows.

> A language which alludes to experience but does not attempt to replace it or to mould our perception of it is the true language of physics. This is because not only the language that we use to communicate our daily experience, but also mathematics, follows a certain set of rules (classical logic). Experience itself is not bound by these rules. Experience follows a much more permissive set of rules (quantum logic)(Zukav 1984 p.277).

Compare this with Laing(1967, p.16);

> Only experience is evident. Experience is the only evidence. Psychology is the logos of experience. Psychology is the structure of the evidence, and hence psychology is the science of sciences.

It could well be that future development of this

calculus will resolve the issue strongly debated by

Searle(1980) and others(see the issue of Behavioural and

Brain Sciences, 3(3) and also Hofstadter and Dennet 1981

pp 373-382) that the instantiation of a formal computer

program, by itself will never be sufficient for

intentionality to be ascribed to it. Searle's main

point is(if I am correct in interpreting it) that the

mere formal manipulation of symbols cannot duplicate the

cause and effect relationships embodied in the human

brain which determine our experience and understanding

of the world. This argument is very close to what is

being advocated here; i.e that experience follows a

different logic to that involved in the formal

manipulation of symbols.

IV

Ecology is defined as the study of the

interrelationships between living organisms and their

environment. As such it rarely deals with single causal

factors when assessing a given situation. Quinn and

Dunham(1984) remark that the methodology usually

employed is more akin to statistical hypothesis testing

> in which potential causal processes are
> identified, and their probable contributions
> are evaluated, weighted and tentatively
> generalised to other situations(1984 p.23).

They go on to show that the adoption of a strictly

hypothetico-deductive approach a la Popper to

investigations of ecological change leads to three major

problems. These are;

a. In patterns of change with multiple causes it is not

possible to perform critical tests to ɪsolaɾe

the effects of processes occurring simultaneously.

b. Treating possible contributing factors to such

patterns as distinguishing hypotheses leads to

univariate critical tests and the behaviour of a

multivariate process may not be reliably inferred from

any combination of univariate tests if there are strong

interactions amongst the relevant factors.

c. The construction of null hypotheses in a

multivariate situation is often not possible, as

generally one could not deduce the nature of the

expected patterns in the absence of any given process.

In many models estimates cannot be made independently of

the actual distributions to which predictions of the

model will be compared.

V

To recap. The discussion so far has touched on

several deficiencies of the hypothetico-deductive

method.

1. It decrees as outside of the bounds of scientific

activity statements of an existential character; these

being precisely the type that are necessary in founding

a psychological science of dreaming.

2. Shortcomings in classical logic are revealed by work in the area of quantum mechanics. Ideas developed in this arena point to the elaboration of a quantum logic which aims to depict the rules which experience follows. This new logic concentrates upon relationships between events. Its basic 'unit of currency' is action.

3. Further shortcomings in classical logic become apparent when a particular theory becomes unable to provide a satisfactory framework for predicting and understanding events. Scientists then resort to jumping out of that frame of reference to a new viewpoint. This process, necessary to the evolution of scientific ideas is not presently captured by any formal system of logic.

4. In the study of ecological type systems, factors contributing to change are usually multiple and cannot be usefully investigated or understood by the use of the hypothetico-deductive method of scientific reasoning alone.

It is now intended to utilise these conclusions in order to arrive at a framework which provides a theory and methodology, apposite to addressing the subject matter of dreaming.

Alternative Strategies

If as has been proposed the conventional form of hypothetico-deductive reasoning adopted by many scientists is unsatisfactory for dealing with the

'experiential premises' upon which the world is constructed, experienced and understood by us then it is to be hoped that there are better positions from which to initiate enquiry into a phenomenon which is intimately related to those premises.

It must now be asked how the principal subject of our interest, i.e dreaming(and dream psychology) connects with the above mentioned points.

I

On reflection dreaming does indeed appear to be a phenomenon prone to the shortcomings of investigation by Popperian scientific method. Several reasons for this are outlined below.

1. Any science which attempts to study dreams must rely in the first instance upon statements of an existential character(point 1, p.13)

2. Dreaming being a form of experience, would seem to be an ideal candidate for the eventual application of quantum logic. However at present because of lack of suitable investigation it cannot be said with certainty that the nature of this experience violates existing logical forms, although a case could be made that the temporal and spatial quality of some dream experiences may very well do so. Many people have no doubt experienced for themselves the difficulties which can sometimes arise when trying to translate one's prior

dream experience into words(point 2, p.14).

3. A range of approaches to studying dreams has evolved broadly speaking over the last 80-90 years(these perspectives being from psychoanalysis, neurophysiology, information processing theory, and cognitive psychology) which cannot be logically derived from each other although it is not immediately obvious what relationships exist between these approaches.(point 3, p.14).

4. A perusal through the catalogue of studies on dream content compiled by Winget and Kramer(1979) indicates that dream content is shaped by a large number of factors. And if the range of approaches to dreams is anything to go by then it also appears to be a phenomenon which can be thought of as involving an interplay of factors from several levels(point 4, p.14).

II

It is the contention of the author that the problems highlighted as resulting from the scientific method as envisaged by Popper arise particularly when one is studying systems comprised of a complex series of processes taking place at various levels of organisation. It may be objected that one of the criticisms directed against the Popperian schema; that it inadequately dealt with the process whereby new scientific theories arise from the ashes of old, is not

in any way related to the activity or activities, of a system as such. In reply to this possible objection I would contend that the activity and products of the scientific community over time does in fact constitute an enquiring or learning system(Checkland 1985) and moreover that the successive development of theories within a particular discipline illustrates several of the abiding features of such systems. These are;

1. That they are hierarchically organised. Not only are higher levels dependent upon lower ones, but they are organised in terms of different levels of complexity. The relationships between concepts in general relativity for example are of a different order to those in classical mechanics. Alternatively expressed this is that systems exhibit stratified order.

2. As one examines successively higher levels in a system, the greater the flexibility one encounters. As one moves through the succession of natural sciences; physics to chemistry to biology to psychology to sociology, one encounters less precisely defined terms in the language of explanation. The historical unfolding of these subjects as independent disciplines could be viewed through the systems perspective as constituting transitions between levels of scientific development.

Given that traditional scientific practice seems at

its weakest when dealing with complex systems and that dreaming and its attendant study also seem to provide comparable methodological difficulties, one could ask whether an understanding of systems in general will provide us with a suitable basis for constructing a broad framework for dream psychology. This will be the task of the next chapter.

CHAPTER TWO: GENERAL SYSTEMS THEORY

> The universe consists of processes of
> synthesising systems of systems and
> disintegrating systems of systems.
>
> T. Downing Bowler

Introduction

Von Bertalanffy(1951, 1967, 1972, 1975, 1981)

developed General Systems theory over a number of years.

Many individuals contributed to the growth of ideas

leading to a generalised systems movement(e.g Boulding

1956) but it is to von Bertalanffy that its origin is

acknowledged. In formulating systems thinking one of

the strategies favoured by von Bertalanffy was to seek

isomorphisms between the laws discovered in different

fields in the hope that this might lead to a discovery

of a systems principle. His goal was to provide a

metatheory which would explain a whole range of theories

across the spectrum of scientific disciplines; that

science might be unified through general systems

theory(Ackoff 1964). Ackoff(1964) has speculated

whether systems theory might not only bridge the gap

between the formal and informal sciences but between the

arts and the humanities. Capra(1983a, 1983b) has made

similar points. It would be wrong though to think that

systems theory has been without its critics. Hempel for

one is less than enthusiastic.

It does not seem to me that the recognition of
isomorphisms between laws adds to or deepens
our theoretical understanding of the phenomena
in the fields concerned(Hempel 1951).

It is not surprising however that systems theory has

been so heavily attacked. Its doctrine of wholeness is

contrary to what many regard as the only way to conduct

rational scientific enquiry, i.e reductionism. The

issue of whether holistic features of systems actually

require holistic laws that cannot themselves be reduced

to the fundamental laws of physics is an aspect of

systems theories that has provoked much debate and

little agreement. It is seen by some(Davies 1984) as

one of the major unsolved problems of modern physics.

If these are the aims of systems theory what then are

its content and methodology? We might begin by seeing

what systems theorists regard as constituting a system

in the first place. A number of suggestions have been

offered¦

Definitions of Systems

1. Von Bertalanffy(1951 p.304) defined a system as

a"complex set of elements in interaction to which

certain system laws can be applied".

2. Klir(1969) considers a system as "a complex physical

object consisting of several parts each of which is

associated with some quantities that are in a relation

to the quantities of other parts".

3. Sheldrake(1983) looks upon a system as an

hierarchically organised interconnecting set of subsystems which possess properties at each level of complexity that cannot be fully understood in terms of the properties of the parts in isolation. This is drawing attention to the *emergent* properties which may arise at progressively higher levels of systems.

4. Capra(1983b p.26) defines a system as "an integrated whole whose properties cannot be reduced to its parts".

5. Sutherland(1975) proposes that in order to be described as a system three criteria must be satisifed.

a. A system must be in or be capable of, obtaining a state of integration to separate it from its milieu. This criterion pertains to the ecological dimension of a system.

b. It must contain at least two morphologically determinable entities(i.e differentiable subsystems). These can be structural, functional or spatial.

c. It must be capable of exercising constrained action amongst its subsystems, such that their behaviour is not entirely autonomous.

Examples of systems in the real world include societies, eco-systems, living organisms, and brains to name but a few. These all exhibit the enormous complexity that is a feature of the phenomena to which general systems theory is applied. The magnitude of variables involved in the control of the system's

behaviour makes usual forms of analysis impossible. Owing to this complexity and the contingent non-linear input-output relations which they exhibit, systems' activities are usually discussed in terms of the transactions(simultaneous and interdependent interactions between multiple components) and feedback loops by which they are regulated.

Taxonomy of Systems

To begin to grasp the scope of systems theory it is helpful to be aware of the number and types of systems that have been proposed. We will look at two schemes which aim to group these into some orderly fashion.

Scheme 1.

Klir(1969) begins by defining a system as being either physical or abstract. Physical systems are those in which there are measurable quantities. All other systems are abstract. A physical system may in turn be looked upon as real or conceptual. In real systems the quantities are known to exist whereas in conceptual systems they are only assumed. Following this preliminary sort Klir's categorization proceeds according to the nature of;

1. The interaction of the system with its surroundings.

2. The transitions between different system states.

3. The type of control exhibited within it.

4. The level of internal responsiveness.

5. The degree of goal directed behaviour exhibited.

The different types of systems which fall under these headings are listed below together with brief definitions.

1. DEGREE OF INTERACTION WITH ENVIRONMENT.

At this level systems may be closed(bound) or open(unbound). A closed system is one which for all intents and purposes can be considered as isolated, involving no substantial interchange of energy or entropy with its immediate environment. The universe as a whole is regarded as the only truly closed system but where a system is substantially isolated it is customary to speak of a relatively closed system.

2. TRANSITIONS BETWEEN STATES.

Continuous systems are those whose behaviour can be regarded as continuously variable between states. Discrete systems are those whose measurable quantities only acquire a finite number of discrete values. Rene Thom's catastrophe theory(see Saunders 1980) evolved as a branch of mathematics to describe the general behavioural properties exhibited by such systems. If any of these types of system asserts itself as an element of a higher system then they are referred to as hybrid systems.

3. CONTROLLED SYSTEMS.

There are two types of these. Deterministic systems

are those whose output is a direct function of the values of the principal quantities. In Stochastic systems on the other hand(and these are usually the ones more frequently associated with living systems) each element of the relations within it is only associated with a conditional probability.

4. LEVEL OF INTERNAL RESPONSIVENESS.

Simple(memoryless) systems are those whose principal quantities are defined according to the instantaneous values of quantities external to the system. Complex systems are those where at least one of the principal quantities is not determined by the immediate value of external quantities.

5. DEGREE OF PURPOSEFUL BEHAVIOUR.

Systems where at least one of the principle quantities are defined on the basis of a future value of an external quantity are known as teleological systems. This is a rather formal way of saying that they demonstrate goal directedness. In contrast to this a system will be said to be physically realisable.

Scheme 2.

Sutherland(1975) although acknowledging the utility of many of the distinctons between systems that Klir has used nevertheless has adopted an approach which is a step closer to the central philosophy of systems theory. To Sutherland the properties of systems can be

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summarised by reference to their structure and behaviour. It is by consideration of isomorphisms in these two areas that he believes one of the main aims of systems theory(to (a)discover isomorphisms between systems of quite different constituents, in the hope that (b)some general principle(s) of action can be discovered to which they conform) will be realised. As a result his method of classification emphasises the various structural and behavioural modalities of systems. These he proposes as;

A. Modalities of structure.

1. Evolutionary modalities.

This is concerned with the developmental path taken by a system. It is proposed that all systems appear to evolve through one of two processes: segmentation or differentiation. Segmented systems have an array of structurally and functionally similar subsystems. Differentiated subsystems are the reverse in that each subsystem is structurally unique having evolved to fulfill a unique functional niche.

2. Boundary modalities.

This concerns the nature of system relationships with the world outside. The chief referents here are open and closed systems.

3. Organisional modalities.

Hierarchical structure stands out as the preeminent

organisational modality(Sutherland 1975). These are frequently encountered in both natural and artificial systems. Simon(1973) has demonstrated mathematically that hierarchical systems evolve much more rapidly from elementary constituents than non-hierarchical systems containing the same number of elements.

B. Modalities of behaviour.

The focus here is upon the predictability of the system. Accordingly a system may be examined from the perspective of it being either deterministic or stochastic.

Systems Thinking and Scientific Method

Checkland(1985) nominates three characteristics as delineating the pattern of scientific thinking. These are reductionism(in the sense of explaining the complex by reference to the simple), repeatability of experiments, and refutation of hypotheses. They have been defined, as they necessarily must be by reference to the historical development of scientific method. From the discussion in chapter one it would seem necessary to add another characteristic to these. I shall call this creativity. It is not describable within the framework of hypothetico-deductive logic, and in contrast to the previous three is not characterised by structure. It is also the hallmark of the activity of *individuals.*

One is faced with the choice of either amalgamating
this fourth characteristic with the other three, and
thereby acknowledging that science escapes a complete
logical definition or else one excludes it, and becomes
left with the odd problem of characterising science as
an activity without reference to the intrinsic activity
of creating scientific hypotheses upon which its
continued progress depends. A problem it certainly is.
Feyerabend(1975) faced with this argued that the only
principle which does not inhibit progress is 'anything
goes'. Chalmers(1983 p.169) toward the end of his book
'What is Science' concludes that there can be no
"universal conception of science or scientific method"
as long as science is understood as some quest for
unending truth. Science has been usually understood by
reference to what scientists have done in the past.
Perhaps if this is not too much of a contradiction it is
now time to consider it in terms of what might happen in
the future! One of the tasks of systems theory is to
literally change the way we think! Sutherland promotes
systems thinking as the next step in the evolution of
scientic thought. So what are the central components of
using systems methodology in practice and how does it
fare in relation to the problems facing scientific
method given in chapter one?

Checkland tells us that although the phrase 'systems

approach' is by now a familiar enough one the actual content of this approach is somewhat less so.   Systems thinking can be said to consist of the formulation of substantive theories(i.e about particular subjects) and methodological theories(concerning how to go about investigating the subject matter).   This   dichotomy enables one to examine not just problems that are the focus of interest within a particular discipline, but also problems in the discipline itself. In this sense systems theory is self referential.   The 'case records'(Checkland 1985) or critiques that one makes through an analysis of the problems in a discipline can then be used to construct systems theories and models for use in tackling those problems. The degree to which these problems are successfully dealt with in turn becomes a source of criticism of systems theory and a means by which it can be revised. Systems thinking thus embodies dialectical reasoning at its heart.

   Systems theory as a method of problem solving has I contend several advantages over purely hypothetico-deductive reasoning.

1. Systems methodology incorporates hypothetico-deductive reasoning as one moment within it, so that at the appropriate time one may test particular hypotheses generated by it. It therefore has all the advantages which that method affords. Furthermore;

2. A systems approach implicitly allows for the existence of human experience and consciousness as a valid starting point of enquiry. Consciousness viewed from a systems perspective of the human brain, is construed as an emergent phenomenon. Human desires, hopes, loves, perhaps even free will(see Hofstadter 1980 P.708) can be looked upon as higher level features which cannot be understood in their entirety from the lower levels of neurophysiological organisation.

3. Systems theory has evolved to meet the need for workers to carry out meaningful systematic research into complex phenomena entailing a plethora of interacting variables. Customary methods of hypothetico-deductive reasoning as we have seen in chapter one are often not feasible in these circumstances.

4. Systems thinking embodies an abstract method of reasoning involving a succession of analytic-synthetic moments characteristic of dialectical reasoning(Sartre 1976). This structure effectively plans the construction of new theories in the course of its application. It is able to do this by virtue of its eschewing the need for a formal logic of creative reasoning.

From what has been written thus far it would seem reasonable to conclude that systems theory does offer a potentially promising approach to the study and

investigation of dreaming. In case any further
justification of this is required, the following section
is intended to provide a brief discussion of the
applicability of systems ideas to an understanding of
brain function. I of course make the assumption that my
readers will not question the presupposition that a
dream is a product of cerebral activity and not as the
Assyrians, Babylonians, Egyptians, or Ancient Greeks
believed something sent from the spirit world.

A Perspective on the Brain.

I

From the aforegoing it will be becoming clear(I hope)
that when we describe something as a system we are using
a convenient shorthand for talking about connected
patterned processes in nature. The human brain was one
of several examples given earlier of systems. Let me
elucidate what is entailed in viewing the nervous system
in this manner. From a neuroanatomical perspective the
brain can be thought of as comprising three
interconnected levels; the brain stem, subcortex and the
neocortex(Luria 1973). These crude evolutionary
distinctions apart however, the brain's functional
organisation can also be looked at from differing levels
of description. We are more used to encountering
different levels of description for the same set of
events when discussing computer systems(Hofstadter

1980). For instance we speak of machine languages at the lowest possible level. A step up in description and we move to assembly languages, and at a still further level of abstraction one encounters the familiar 'high level' languages(e.g Basic, Fortran, Pascal etc). Although we have as yet no idea as to the nature of the 'languages' or formal rule systems governing the brain's activity(if in fact that is the correct way of conceptualising the logic of neural activity) we still opt to utilise a set of descriptions that emphasise the differing levels of organisation within it. These refer to the neuronal, neuropharmacological and neuroanatomical levels.

Although higher level descriptions of actions cannot be stated simply in the languages appropriate at lower levels(e.g one cannot explain love in terms of a particular pattern of neural activity), it is important to remember that ultimately, no matter how great the flexibility of operation which the higher level description is necessary for, it is nonetheless ultimately dependent upon the inflexible rules at the lower level which underlie neural firing.

II

What has been said thus far has focused upon the objective, visible aspects of brain function. What about mind? Amongst many leading philosophers and

surveyors of the scene in the cognitive sciences 'mind' is now conceived of as the top most level of description of brain activity(Smullyan 1982, Hofstadter and Dennet 1981, Dennet 1981, Hofstadter 1980, Searle 1980, Minsky 1980). In the language of systems theory mind is an emergent property of the brain. Hofstadter(1980) has provided a speculative account of how consciousness could arise in a complex system based upon the idea of tangled hierarchies or 'strange loops' as he calls them. These are subsystems of symbols in which the uppermost levels reach back toward the bottom level and influence it, whilst at the same time being themselves determined by the bottom level. Ultimately of course this symbol tangle is untangled at the 'hardware'(neuronal) level. In the Hofstadter scheme the system maintains an internal symbolic representation of itself by means of a subsystem of symbols representing its own activity.

> In communicating constantly with the rest of the subsystems and symbols in the brain it(the self) keeps track of what symbols are active, and in what way. This means that it has to have symbols for mental activity-in other words, symbols for symbols, and symbols for the action of symbols(Hofstadter 1980 p.387).

Science is perhaps at last ready to deal with consciousness, and the path is now clear to begin a systems examination of dreaming.

PART TWO

Existing Theories of Dreams

The analysts behave as though they had no more to say about dreams, as though there was nothing more to be added to the theory of dreams.

    Sigmund Freud

Attempting to remember one's dreams should perhaps not be encouraged.

    Francis Crick and Graeme Mitchison.

The ability to be puzzled is the beginning of wisdom.

    Erich Fromm

A Systems Perspective for Dream Psychology

Gregory Bateson remarked that a combination of diverse pieces of information defines an approach of very great power toward what he deemed 'the pattern which connects' (1985 p.77). The origins of the systems approach lie in the search for this pattern which connects. Consequently the way in which it will be employed to construct a psychology of dreaming will place great emphasis on the notion of pattern. As mentioned in the preceding chapter, systems research consists of both a 'system of activity' for conducting one's inquiries, and the mapping of a 'conceptual system' onto one's relevant object of study as part of that inquiry. When using this paradigm, Checkland(1985) proposes a sequence of activities to follow which begins with the formulation of a conceptual model of the relevant system under scrutiny. Allied to this is the 'root definition' (1985 p.164) which one constructs of that system. I shall therefore begin with a description of the systems theory of dreaming which I am proposing. This is stated below.

The experience of dreaming may be envisaged as the emergent property of a hierarchically organised, multilevelled set of information processing operations. These operations interlock the structurally stable uppermost layers of the human personality with a lower level set of non-conscious cognitive processes upon which it is supported.

The first test of the fruitfulness of this conceptual

model will be to employ it as a critical tool in the

assessment of existing work in the psychology of

dreaming. This forms the rationale behind part two of

the present work. For this purpose I will be using a

number of criteria which I believe are necessary for an

adequate model of dreaming to meet.

> They must attempt to provide us with reasons
> for the structure and content of dreams; for
> the persisting styles and patterns evidenced
> in them. They must seek to instruct us how
> dreams are formed from the interplay of the
> myriad layers of human personality, how
> dreaming evolved, what multiplicity of
> purposes they serve. They must seek to inform
> us of the different ways in which we can use
> dreams to exlore different aspects of our
> lives...Above all they must be based on sound
> observation(Roberts 1985 p.130).

Some of the themes that will be followed in the course

of this section are;

1. What 'level of resolution'(Klir 1969) do any

proposed explanations reside at?

2. What happens when hypotheses generated to account

for experience or behaviour at a particular level are

falsified or found to be wanting?

Dennet(1981) argues that cases of difficulty in

explaining events at one level of a system can be

resolved by reference to the next level up within it,

and that eventually this may lead one to investigate the

actual design of the system itself(see Bannister and

Fransella 1980 p.21 for an example of how this operates

in practise). Laing(1968) advocates a similar procedure, but rather than the ultimate referent being the design of the system in question, to Laing it is the context of the *total social world system*(1967 p.15).

3. The weight given to the reported characteristics of dream experience, in comparison to that given the processes lying outside of consciousness which are inferred as being responsible for these characteristics.

4. The coherence with which a model actually does model the known features of dream experience.

5. How each approach 'frames' the set of input-output relations presumed to be taking place in terms of that model.

Subsequent to this review Part Three will consist of the presentation of the central tenets and postulates of the systems theory of dreaming and its further elaboration through empirical work.

CHAPTER THREE: PSYCHOANALYTIC THEORIES OF DREAMS

Put out that Light,
Put out that bright Light,
Let darkness fall.

Put out that Day,
It is the time for nightfall.

Stevie Smith

1. THE FREUDIAN THEORY

Because of the central role Freudian theory has
occupied within dream psychology since its inception it
will be receiving extensive treatment here. This is
warranted above all by the fact that until of late there
have been no rival theories of dreaming. One would
fairly presume that this longevity is due, in part at
least, to the successful and novel way in which Freud
approached his subject matter. It is comprehensive both
in terms of its manner of presentation and in terms of
the depth to which many features of dreams are addressed
within it. And to this day it continues to exert an
influence upon each new generation of dream researchers.
There is undoubtedly much to be learnt from its
examination.

I

The theory of dreams was to a large extent the
foundation upon which Psychoanalysis as a discipline was
constructed. One might therefore expect that any major

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revision or refutation of this theory would have serious

repercussions throughout the whole of psychoanalysis.

This may in part explain the unwillingness of many

practitioners to regard Freud's writings on the subject

as anything but sacrosanct, their being tantamount to

established fact. Freud himself was acutely aware of

this problem as his remarks quoted in the heading to

this section make clear.

One should not confuse this failure to look beyond

Freud with the multitude of approaches to dreams which

have arisen within psychoanalysis and which have taken

as their focus of enquiry the issue as to how a dream

should be interpreted. Hall(1951) surveying the work of

those around him sadly concluded that the prevailing

attitude was "as if the whole position of dream theory

was finished and done with". This reluctance can be

traced to the present day; Charles Rycroft a

distinguished analyst summed up his recent book(The

Innocence of Dreams 1981) with these comments;

> I have made nine specific points about the
> psychology of dreams; that four were patent
> disagreements with Freud's theory and five
> were elaborations or reformulations of
> Freudian ideas.....But I would like to make it
> plain that I have no wish to lumber the world
> with yet another theory of dreams.

This discussion of the Freudian theory has begun in

this manner quite deliberately. In the history of

ideas, scientific theories are seen to develop and

change as they pass through successive hands of workers. This is as true today of Einstein as it also is of Darwin. For example, although still enjoying success in its ability to provide us with insights into the natural world, evolutionary theory is now radically different to how it appeared when it first left Darwin's pen. The Freudian theory of dreams however is almost unique in this respect in that it has not altered in form since it first saw the light of day. This is not because Freud was right; no-one ever can be absolutely right. The quest for absolute knowledge is a futile and perhaps dangerous exercise. Freud would certainly have had none of it. Embedded within the 'hows and whys' of Freud's theory are to be found I contend the reasons for its stagnation as well as its success. To elucidate these are the principal tasks of this critique. For the main tool of analysis we will employ a systems perspective of dreaming and ask whether Freud's theory ever was or could be, an adequate formulation of the phenomena of dreaming.

II

The Scope of Freudian Dream Theory

The 'Interpretation of Dreams'(Freud 1978) had ramifications for what Foulkes(1978) termed both dream and dreamer psychology. Dream psychology embraces those statements concerning the processes of dream formation

as they are for all people, whilst dreamer psychology is
concerned with the individual psychology of the dreamer;
why a particular dream was dreamt by a particular
individual. Dream interpretation is therefore central
to this latter purpose. The distinction highlights what
is the major ambiguity within the theory. This is
between viewing the dream as a final stage in a long
sequence of events connected by simple cause and effect
relationships, and viewing it as an experience imbued
with meaning and actively constructed by aspects of
someone's personality.

Indispensable to understanding both the derivation
and the application of the theory is the tool of free
association. This is how Freud described what led to
its use in the sphere of dreams;

> I have been engaged for many years(with a
> therapeutic aim in view) in unravelling
> certain psychopathological structures
> -hysterical phobias, obsessional ideas and so
> on. I have been doing so in fact ever since I
> learnt from an important communication by
> Josef Breur that as regards these
> structures(which are looked on as pathological
> structures) unravelling them coincides with
> removing them. If a pathological idea of this
> sort can be traced back to the elements in the
> patient's mental life from which it
> originated....it simultaneously crumbles away
> and the patient is freed from it. Considering
> the importance of our other therapeutic
> efforts and the puzzling nature of these
> disorders I felt tempted to follow the path
> marked out by Breur....It was in the course of
> these psychoanalytic studies that I came upon
> dream interpretation. My patients were
> pledged to communicate to me every idea or
> thought that occurred to them in connection

with some particular subject; amongst other
things they told me their dreams and so taught
me that a dream can be inserted into the
psychical chain that has to be traced
backwards in the memory from a pathological
idea. It was then only a short step to
treating the dream itself as a symptom and to
applying to dreams the method of
interpretation that has been worked out for
symptoms(The Interpretation of Dreams 1978
pp174-75).

Freud's emphasis on interpreting dreams and showing
them to have meaning was an idea which in his own day
ran contrary to the prevailing currents of thought.
With free association, memories once accessible to
consciousness but now forgotten could once again be
brought to light. This has been successively
demonstrated more recently in rigorous laboratory
experiments(Haber and Erdelyi 1967).

This technique enabled Freud to reach a degree of
understanding of the contents of a person's dream in
relation to more orderly schemes of thought lying
outside of consciousness. He decided though that a more
secure theoretical basis was required for a description
of how one was a function of the other. In his own
words he sought to discover "the characters and
syntactic laws"(1978 p.381) which would give him a more
precise model of this relationship. Even now this
stands as a measure of Freud's genius. For he is here
seeking a lawful means to describe the transformation of
information between differing levels of the psyche.

Alas the idea that dreams are in a sense analogous to neurotic symptoms has had unfortunate consequences as will be seen later.

In seeking to discover these laws Freud's ideas were influenced heavily by the properties which he considered an adequate scientific theory should possess. They thus became modelled upon the classical physical and biological sciences of his day. This led to the theory being replete with descriptions of forces and transformations of psychic energy on the one hand and drives and instincts on the other. To Freud, the process of transforming the latent dream thoughts into their manifest form had to be embedded into a framework which was ultimately referrable to the Newtonian model of the day.

This theme pervades all of Freud's work even though in the later stages of his life he had witnessed the downfall of the Newtonian model in the midst of the revolution instigated by Albert Einstein.

Despite this it would be an error to say that psychoanalysis was based apriori upon reductionist principles. Freud(1976) remarks in another context that one needs to beware confusing the mechanism of a process(usually conceived in biological terms) with the factors favouring the process(i.e which are psychological); and when we come to examine Freud's

model of what the mechanisms are which drive the dream process they seem to be purely psychological constructs. Hence Freud has really given us two dream theories; a pyschological model usually referred to as the 'Topographic' model and the so called 'Economic' theory which is more or less the topographic theory transposed into the language of drives and forces. We shall now discuss each of these in turn.

III

The Psychological Model of Dreaming

At the bottom of every dream was said to lie a repressed wish which sought expression and fulfillment in the dream, under the relaxed conditions of censorship which prevailed during sleep. In order to fulfill this wish, which was essential for the safe functioning of the psyche it had to be disguised. This disguising process was undertook by the 'dream work', a sort of battleground within the psyche. The protagonists were the Id, the reservoir of ungratified instinctual impulses(primarily sexual and aggressive in nature) in opposition to the Ego, and Super Ego, the moral and conscientious parts of the personality. An immediate problem here is that for something to be disguised it must first be recognised by the psyche in some way so that it, 'knows' what to disguise. This simultaneous state of both awareness and unawareness corresponds to

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what Sartre(1957) termed bad faith; a lie to oneself within the unity of a single consciousness.

The Id is said to be governed by the primary process and the Ego/Super Ego by the secondary process. The primary process is characterised by the condensation of a multiplicity of thoughts to a few, their displacement onto other streams of thought and their symbolism in various forms. Accordingly this process is said to operate outside of the categories of space and time and without regard for the rules of formal logic and grammar. The secondary process is characteristic of waking thought and is recognised by its obeyance to just those rules disregarded by the primary process.

Freud's thinking here, whether it is correct or not, is anticipating some of the conceptual ingredients of systems theory. He is expounding the belief that dreaming is the result of a series of communications taking place between various subsystems which as a whole comprise the psyche.

Under the conditions of sleep an unconscious wish which has recently been stirred, links itself up with current wishes and fantasies located in the preconscious. Just how this occurs is far from explicitly stated. Linked with the preconscious wishes, the unconscious wish is still unable to evade the censor and pass into consciousness. Consequently a regressive

path is entered whereby groups of memories of a predominantly visual nature exert their attraction. En route to their becoming perceptual in this way, the dream thoughts undergo condensation, displacement and symbolism. By becoming perceptual in this manner Freud considered that it was by that fact alone that the dream thoughts had "found a way of evading the obstacle put in its way by the censorship and by the state of sleep in the preconscious"(1978 p.729).

In addition to the dream work mechanisms referred to here Freud added the concept of secondary revision/elaboration. He later withdrew this from the dream work proper but felt that it was necessary to be considered because every dream report bore its mark as the 'dressing' which was apt to being imposed by the conscious mind upon wakening. This he believed had the effect of presenting the dream as a more intelligible whole than in fact it was.

There are several problems with this formulation of Freud's.

1. Infantile wishes which are held to be essential for constructing the dream, would, because of the time when they first arose, be likely to exist in a representational form to begin with. The young child would have little recourse to language and would as Piaget has demonstrated still be utilising

'sensori-motor' schemas of an imaginal nature. The theory implies that the agencies of censorship(ego/super ego) operate in the rational verbal mode and that they can only notice unpleasant thoughts which are similarly encoded. The proposition that dream thoughts evade censorship by virtue of their becoming perceptual(and predominantly visually perceptible at that) is not only untenable on this basis but implies that congenitally born blind people cannot dream. This is a very puzzling part of Freud's theory for he tells us that his own dreams were of a more conceptual than perceptual nature.

2. A problem with the wish fulfillment hypothesis is that as Jones(1978) points out, in all the numerous examples of dream interpretation which Freud presents in 'The Interpretation of Dreams' there is not one single example where the manifest content of the dream is traced back to a repressed infantile wish. This is extraordinary. May we not ask how it is possible to vouch for the role of infantile wishes in the causation of dreams if it is not necessary to trace back to them via the associative chain produced by the dreamer? Foulkes(1978) in his mathematical formalising of the associative network produced by the dreamer(The Scoring System for Latent Structure) has not been alone in interpreting the value of the model to be that the process of dream interpretation approximates in reverse,

those steps which led to the formation of the dream.

If a repressed infantile wish is not to be found within this matrix by observation(i.e free association) then it cannot be any kind of scientific practice to insert one there free from the requirement that such a claim be tested. It is clear then that Freud's reasons for inserting it must lie outside the province of dream psychology. A candidate for explanation is that Freud did so in order to make more complete, the previously alluded to relation between dreams and neurotic symptoms. Free association had led Freud to conclude the importance of infantile wishes in the formation of neurotic symptoms. However because a set of phenomena(neurosis) can be investigated by one particular method(free association) it in no way logically entails that because a second set of phenomena(dreams) can also be investigated by the same method, that it too will have the same explanation as the first class of phenomenon.

IV

Implications of the Psychological Model

A. Children's Dreams

The differentiation between primary and secondary processes within the model has implications which Freud was unaware contradicted his own beliefs. As indicated earlier the primary process(so designated because of its

presumed developmental primacy) is characterised by condensation and displacement. Because of this alleged primacy we might expect, in the case of young children, for the primary process to meet with little opposition from the secondary processes as the ego/super ego will be as yet only poorly developed. On this basis one would postulate that a predominance of primary process mentation would produce more bizarre and extravagant dreams in young children than in adults. This is contrary to Freud's own views that children's dreams were simpler and is also at variance with the recent evidence collected by David Foulkes from which it was concluded that children's dreams are "less varied in their content (and) less complexly determined than adult dreams" (1979 p.160).

Freud no doubt postulated children's dreams to be simpler because he reasoned that without the presence of the super ego there would be little distortion of the latent thoughts. This leaves us with the conceptual difficulty within the terms of the theory, of distinguishing between primary and secondary mentation; the primary processes being defined on the basis of mechanisms which change or distort original thought processes whilst the secondary processes are said to be in a fierce tug of war with the primary process so that distortion occurs. One is thus unable to unambiguously

say from what source distortion originates.

B. Structural features of the Dream Work

Freud's model of dreaming contains inherent
structural properties which have been more thoroughly
investigated by Polombo(1973) and Foulkes(1978).
Foulkes' analysis lends support for the concept of
'knotenpunkte'; elements particularly rich in
associations. In Freud's model this concept was applied
to the manifest thoughts only. Foulkes finds that there
are such elements in the pathways of thoughts leading to
the dream. Obviously if such elements are present among
the dream thoughts that do not become manifest it is not
sufficient to explain the representability of those that
do. This poses problems for some writers(e.g Ernest
Jones 1973) who have sought to explain the
representability of dream images on the basis that those
overdetermined points in the manifest content frequently
exhibited the greatest sensorial vividness. This was no
doubt on the basis of Freud's own comments that;

> Analysis shows that the most vivid elements of
> the dream are the starting point for the most
> numerous trains of thought(1978 p.444).

However two pages further in the text Freud cited an
example of a very unclear dream and then remarked;

>...the lack of clarity of the dream was part
>of the material which instigated the dream.

Freud was thus stating that the clarity(vividness) of a

dream may be determined by both the quality and the

quantity of the impinging thoughts. The issue of how,

if at all these factors may interact is left open.

C. Intellectual Activity in Dreams

Freud devoted a considerable section of the

'Interpretation of Dreams' to the matter of whether

dreams in any sense exhibited intellectual activity of

their own. Although he proposed that dreaming was a

meaningful form of mental activity, it is probable that

his insistence on classifying the mental products of

sleep into an altogether different category from waking

thoughts was what led him to decide;

>Everything that appears in dreams as the
>ostensible activity of the function of
>judgement is to be regarded not as an
>intellectual achievement of the dream work but
>as belonging to the material of the
>dream-thoughts as having been lifted from them
>into the manifest content of the dream as a
>ready made structure(1978 p.577).

At first sight this seems to be at odds with an

earlier comment of Freud's that it is beyond dispute

that dreams can..

>carry on the intellectual work of the daytime
>and bring it to conclusions which had not been
>reached during the day(1978 pp131-132).

By analysing apparent instances of intellectual

activity Freud was able to demonstrate their origins in

latent dream thoughts. However he had little to say about those dreams which were undoubtedly acts of creation. Into this category we would include the dreams of Robert Louis Stevenson which produced many of the narratives for his stories. Another example would be the dream of the German chemist Kekule which led to his discovery of the ring structure of the benzene molecule.

Seeing as we have touched on the theme of creativity it is of interest to note that editions of 'The Interpretation of Dreams' from 1914-1922 contained at the end of chapter 6 an essay of Otto Rank's entitled 'Dreams and Creative Writing'. Since this has been omitted from all subsequent editions all we are left to ponder on is Freud's remarks that "Whence the artist derives his creative capacities is not a question for psychology"(quoted in Rycroft 1981 p.157 this remark dates from 1912). How odd that the issue of creativity has been eschewed by both philosophers of science and psychoanalysts!

Dream Symbolism

Freud is probably most well known for his discussions on the nature of symbolism, by which we mean the process whereby some image or idea may refer to, or stand for something other than itself.

Many writers appear in no doubt that this was to be

considered a distinct function to either condensation or displacement, although if one examines this issue closely it can be seen that the so called symbolic representation is nothing more than the product of condensation and displacement. Thus, if a particular line of thought is subjected to condensation and displacement the end product of this will be a symbolic representation for the original thought. Rycroft, some of whose comments we noted earlier, points out that the classical psychoanalytical view of symbolism as something qualitatively different from the imagery and metaphor used in waking life can no longer be maintained, although he is at times beset by the same confusion.

Freud was much occupied with sexual symbolism. It is true to say though, that his views in this area have been greatly misunderstood. His own comments are worthy of our attention;

> The assertion that all dreams require a sexual interpretation against which critics rage so incessantly, occurs nowhere in my Interpretation of Dreams. It is not to be found in any of the numerous editions of this book and is in obvious contradiction to other views expressed in it(1978 p.521).

Much of the confusion has arisen because the individuals who have levelled these criticisms have failed to consult the original material. Freud was partial to giving many examples of symbols pertaining to the sexual

act, because he attributed supreme importance to the sexual life of a person. That dreams often contain such symbolism has been amply demonstrated(Freud 1974, Hall 1973) but it is also well established that such symbolism is not present for the purpose of representing unacceptable impulses to consciousness in a disguised form. Freudian theory is unable to explain why an individual should on one night employ symbolism such as climbing a flight of stairs to represent sexual intercourse and on another night have an overt sexual dream. The present writer is in agreement with Faraday(1974) that dreams reveal rather than conceal the truth from the dreamer and that symbolic language is a very efficient way of articulating a whole constellation of feelings.

The means by which one arrived at the interpretation of a given symbol was for Freud, theoretically at least, contingent upon the associations given by the dreamer. One could discover several referents for any one symbol and for this reason Freud was correct in arguing that it is pointless to use any kind of dream dictionary in order to read off translations for various symbols/images. Freud in no way contradicts himself in his descriptions of the possible symbols which may be used to refer to parent figures for example, or, for that matter the sexual organs, because he stressed that

the interpretation of a dream could only be arrived at from its context.

That meaning plays such a crucial role in the genesis of that matrix of thoughts which leads to a particular dream, poses considerable difficulties for Freud's mechanistic model of dreaming; the so called 'Economic Theory'. We will now briefly describe the main aspects of this.

V

The Economic Theory of Dreams

This aspect of Freud's work, couched in the language of neurobiology, deals in principle with the distribution of psychic energy throughout the three systems of the mind; Unconscious, Preconscious and Conscious. In essence it is an attempt to impose upon the data revealed by free association a framework in keeping with classical mechanics and drive based biology. Within this perspective the dreaming mind requires something which will set it in motion. Freud postulates the semi-mystical concept of the wish to sleep to meet this requirement. When active this brings about a withdrawal of cathexes(bound psychic energy) from the body's motor systems resulting in sleep paralysis. The desire of the unconscious infantile wish(not to be confused with the wish to sleep) to seek expression is now conceived of as a current of

excitation moving toward the system conscious and which during the dream work becomes cathected(bound) to other nmemic elements in order that it may ultimately be discharged in an acceptable form. The concept of the wish to sleep is thus the bridge between the psychological and biological perspectives(in Freud's terms the topographic and economic models) in that it is a psychological construct with energetic properties. Mind then, is seen as passive, its products determined by physico-chemical processes and the dream is merely a safety valve for the discharge of unconscious energy. Battista(1978) has described Freud's theory as dualistic because the concept of psychic energy which it utilises is vitalistic and incompatible with physical energy. The economic theory considered alone is not scientific. None of its theoretical constructs have any meaning independent of what they are trying to explain(i.e the dream work). They describe no physiological processes correlated with dreaming, nor could they for there was no evidence of such processes available at the time. Most theorists today are in agreement that it is superfluous. Freud laboured under the still widely held opinion that neurophysiology was somehow a more fundamental science than psychology.

It would be wise to postpone any conclusions about Freud's dream theory until one has looked at how it has

fared under his successors in the psychoanaltyic movement. Any comments on the intrinsic merits(or otherwise) of a psychoanalytic theory of dreams will need to be based on judgments relating to the totality of its development to date and not simply on its original form.

2. POST-FREUDIAN APPROACHES TO DREAMS

It becomes apparent on inspecting the works of psychoanalytic commentators on dreams, that where differences do exist, they are principally to do with interpretation. Both the method whereby an interpretation is arrived at, and the result itself of the application of the method, have become subjects for disagreement. Despite these disagreements and the central role which interpretation occupied in Freud's model, any opposition to Freud's interpretive scheme did not lead to opposition to the dream theory itself. This can be understood on two grounds. Firstly Freud's followers were much intent on remaining in his personal favour. Several of his contempories, e.g Wilhelm Reich, suffered much misery and rejection on account of their and Freud's disparate views(see Wilson 1981). Jung(1973) in his autobiography describes the path which culminated in his break from Freudian orthodoxy, and it is clear from this how great was the displeasure which

attended Freud with regard to any abandonment of his

theory. Jung informs us that Freud implored him

> My dear Jung, promise me never to abandon the
> sexual theory. That is the most essential
> thing of all. You see, we must make a dogma
> of it, an unshakable bulwark.(Jung 1973
> p.173).

The pressure to conform amongst his followers was no

doubt great.

A second reason, though not entirely divorced from

the first was the novelty of the discipline they were

engaged in. Freud was adamant that others must not rock

the boat and thereby hinder the acceptance of

psychoanalysis as a science. Though Jung did disagree

strongly on the importance of sexual matters in dream

formation(he saw them as having been overestimated)

there was reticence on his part to be associated with an

alternate theory.

> I have no theory about dreams. I do not know
> how dreams arise, and I am not sure that my
> way of handling dreams even deserves the name
> of a method(quoted in Greene 1979 p.298).

Nevertheless, a theory and method can be abstracted from

Jung's work with little difficulty, even though he was

reluctant to say so. So to this we will now turn our

attention.

I

Jung's Approach to Dreams

a. Theory

The Jungian view of the unconscious was of a division between a personal layer, the contents of which are roughly synonymous with the Freudian unconscious and a collective layer of memories and experiential structures(the archetypes) which are universal in character and common to all. The collective unconscious was said to manifest itself in certain typical forms of behaviour and experience. To Jung the dream was a rich source of archetypal imagery.

As Evans(1983) points out, Jung's notion of the unconscious has been maligned and much misunderstood. It is possible to interpret it without recourse to mysticism. The basis of Jung's argument was that just as the body has evolved over time in response to the pressures and demands of the environment so too has the psyche. And just as vestiges of our evolutionary past are to be found in the body, so too might vestiges of early psychic structures be found in the present day psyche. This as Evans tells us is a sound scientific hypothesis to account for the common occurrence in the dreams of a wide range of peoples of the same symbolic imagery. In fact there are three hypotheses which might be advanced to 'explain' this.

1. The common notion that the human race shares some kind of collective mind, into which individual minds can tap.

2. That these archetypal images arise in some as yet unknown way from the common anatomical or structural pathways in the brain which lead all people to form the same kinds of symbolic imagery. It could well be for instance that certain archetypel images are in fact the most efficient way of representing situations that are common to the nature of the lives that people lead. This is analogical in some sense to the thirteen or fourteen basic themes that form the basis of virtually all Greek Tragedy.

3. An alternative idea is that the 'collective unconscious' is in some way derived from an interplay of language with this limited set of dramatic(see 2, above) human experience. Language too possesses archeological type structures, becomes modified with age, items become added and deleted, meanings change, but the morphological form of words etc maintain a link with the linguistic past. In this sense language functions as some kind of external group mind. John Berger remarks that;

> The boon of language is that potentially it is complete, it has the potentiality of holding with words the totality of human experience-everything that has occurred and everything that may occur(Berger 1984 p.95).

Language as mind? This perhaps brings Jung a little closer to modern cognitive psychology than many would ever have believed possible. I suggest that Jung's famous dream from which he discovered(unearthed?) the notion of the collective unconscious be re-read from this perspective.

Jung's theory of dreams briefly stated is that dreams arise from an interplay between the conscious and the unconscious(personal and collective). By utilising unconscious imagery the dream sought to exert a stabilising influence on the mind, a kind of psychological homeostasis. It was only when the situation on which the dream was working could be related to commonly occurring human dramas (i.e commonly occurring throughout history) that the imagery of the collective unconscious would be called upon.

b. Method

Jung too relied upon the associations of the dreamer. However the manner in which he elicited them was qualitiatively different from free association. 'Amplification' involved a broadening out from the dream image in a series of directed associations to a multiplicity of analogous situations and meanings. It is not a step by step chain. One may return again and again to the same starting point to embark upon a fresh series of revelations. Jung was also keen on

investigating whole dream series in such a way that information gleaned from later dreams could aid and in fact correct the interpretations derived from earlier ones.

Interpretation therefore acted in the manner of a scientific hypothesis; being furnished to place a framework on existing data and ready to be replaced should the need arise in the light of future data. The actual chronological order of a dream series is seen as being of less importance than the underlying logical and semantic relations which they express. Sequences of dreams are envisaged as unfoldings around a common core or centre of meaning. The art of laying bare this meaning as fully as possible relies on relating a particular dream image to the symbolic and mythical heritage of past human experience. This would only rarely be possible when dealing with material from a single dream.

II

Of the post-Freudian dream psychologies, most have remained loyal to the interpretive procedures of either Freud or Jung, being chiefly dependent upon associations of one kind or another. Notable exceptions to this have been Harold Kelman(see Knapp 1979) and C. Brooks Brenneis(1975).

Kelman has adopted what he calls a dialectical

phenomenological approach. He has recognised the role

played by the therapist in the interpretive process and

how accordingly there can be no real objectivity in the

analytic situation. Both client and therapist are

continually acting and responding in relation to the

other, and so each one is affected by the acts and

creations of the other. This is an important issue. It

is from such a perspective that one can see how it is

that analysands come to be producing dreams in accord

with the theoretical stance of the analyst. It has long

been observed that clients undergoing Jungian analysis

dream in Jungian symbols, and those in Freudian analysis

in classical Freudian symbols. By realising the

inherent subjectivity of each Kelman hopes to arrive at

some more objective value-free appreciation of the

dream. Regrettably attention is devoted to the

'character structure' of the dreamer and its role in the

dream life, without regard for the part played in the

proceedings by the character structure of the analyst.

The basis of Kelman's methodology lies in seeing the

affair less as, the dream as question, the

interpretation as answer, but a technique whereby

> interpretation becomes...open ended
> questioning that furthers the patient's
> experience of his own processes(Knapp 1979
> p.352).

Brenneis on the other hand has turned to the manifest

dream in isolation from or in the absence of

associations from the dreamer and information concerning

the dreamer's life experiences. What inferences can one

draw from the manifest dream in such a situation? The

work has developed from a skepticism for assigning

motivational bases to dream content with any

reliabillity, because

> impulse and defence interpretations are
> infinitely malleable and can be made to fit
> any results(Brenneis 1975 p.199).

What one can do instead is to look for recurring

structures or patterns of organisation within the dream,

and from these infer the presumed ego modalities which

shaped them. The ego modalities are not said to imply

any intentional or conscious way of organising

experience. Rather they are those;

> persisting and recurring patterns of
> internalisations by which experience is
> formulated, organised, represented, and which
> appear in the manifest dream in nearly 'pure'
> culture form. They then have the quality of a
> structure(Brenneis 1975 p.202).

Brenneis then differentiates between abstractions at

the level of structure and abstractions at the level of

motivation. The hypothetical ego modalities are of the

former kind and interpretations the latter. This

distinction however is not as clear cut as Brenneis

would have us believe. If one concludes for example as

Brenneis does, that the more frequent appearance of

animals in men's dreams either as attackers or as

objects of attack "reflects ...an inclination for

structuring experience in predatory terms" then this ought to lead to important motivational inferences otherwise the finding is something of a red herring.

Brenneis moreover is still restricted by perceiving the whole sphere of active ego organisation of thought in classical Freudian terms of "a negotiation between instinctual demands and super ego pressures". This dichotomy is so much a cornerstone of Freudian theory that it seems to be accepted on faith alone. It would be interesting, were someone instead to start from a structural description of the psyche and use this as a working hypothesis and then try to deduce what properties dreams might have if they were derived from such a background.

III

Adaptive Functions of Dreams

The contention that dreams were best understood as a form of neurotic symptomology tended to impose an unfavourable attitude toward the belief that there are beneficial aspects to dreaming outside of the hypothetical function of redistributing psychic energy. Several of the more recent psychoanalytic commentators have sought to redress this, and some of these views will be discussed forthwith.

There is of course the possibility that even if dreams are associated with adaptive functions it is not

the consciously experienced dream that is important but
the underlying physiological and cognitive processes
which have as their consequence the experienced dream
and the observed beneficial effects. An analogous
situation exists concerning the status of visual imagery
as epiphenomenon in the field of human waking problem
solving activity(Paivio 1971). The author is however in
full agreement with Foulkes;

> In so far as one proposes dream functions at a
> level of consciousness and conscious self
> representations, it scarcely seems likely that
> the dream itself would not participate in the
> process of change(Foulkes 1981 p.42).

Numerous individuals(e.g Jung, Fromm, Adler, French,
Ullman, Faraday) have stressed the problem solving
function of dreams notably in the context of
interpersonal issues. Both French and Ullman(see Jones
1978) saw this occurring by means of the insertion of a
recent problem(focal conflict) into a network of
analogous historical problems and solutions. Supposing
however and this is not unreasonable to ask, there are
no successful analogous historical dramas? Might the
effects then be something other than beneficial?

These suggestions exhibit some similarity with
Freud's proposal that the day residue effects a
transference onto past psychic material concerning
unresolved infantile conflicts, as well as Foulkes'
recent contention that the dream serves to integrate

information between the episodic and semantic memory systems described by Tulving et al(1973). One could view the same ideas in terms of the levels of processing argument advanced by Craik and Lockhart(1972). In those proposals memory is seen as being hierarchically organised. The more important the information the deeper the level of semantic analysis it is subjected to. How far the theoretical constructs of psychoanalysis are addressable in the language of experimental psychology however remains to be seen but they are worthy of our notice if for no other reason than that a framework involving different levels for processing different kinds of information anticipates a core feature of the systems view of dreaming.

Adler(see Gold 1979) puts forward an extreme rationalist perspective on the function of dreams. Foremost in this is the belief that everyone is continually preparing themselves for the future, and this is as true a feature of dream life as it is of waking life. The dreamer can try out a variety of solutions to problems relating to past, present and future in a manner consistent with her/his personality. Jones(1978) has gone as far as to question whether Adler even took much time to remember his own dreams. Indeed many of Adler's remarks on the topic do lend credence to this assertion. He says for instance that "there is

nothing in the dream that actually violates what occurs in reality"(Gold 1979 p.329). In the light of this we must be sceptical in citing Adler's work to support the view that sleeping mentation carries over into wakefulness with positive consequences. It would be incorrect though to believe that Adler has made no valid contribution to the study of dreams. He has expressed the notion that there are no universal symbols in interpretation owing to the private nature of language use(see also Fromm 1951). He also concurs with Lowry in attributing to dreams the production of emotions which, when carried over into the day can produce adaptive results. Lowry also thought, like Jung, that the function of dreams was to maintain psychological equilibrium, although their descriptions as to how this is achieved do vary somewhat. Lastly the beneficial aspects of regarding one's dreams as an important form of communication to oneself have been stressed by Fromm(1951) and Faraday(1974).

IV

The Concept of the Self in Psychoanalytic Dream Psychology.

A final subject of consideration before we begin to pull together the diverse strands of thought which have been presented under the umbrella of psychoanalytic dream psychology will be the topic of selfhood as it

appears throughout the field of psychoanalysis. Freud's
tripartite division of the personality into Id, Ego and
Super Ego can be viewed as a description of different
selves within the person arising developmentally from
one another. Later formulations in terms of 'Object
Relations Theory' attempt to bridge the gap between this
individualistic model of the self and social reality.
By a process of internalisation of significant others
early in life, the personality or construed personality
characteristics of these others come to be embedded
within a 'self matrix' so that the original self comes
to relate to these other aspects of self as part
objects(Brown 1962). Implicit in such a description is
the idea of a true or real self which is in some sense
bound by the strictures of a social self.
Heidegger(1962) managed to employ this concept in a way
which avoided the reification of the self, i.e its
turning into something with merely objective properties.
His examination of authentic and inauthentic being with
others stresses the active nature of the self; how the
self is construed from(is dependent upon) ongoing human
activity.

Numerous writers have been very much preoccupied with
the relationship between real and social self.
Laing(1960) charts the course of development as a
negotiation between real and social self seen in terms

of increasing alienation and fragmentation, not just in

the mentally disturbed. Kohut(see Mollon 1981) views

development in terms of the construction of a cohesive

sense of self.

These conceptions of self are open to a number of

criticisms. Novaks(1970) explores the existential split

between self and world which language imposes; in as

much as we believe in an inner core of selfhood beyond

and apart from the outer world.

> The grammatical subject 'I' persuades me to
> imagine an isolated conscious me over here,
> previous to interaction with the world out
> there, where as what seems to be the case in
> fact is that a network of relations to the
> world is what constitutes the self..The self
> has no pure identity..it is constituted by
> activities in engagement with the world(Novaks
> 1970 p.55).

For Novaks then the self is an abstraction, a theme

running through conscious(unconscious) directed

behaviour. The themes from within our behaviour reflect

the themes from within our consciousness. If we view

the self as just one of many possible points of

orientation in the world, then the psychoanalytic

distinction between internal selves as subject and

internal selves as object obscures ourselves from

ourselves. Smail (1981) reminds us that there are a

number of dangers inherent in any attempts to describe

the self.

> Almost any description of the self becomes a
> kind of psychological diagnosis. The trouble

with the idea of the self is that it tends to
exhaust the meaning of what it is to be a
person: it's impossible to think that a person
could be more than himself...by identifying
persons with describable selves we turn them
into objects and paralyse them(Smail 1981 pp
3-6).

V

Conclusion

So how are we to appraise the psychoanalytic theory

now? Clearly there are many lessons to be learnt from

its study which will be of lasting value for any

subsequent attempts to understand dreams. First of all

let us summarise in what ways it is unsatisfactory.

1. One wonders how such a framework could function in

any kind of a scientific manner without recourse to some

method of collecting observations which can do more than

simply confirm the original views(Popper 1963).

2. Following from the above, the wish fulfillment

hypothesis has survived as a concept within the

psychoanalytic literature despite the many indications

from outside the field that it is obsolete as an

explanatory concept.

3. The theory is founded on outdated notions of what

constitutes legitimate scientific activity. It is the

manner of an explanation that is important not simply

the language of its content.

4. It needs to be said that scientific dream psychology

will be better served by those willing and able to free

themselves from their theoretical shackles. It may well be the case that the resistance to the testing of their ideas is historically embedded within the psychoanalytic movement. Perhaps this is due in some ways to Freud's own personality, as well as the social, moral and scientific climate present at the time of the theory's inception. Maybe the analysts realise this themselves, and that is why so many interpretive approaches flourish and continue to flourish. How can we hope to explore and open up ourselves using theories and methods which are themselves closed to further evolution and development?

From the systems perspective the positive aspects which the theory embodies are;

1. The mind as a whole is conceived of as a network of communication between a variety of subsystems. To Freud these are the conscious, preconscious and unconscious. In Jung's work the division is between the conscious and the personal and collective unconscious. Brenneis developed Erikson's(see Jones 1978) concept of psychosocial modalities into that of ego modalities which are postulated to underlie or be reflected by certain recurring patterns within the manifest dream content. To be of use Novaks and Smail remind us that such structural conceptions of the psyche need to be balanced by stressing the qualities of relationship

between the person considered as a whole and the world outside.

2. The idea that the transformation of information from one psychic state to another(i.e from the unconscious to the conscous mind) follows a lawful pattern(Freud).

3. That structural features of dreams(representability of elements) may be understood by reference to a set of non-conscious psychological processes(Freud, Jung and Brenneis).

4. Point 3. above relates to the importance which the concept of 'pattern' has, within both individual dreams(Freud) and over whole series of dreams(Jung, Brenneis).

5. Freud's theory (albeit unsuccessfully) posits isomorphisms between different levels of explanation(topographic v economic). It implicitly recognises that some of the dream's content can be understood via a knowledge of its symbolic referents but that the fact of the dream's existence must be explained at another level of discourse.

The last five points are reason enough for the theory to continue to enjoy a strong influence. However in its present form it is untenable as a satisfactory base from which to explain dreams.

Let me wind up this discussion with two quotations. The first, some sobering advice from Jung.

..we know so little about the psychology of
the dream process that we must be careful when
we introduce elements foreign to the dream
itself into its explanation(Jung 1938).

And the last word we shall leave with Laing.

The greatest psychopathologist has been Freud.
Freud was a hero. He descended to the
'underworld' and met there stark terrors. He
carried with him his theory as a medusa's head
which turned these terrors to stone. We who
follow Freud have the benefit of the knowledge
he brought back and conveyed to us. He
survived. We must now see if we can survive
without using a theory that is in some measure
an instrument of defence(Laing 1960 p.25).

CHAPTER FOUR: NEUROPHYSIOLOGICAL THEORIES OF DREAMS

One mystery alone remains
Of my beloved's sleep:
We've solved the movement of her eyes
And why they do repeat,
We know what brings her breath in sighs,
We've tracked her EEG.
The haunting doubt that still remains
Is does she dream of me?

Milton Miller and Charles C. Thomas

Introduction: REM Sleep and Dreaming

Most of our current knowledge about sleep is owed to
the use of electroencephalography, a technique for
measuring the electrical activity in the brain. The
discovery of a way to analyse the electrical properties
of neurons is usually credited to Ralph Berger, though
parallel work along the same lines was being pursued by
E.D. Adrian. Among the first findings to be made with
the new technology was that the activity emanating from
the brain was not random and in fact could be detected
from anyone. Before long came the discovery of
the alpha rhythm. From this, work led to measurements
being taken from the brains of sleeping as well as
waking subjects. This revealed that contrary to popular
opinion sleep is not a unitary steady state. It has
since been revealed that it can be broken down into a
number of quite different stages, each defined
predominantly by reference to the brain's electrical

activity. These are referred to as stages W(for
wakefulness), 1, 2, 3, 4 and REM. Collectively stages
1-4 are referred to as NREM(non-rapid eye
movement)sleep.

The principal concern as we come to discuss the
theories of dreaming based upon the neurophysiology of
sleep will be stage REM. This is defined as a
relatively low amplitude mixed frequency E.E.G
accompanied by irregular bursts of rapid eye movements.

Probably the most well known fact about REM sleep is
its association with human dreaming. This came to light
when Aserinsky and Kleitman(1953) discovered that if
people were awoken from this stage of sleep they were
very likely to report having been dreaming. In fact an
awakening from REM sleep is something like 80-90% likely
to produce a dream report. This finding led to a great
deal of confusion about dreaming which still abounds
today. The idea arose that REM sleep is synonymous with
dreaming sleep. Fiss(1979 p.21) for example referring
to Aserinsky and Klietman's work speaks of "a phenomena
that has lain dormant(by which he means
dreaming)...suddenly becoming real and measurable".
Throughout the scientific literature today one can still
find quite respectable and eminent scientists making
this same error. The Nobel prize winner Francis Crick
being amongst them(see the subsequent discussion of

Crick's theory). Suffice it to say at this point that the mistake is a wide one.

So what are the reasons for refuting the REM sleep=dreaming sleep equation? Somewhat surprisingly the main evidence to contradict this assertion has been around a long time and is very well known. In 1960 David Foulkes decided to investigate more closely what mental activity might be occurring during the NREM sleep stages. In the course of their work Aserinsky and Kleitman had asked their subjects simply whether or not they had been dreaming. On the basis of a pilot study Foulkes reasoned that not all cognitive and perceptual phenomena occurring during sleep would be labelled by subjects as dreams; the subject would deem many experiences as being unworthy of reporting. Foulkes therefore asked his subjects whether "anything had been passing through their mind" rather than simply asking the loaded question of whether they were dreaming or not. Under these conditions markedly high rates of reporting from NREM sleep were obtained in comparison to those in previous studies(74% cf 4%). He concluded that "reportable mental activity is always present in the sleeping human"(Foulkes 1962 p.23). Work done since this time has tended to find NREM report rates to be between 20 and 60%(Foulkes 1978). Foulkes in fact draws attention to work dating from 1943 which concluded from

E.E.G studies of sleep that "dreams may occur in association with any type of sleep potential pattern"(Teplitz quoted in Foulkes 1962). It seems that in the haste to simplify matters a very misleading picture has been painted by the scientific community. Foulkes and others have gone on to compare the nature of the REM reports with the NREM reports. On the whole REM reports tend to be more vivid, bizarre, well organised and affective. NREM reports on the other hand tend to be more 'thoughtlike' and poorly organised.

What we are entitled to say from the work mentioned thus far is, that awakenings from REM sleep are more likely to give us dream reports of a vivid visual nature, but that dreaming does occur in other phases of sleep too, albeit less frequently. More attentive researchers recognising that the EEG is chiefly a more reliable technology for obtaining dream reports in comparison to other methods are becoming more accustomed to referring to the outcomes of their studies as pertaining to REM dreams only and not to the universal class of all dreams. Of course what has been learnt may often be just as applicable to NREM dreams as well. However it is better that any generalising be done explicitly rather than implictly.

In this chapter I wish to consider the two theories which have been put forward from the field of

neurophysiology which claim to account for the phenomenon of dreaming. These both rank as being very recent in the history of dream psychology. The first, the 'Activation Synthesis Model' proposed by Hobson and McCarley dates from the 1970's and the second, Crick and Mitchison's 'Unlearning' theory, made its first appearance in the summer of 1983.

1. The Activation-Synthesis Model of Dream Generation

In the course of a single night the sleep stages succeed one another in a fairly orderly cyclical pattern. Several features of this pattern regularly stand out.

A. NREM sleep always precedes REM sleep.

B. Stage 3 and stage 4 sleep tends to occur much earlier in the night; later sleep cycles consisting of alternations between REM and stage 2.

C. As the night progresses the length of time spent in each period of REM sleep becomes progressively longer. The early period usually lasts in the region of 6 or 7 minutes compared to a time of 45 minutes to an hour for the last one.

Hobson and McCarley list their principal theortical aims as;

1. To explain how the time course of this cycle is regulated.

2. To propose mechanisms for the formal universal

aspects of dream construction for which there are
plausible matches with the physiology of REM sleep(they
refer to this as the 'D state'). They acknowledge that
they are not attempting to suggest mechanisms for all
aspects of dream construction.

Their adopted research strategy has been to;

> ..look for possible matches between D state
> physiology and dreaming, to seek isomorphisms
> of similar form between the mental and
> physiological domains during dreaming sleep.
> We do not assert the primacy of either, nor do
> we assert that events in one domain cause
> events in the other. They represent different
> conceptualisations(Hobson and McCarley 1979
> p.77).

The model they propose to achieve their first aim
hypothesises the reciprocal interaction between three
structures located in the reticular formation near the
apex of the brain stem; the Pontine Reticular
Formation(PRF), the Locus Coeruleus(LC), and the Raphe
Nucleus(RN).

It is postulated that the pattern of the sleep cycle
is a result of the waxing and waning of giant cell
activity in the Pontine Reticular Formation. Activity
becomes maximal during REM(D)sleep as a result of
decreasing influence from the locus coeruleus and raphe
nucleus. When active these cells(LC and RN) normally
inhibit giant cell activity. The dampening down of the
LC and RN cells arises from the the recurrent negative
feedback that each population of cells has upon itself.

Following this disinhibition and the concomitant activation of the pontine cells(resulting in REM sleep) positive feedback of the giant cells onto the LC and RN cells ensures that giant cell activity will once more be decreased and REM sleep eventually give way to NREM sleep. Three main neurotransmitters have been implicated in this process. The locus coeruleus and raphe nucleus cells have been found to exert their influence by releasing nor-adrenalin and serotonin respectively and the giant cells by means of acetyl choline. Experiments involving the injection of these chemicals into animals has been found to produce many of the characteristics of the sleep cycle(Vivaldi, Hobson and McCarley 1978).

The interaction between the FTG cells and the populations of REM suppressing cell groups(RN and LC) has been modelled mathematically using the Volterra-Lotka equations(McCarley and Hobson 1975) which have normally been applied to the reciprocal interaction effects between populations of predators and prey. The reciprocal interaction model has thus undoubtedly contributed a great deal to our understanding of the cyclical nature of REM sleep. Having now reviewed how Hobson and McCarley account for the temporal dimensions of REM sleep, attention will be focused on the more relevant issue of how the activation-synthesis model

accounts for the construction of dreams within the 'D

sleep' state. This contends that the¦

> ...principal elements of dreams derive from a
> synthesis of information generated by
> activation of motor pattern generators and of
> sensory systems(Hobson and McCarley 1979
> p.112).

Evidence of both a qualitative and quantitative

nature is offered in support of this. First of all

several features of dreams are suggested which could

accord with known physiological activity during REM

sleep. These are noted below.

A. Examples were provided of several dreams in which

one sensory form predominated. These covered a number

of different modes including visual, auditory, and

several in which the predominant sensory form

experienced was of whirling and spinning around. This

latter type was related to evidence of vestibular system

activation during REM sleep. As this latter example is

one in which the sensory form is one rarely experienced

during the day it may be said to provide circumstantial

evidence in favour of internally generated sensory

stimulation as being the basis from which dreams are

constructed as opposed to them originating from a memory

or day residue.

B. The presence of repetitive motoric behaviour in a

number of dream reports was cited as evidence indicative

of motor pattern generator activity.

C. The presence of abrupt scene shifts in dreams was
related to phasic pontine reticular cell activity and
the suggestion was made that separate dream sequences
co-occur with transitions between the activation of
different motor pattern generators or sensory systems.

D. Dream bizarreness it was suggested might arise via
the simultaneous combination of internally generated
sensory activation and behavioural sequence activation
that is rarely met with in waking life.

Quantitative examination revealed;

A. The frequency with which different sensory modes
were found to occur in the dream reports corresponded to
the order of intensity of activation of the brain nuclei
related to these modalities(McCarley 1981). The rank
order of predominance was visual followed by auditory,
vestibular, taste, touch, and temperature(cold).

B. The scoring of lower extremity movement in dreams
indicated a high proportion(80%) of dreams in which
motor activity was present. This is consistent with the
activation synthesis hypothesis that the activation of
motor pattern generators underlies dream construction.

The final steps in the process of dream construction
involve the integration of information from the sensory
and motor systems with information concerning the
current affective state and past experiences of the
dreamer.

Appraisal

At first sight it would seem that a quite reasonable objection to these proposals would be that they cannot account for the meaningful nature of dreams. No matter how sophisticatedly one puts together the facts one cannot conjure a semantic content from the activity of neurophysiological substrata. However Hobson and McCarley do not claim this. They note that the meaningful intepretation of dreams are not contradictory to the activation-synthesis hypothesis.

> This hypothesis suggests only that the first temporal event in dream formation is activation of sensory/motor systems and that idiosyncratic and personal elements in the dream are the ones later retrieved from the dreamer's memory because they most closely match the input from a motor sequence or sensory activation(1979 p.116).

What has not been considered however is that activated memorial contents could determine which sensory/motor pattern systems would be activated and that this would still produce the isomorphisms observed between the psychological and physiological domains.

One must have slight reservations about some of the hypotheses. For instance the notion that pontine reticular activity is related to transitions between scenic contents in dreams, whilst interesting, is extremely difficult to prove either way. As it is the evidence of the nature of this activity comes from physiological recordings from animal brains. Whether

this relates to human dream construction is surely dependent upon the belief that animals dream. The evidence for this (as we shall see in the next chapter) is not convincing. Overall then a number of points are worth keeping in mind.

1. Dream construction is envisaged as a process involving several levels of information processing(from activity at the neurophysiological level through to activation of personal and idiosyncratic memorial contents), although an interaction between these levels to produce a dream has not really been considered.

2. The suggestion that structural changes in dream content mirror transitions between underlying information processing subsystems.

3. The distinction between the form and content of dreams. It is the view of Hobson and McCarley that it is the form of dreams that dominates their content rather than it being the various contents which shape the form. This implies some hierarchical decision procedures, whereby the selection of contents for inclusion in a dream depends upon the prior determination of its form.

4. The main weakness it must be said concerns the fact that this is a theory of REM dreams. If dreams were only to occur during REM sleep then this wouldn't be a problem. However as we have seen, dreaming is not

restricted to the REM phase. A critical test would be the extent to which the conglomerates of physiological activity purported to be involved in dream construction are also evident during NREM sleep. If activity thought to underline aspects of dream content cannot be demonstrated during NREM sleep whilst the presence of NREM dreams possessing these features can be clearly shown, then modification of the theory will be required.

2. The Unlearning Theory

In July of 1983 Francis Crick better known for his role in elucidating the structure of D.N.A, together with Graeme Mitchison published an article in the journal 'Nature' entitled 'The function of dream sleep'. According to the previous week's issue of this journal it purported to explain 'Why do we dream'. The result of this article was a debate in which the new theory was greeted with widely differing opinions as to its merits. As is usual with the topic of dreams the attention of the popular press was attracted. Consequently several largely uncritical reviews appeared. The reviewer in the Guardian Newspaper(Veitch 1983) remarked that the theory was "likely to arouse only marginally less excitement than Sigmund Freud's interpretations". All in all quite a stir was made.

What may be considered unusual about the development

of the ideas contained within the original article is
that neither author appears to have spent much time
collecting any dream material. Furthermore they admit
that the ideas themselves are not testable. Sympathetic
commentaries(see New Scientist 28th July 1983 p.266) go
further and even admit that it has no direct evidence in
its support.

How odd that a set of untestable ideas with little
supportive evidence and what is more, produced, as will
be seen, by workers who appear unfamiliar with the
existing body of knowledge in that field, should gain so
much attention and credence.

Why this could happen is a point I shall return to
later. This can only be done once the main purpose;
that of reviewing Crick and Mitchison's hypothesis, has
been carried out.

In the discussion which follows the main points in
Crick and Mitchison's model will be numbered and
highlighted, and each of these followed in turn with
contrasting comments of the author's drawing attention
to the weaknesses in the arguments presented.

Dialogue: The Theory

The paper presented in 'Nature' begins by advocating
a new explanation for the function of REM(rapid eye
movement) sleep, which we are led to believe is the same
as 'Dream sleep'. Hereinafter virtually no reference is

made to Dream sleep. This hypothetical function is said to be the removal of certain undesirable modes of interaction in networks of cells in the cerebral cortex. By so doing, it is postulated, the brain maintains its efficiency as a mechanism for the storage and retrieval of information. Prior to elaborating on this, an outline is given on what is known about REM sleep. As this section of their paper provides the basic data to which the later ideas conform, it plays a crucial role. As it is also a source of inaccuracy and misunderstanding, it is worth a close look.

1. Crick and Mitchison claim that a;

> ..major difference between REM and NREM sleep lies in the dreams associated with them. For most people the few dreams found in NREM sleep tend to have a rather thought like character. During REM sleep on the other hand dreams occur more frequently and usually have a perceptual vividness and the illogical episodic character with which we are all familiar (p.112).

It is hardly true to claim that few dreams are found in NREM sleep. Admittedly average rates of recall at 20-60% are less than for REM sleep(80-90%), but this could hardly be deemed infrequent, and in fact the highest rates of dream recall are associated with the hypnagogic period(sleep onset) which is by definition a period of NREM sleep(Foulkes 1962, 1978). The distinction between typical REM and NREM dreams was called into question by Antrobus et al(1981) who

suggested that the difference is merely artefactual,

seeming to disappear as the number of nights from which

awakenings are made increases.

2.   Crick et al go on to say that;

> Since the majority of dreams are not
> remembered that function(i.e the REM sleep
> function) is more likely to be associated with
> the unconscious dreaming process- that is,
> with REM sleep without awakening rather than
> with the few dreams which are recalled(p.112
> brackets mine).

Examination of the above reveals that an assumption

is made that the function of REM sleep is only carried

out if in some way one does not remember what one has

dreamt. This would be logical only if it was true that

in recalling one's dreams one also interfered in some

way with the beneficial results of the earlier process.

No evidence is offered in support of this idea, rather

somewhat cheekily this 'information about REM sleep' is

used to prop up the later contention that dream recall

is detrimental to the purpose which REM sleep serves!

One could also take issue with the assertion that the

majority of dreams are not remembered.   At the very

least this is a culturally biased statement, at worst

unverifiable.   As the only criterion for a dream having

occurred is a verbal report that one has dreamt, one

cannot say too much about whether a dream has actually

been occurring in the absence of this.   In other words

one cannot use other criteria such as the incidence of

REM sleep to ascertain that someone has in fact been dreaming. Malcolm made this point in 1959. It ought not to have escaped attention.

3. Following the review of material relating to REM sleep, the article proceeds with the substance of the new proposals;

> The mechanism we propose is based on the more or less random stimulation of the forebrain by the brainstem and will tend to excite...inappropriate modes of brain activity, and especially those which are prone to be set off by random noise rather than by highly structured specific signals. We further propose a reverse learning mechanism that will modify the cortex in such a way that this activity becomes less likely in the future. For example if a synapse needs to be strengthened in order to remember something then in reverse learning it would be weakened. Put more loosely we suggest that in REM sleep we unlearn our unconscious dreams. We dream in order to forget(p.112).

The inappropriate modes of brain activity referred to, have as their correlates far fetched or bizarre associations(fantasy), obsessions and hallucinations. Thus we are led to infer that in the absence of this 'unlearning' process these 'parasitic modes of activity' as they are described may prevail in waking life. It is acknowledged that there is little evidence for this, but Crick and Mitchison attribute this to the fact that more prolonged REM sleep deprivation experiments have not been done.

Schatzman(1983) argues that it is difficult to reconcile the view that the purpose of REM sleep is to suppress spurious memories and parasitic thoughts with the evidence that dreams can display solutions to waking life problems. Great artistic and scientific achievements have resulted from dreaming. We have already seen Robert Louis Stevenson and Kekule mentioned in this context. There are a host of others; Coleridge, Sherrington, Loewi, Tartini. Haber and Erdelyi(1967) as was mentioned in chapter three, have shown that these far fetched and bizarre associations have actually been shown to aid in the recovery of previously inaccessible information from memory. More recently(Lewis and Glaubman 1975, Glaubman et al 1978, Hicks et al 1980) evidence has been provided that suggests that this type of thought enhances and promotes creative thinking. The evolutionary value of a process which actively promotes creative and flexible thinking is undeniable, and would also seem to offer some reason as to why peoples of all cultures have been remembering and sharing dreams for so long.

The belief that dreams are based upon random stimulation has been held in the scientific community for so long now(not usually may I say by

people who have taken the trouble to study dreams),
that dream researchers must despair of ever
convincing their colleagues otherwise despite the
overwhelming evidence to the contrary. Let me
briefly summarise some of this.

a. Freud(1978) demonstrated fairly acceptably that
dreams are meaningful creations of the human mind.
Numerous psychotherapists of a variety of
persuasions have subsequently verified this.

b. Kramer et al(1976) established under laboratory
conditions what has also been known by
psychotherapists for many years; that the dreams of
a single night are related(see also Offrenkrantz
and Rechtschaffen 1963) and furthermore that people
dream in consistent and verifiable styles over long
periods which can be distinguished from those of
other individuals.

c. The phenomenon of recurring dreams makes it
very hard to envisage dreams as resulting from any
kind of random stimulation. In a similar vein the
recurrence of themes and images, both within a
single dream and over several dreams would also
make it extremely difficult to envisage dreaming as
a random process.

   Crick and Mitchison's rather weak answer to the
question of recurrent dreams is that they are

dreams;.

> ..which for one reason or another tend to wake
> up the sleeper, perhaps because of the anxiety
> associated with them. This will have the
> effect that the learning process changes sign,
> passing from reverse learning to positive
> learning, so that the underlying spurious
> associations remain, and so a similar dream is
> likely to occur on some later occasion(p.113).

This therefore implies that even recurring elements of a dream must in some sense exhibit a tendency to wake up the sleeper. The presence of an image or theme several times in a single uninterupted dream would therefore falsify this hypothesis. I have observed this in my own collections of dreams on several occasions. However if in doubt a perusal through the many dreams collected in the course of dream research over the last thirty years would reveal numerous other instances of this as well. If as is being held here, awakening should increase the likelihood of the reinforcement of those modes and patterns of thought which the dreaming process is functioning to weaken, we can justifiably ask why it is that a sleep pattern has evolved in which the longest REM period of the night occurs at the termination of the sleep period. Would nature really provide such a wasteful pattern of sleep?

4. Nowhere in Crick and Mitchison's article do they cite any dreams they have collected themselves. Neither do they make reference to dreams collected in the course of other studies. They thus appear to develop a dream

theory which makes no reference to any observed features

of dream life. This becomes more understandable with

their final coup de grace, as it were, by suggesting

that;

> In this model attempting to remember one's
> dreams should perhaps not be encouraged
> because such remembering may help to retain
> patterns of thought which are better
> forgotten. These are the very patterns which
> the organism was attempting to dampen
> down(p.114).

Presumably remembering other people's dreams is

detrimental also and that is why the authors don't

bother to mention any. If as Schatzman(above cit)

reminds us this theory were true, and the advice offered

valid, then much psychotherapeutic practice and many

people's habits of recalling dreams would need to

change. To return to Schatzman once more;

> However, there is no more reason to accept the
> advice than to believe the theory. Studies on
> the differences between dream recallers and
> non-recallers do not reveal any characteristic
> symptoms of mental disorder in recallers(above
> cit p.797).

We might also add that if one does not actively try

to remember one's dreams and if the unlearning process

does occur concomitant with REM sleep, then why is it

that we often recall a dream much later in the day

contingent upon the chance occurrence of a suitable

internal or external cue? As such remembering may occur

several hours after the cessation of dreaming, without

any effort having been made to recall a dream, this

strongly challenges the view that dreams are wiped clean

from the slate unless immediately recalled on waking.

One must be careful not to equate the low availability

of cues for recall whilst in the waking state with the

view that the dream has been forgotten. As dream

recallers and hypnotists alike will testify, dream

recall is a state dependent phenomenon.

Appraisal

This theory has been misconceived from the outset.

There is already in existence a substantial body of

knowledge which contradicts flatly all of the

assumptions upon which the theory is premised.

1. It is falsely based on the notion REM sleep and

Dreaming sleep are synonymous. The incidences of dream

recall outside of REM sleep earlier referred to(20-60%)

indicate that REM sleep cannot be seen as a necessary

condition of dreaming.

Studies of children's dreaming over the age range

5-15(Foulkes 1982a) has led to the conclusion that at an

early age REM periods may be "largely empty of those

organised experiences we call dreams". This together

with critiques of the few investigations which have

directly faced the issue of whether animals dream(it

seems likely they do not possess the requisite cognitive

skills to do so, but see chapter five for further

discussion of this), suggest that besides REM sleep not

being a necessary condition of dreaming, it is not a sufficient condition either. This leaves Crick and Mitchison's theory in a similar predicament to a house built from a pack of cards, with the bottom card having just been removed.

What has been exposed here is that there never were any grounds for equating REM sleep with dreaming. I have made this point at the beginning of this thesis, but it is worth emphasising again because it is so important. REM sleep is a physiological state defined by various indices of physiological activity(E.E.G, E.O.G, E.M.G). Dreaming on the contrary is defined by reference to a quality of experience, characterized by phenomenology not physiology. As such it belongs to an entirely separate conceptual domain than any physiological state defined on a non-experiential basis.

The reasons why scientists have for so long continued to ignore this difference owes much to the way in which scientific thinking has relegated human experience to the second division of empirical data. What seems to count as real data is that which can be accomodated easily within mechanistic models, with all traces of any 'subjective' elements removed. In the Crick and Mitchison model this is achieved by giving greater credence to machine simulations of physiological processes(Hopfield et al 1983) and data from non-human

animals than to the wealth of material provided by human

beings which makes a nonsense of the new theory.

2. Crick and Mitchison's work really has nothing to say

about dreaming. It is a theory about the function of

REM sleep with implications for the construction of

artificially intelligent machines. If that was all it

was, then there would be little room for argument.

However throughout it trades upon a spurious association

with dreaming that is not warranted and through which it

has gained considerable attention rather than upon its

own merits.

3. The systems perspective postulates a set of

non-conscious cognitive processes underlying the

experience of a dream on the conscious level. It cannot

be said with any veracity that the theory just reviewed,

for all the hullabaloo with which it was greeted,

contributes anything to a knowledge of what these might

be or how they might operate. None of the criteria for

a satisfactory theory of dreaming outlined at the

opening of part two have been met.

Conclusion: Physiological Dream Theories

The two theories we have reviewed are somewhat

different in character. The activation-synthesis model

adopts an approach which is more attuned to the goals of

general systems theories. The systems scientist

Sutherland(1975) tells us should "explicitly search for

isomorphisms amongst the universe of phenomenon"(1975 p.4). Hobson and McCarley consequently exhibit a respectful stance to that data on dreaming which exists purely on the psychological level. The Crick and Michison proposals however show little awareness that there is a manifest structure and content to dreams that is not detectable at a lower level of abstraction.

Regrettably the erroneous belief that there exists a perfect correlation between dreaming and REM sleep which somehow makes them synonymous is still widely held by those who proffer explanations of dreaming at the sole level of neurophysiology. Just as Freud was unclear about the level of explanation one should adopt in a theory, so too are many contemporary workers. Some dream psychologists are beginning to exhibit impatience with this. Foulkes pulls no punches.

> Until neural sciences comprehend the myriad
> everyday miracles performed by our mind/brain,
> psychology shall have to go it alone, and hope that
> in the process, it can broaden the perspectives of
> brain theory to the point where such theory meets
> psychology halfway in its quest for reasonable
> psychophysiological correlations(Foulkes 1978
> p.107).

Even in the 1930's Lashley told us that;

> Psychology today is a more fundamental science
> than neurophysiology. By this I mean the
> latter offers few principles from which we may
> predict or define the normal organisation of
> behaviour, whereas the study of psychological
> processes furnishes a mass of factual material
> to which the laws of neural action in
> behaviour must conform(quoted in Foulkes 1978
> p.107).

Any theory of dreaming which derives from the field of neurophysiology needs to recognise the emergent properties which arise when one moves to the psychological level. To their credit Hobson and McCarley can be excused this criticism. Crick and Mitchison most certainly cannot.

CHAPTER FIVE: COGNITIVE THEORIES OF DREAMS

My thoughts arise and fade in solitude,
The verse that would invest them melts away
Like moonlight in the heaven of spreading day:
How beautiful they were, how firm they stood,
Flecking the starry sky like woven pearl.

P.B. Shelley

Given that we are only ever dealing with reported
experiences after they have occurred and that dreams
themselves are elusive: one might be forgiven for
wondering how one could ever propose in any detail the
steps by which the brain manufactures them. In fact the
question as to how exactly the brain goes about this was
for a long time put to one side. The paradigm for dream
research provided by Aserinsky and Klietman led to the
scientific study of dreams being "one of the few fields
where the accumulation of data has preceded the
expounding of theory"(Hursch 1973 p.363). In fact
Hursch noted in 1973 that a formal theory(i.e one which
was testable) of dreaming was long overdue. At that
time however the field of cognitive psychology was still
in its infancy. Only six years had passed since the
publication of Neisser's seminal 'cognitive
psychology'(Neisser 1967). This work revitalised the
study of human cognitive processes and placed dreaming
firmly in its realm. He suggested that the processes

responsible for ordinary perception are also responsible

for the vivid visual properties of dreams. The apparent

realness of dreams however he concluded were not due to

its visual properties.

> ..hallucinating schizophrenics, like many
> dreamers believe completely in the reality of
> images which are quite indistinct; voices
> heard only as rumours, or faces seen only as
> blurs. They also disbelieve in the reality of
> things that they see very well...Reality
> testing is not primarily a matter of clarity,
> it involves questions of coherence,
> predictability and sensibleness. Dreams and
> schizophrenic hallucinations seem real because
> there are questions which dreamers and
> lunatics do not ask(1967 pp 150-151).

With the benefit of hindsight it can be wondered why

there should have been any confusion between imagining

and perceiving. Sartre(1948) had given ample

phenomenological descriptions of imaginative

consciousness to avoid the confounding of images with

perceptions. In as far as perception and images(waking

and dreaming) were argued to be the outcome of

constructive cognitive processes and not merely

passively formed copies of real world objects and/or

events, it is probable that this similarity prohibited

Neisser from realising that the nature of the processes

in perception are necessarily anticipatory(and

consequently any perception can in theory be refuted.

Witness for example the Ames series of experiments in

which they frequently are!) whilst the information and

relationships expressed by means of an image are already

known. Neisser's prior statement might then be more

appropriately expressed as 'Dreams and schizophrenic

hallucinations seem real because_∧ in themselves they do not ask

questions!'. Perhaps if we remember that psychology was

barely out of the stranglehold that behaviourism had

imposed on the discipline for so long, the error

concerning images and perceptions can be more easily

understood.

In the last two decades a number of cognitive

theorists have propounded a variety of opinions and

perspectives on the means by which dreams arise. We

will consider four such theories here.

1. The Computer Theory.

2. The Cognitive-Symbolic Model.

3. The Cassette Theory.

4. The Personal Construct Model.

The first of these, the computer model, in fact owes

its origins more to developments in computer science

than to those in experimental psychology, although

computer simulation of psychological processes has now

become a recognised aspect of cognitive psychology.

Evans' theory is undoubtedly a novel and far sighted

one. It is this which will be discussed first.

The Computer Theory of Dreams

This was first advanced in 1964 and further revised up

until Chris Evans' death in 1979. Evans and

Newman(1964) began by proposing an analogy between the operations of computers and human brains. They noted that as computer programs are developed and improved so as to give better performance, old unwanted instructions still remain which with increasing development begin to clutter up the program. This cluttering up of a program leads to decreased flexibility and efficiency of processing. In order to combat this the old instructions are 'cleaned off' during the off-line periods when the computer is no longer engaged in any tasks. Perhaps, argued Evans and Newman those programs instantiated by the brain also become inefficient as old routines and procedures are modified and updated. Sleep then could correspond to those regular off-line periods for humans with dreaming being the psychological correlate of the revision, rechecking and resorting of old programs. Some of these programs may be particularly concerned with interpersonal situations and relationships. The great deal of bodily activity taking place during sleep may be a sign of muscle movement programs being run. Programs might also deal with very specific aspects of the material stored in the brain. For example;

> All events concerned with bicycles or spoked
> wheels may be the subject of a special program
> and ipso facto a dream(Evans and Evans 1983
> p.169).

1. The first stage in the proceedings might involve the inspection of recent information and, if it was deemed to be important, its subsequent transfer into long term storage for addition to our database of knowledge in a particuar area.   There would be obvious advantages in carrying this out when sensory input was reduced to a minimum and the new input could be scanned without interuption.   Evans describes a dream thus as a momentary interception by the conscious mind of material being sorted scanned and transferred into long term storage.   Hallucinations resulting after sleep deprivation could then be envisaged as a 'spill over effect', a desperate attempt of the sorting mechanism to do its job while the individual is still awake.

2. Besides updating the information on which our programs are acting, as we gain in experience and our input gets richer and more diverse, we modify our programs rather than replace them with a fresh set.   In order to meet changing circumstances, it is hypothesised that a process of 'garbage removal' takes place similar to that necessary for the efficient functioning of modern computers.

   Evans goes on to refer to two sets of processes which constitute dreaming; Dream Type A and Dream Type B. Dream Type A refers to those processes which are ongoing through REM sleep and possibly throughout the whole of

sleep which remain untouched by consciousness and therefore never experienced. Dream Type B is a subset of those Type A processes which become modified by the imposition of consciousness. During these Type B conscious dreams the brain once more comes 'on line' and has a glimpse of the programs being run. It is to be emphasised that the logic which we impose on becoming conscious of this material is not necessarily the same as that 'internal logic' from which the brain operates. Dreams may therefore often appear senseless from the perspective of the conscious mind. Evans(1979) attempts to give us some indication as to why this is so by providing an example dream of his own. As this is most instructive for helping us to understand his ideas, it is reproduced below.

> I was conducting a fantastic experiment with some colleagues in the main cafeteria at the National Physical Laboratory which had become filled from floor to ceiling with water in which a great deal of fish of various shapes and sizes were swimming. By some device we quick-froze the water, thus locking the fish into a huge cube of ice, with the aim of studying the levels at which the fish had been swimming. The dream ended as we began to mark off levels on the icy wall of the cube(Evans and Evans 1979 p.168).

Clearly this possesses many of the characteristics of a typically strange dream. On reflection Evans noticed that the dream was connected to a series of incidents which had happened during the previous day or two all of which revolved around the theme of fish. These events

were

a. Having eaten fish for lunch.

b. Cleaning out a goldfish tank at home.

c. On watching television the previous evening, a
particular striking image had stuck in his mind from a
fish finger commercial.

> However implausible the concept, my brain had
> evidently considered it to be a significant
> new image and it had been pulled into a
> special program, which on the face of it,
> would seem to have been dealing with
> fish(Evans and Evans 1979 p.168).

Food for thought indeed! And yet despite the quite
striking appeal and power which these suggestions hold,
one cannot help wondering what semantic networks there
were revolving around Evans' brain at the deeper level.
One feels compelled to ask 'Yes but what do fish mean?'.

Appraisal

1. If nothing else this theory has a great deal of
intuitive appeal and does provide very plausible
explanations for some of the phenomenological aspects of
dreams, as well as the phenomenon reported in REM
deprivation experiments. However one does wonder if the
theory's appeal is more intuitive than pragmatic.

2. It cannot be said to outline a prospective program
of research with which it may be tested and refined,
although in the earlier presentation(Evans and Newman
1964), it did advance the hypothesis that in the case
where longer programs are being inspected and rewritten

an overall semblance of cohesion would remain from those

regions which have been left untampered with. Put more

simply, longer dreams could be expected to exhibit

greater narrative coherence. As far as I am aware there

has been no direct test of this hypothesis.

3. The question of the meaning behind dreams is I think

inadequately dealt with. The fish dream example does

give us some indication that at certain levels of

analysis the issue of meaning may be irrelevant. Many

dream researchers though have always accepted that the

syntax with which a dream is put together is a separate

aspect to that of the deeper meanings contained within

it. I think the weakness in the computer model in this

area is that it does not differentiate sufficiently

between different levels of meaning.

4. The theory is in its infancy and maybe if someone

can take up the mantle from where Evans left off these

criticisms will be met. Perhaps its virtue lies in the

fact that it is giving a very high level description of

the brain's activity when we dream, and at the same time

is providing us with a language with which to talk about

it. In so doing it is the first theory of its kind and

the first to contemplate dreaming as an interlocking set

of procedures for the handling and manipulating of

information.

A Cognitive-Psychological Model of REM Dream Production

This theory was first fully stated in 1982(Foulkes 1982b) although it has evolved from the work contained in a number of previous books and articles(Foulkes 1978, 1981, 1982a, Kerr and Foulkes 1981, Foulkes and Schmidt 1982) and is best understood by following its progression through these. In the cognitive-symbolic model several distinct stages to dream formation are proposed.

Stage 1.

Spreading disinhibition of relationships between concepts located in semantic memory.

This disinhibition simultaneously activates a number of semantically distant units. These units are coded in a propositional form to begin with(i.e events are represented in a form prior to visual or verbal coding). Indeed there is now a growing body of opinion which holds that all our knowledge of the world is propositionally encoded(Quillian 1969, Lindsay and Norman 1972, Pylyshyn 1972, Starling Reid 1974, Hanson 1978). Dennet(1981) confesses it is a harder task to specify what propositions are, rather than what they are not. However for the purpose of the present discussion I will attempt a definition. Propositions are structural or procedural forms of knowledge in which certain subject-predicate relationships are encapsulated

or realised. It may help to think of the process of constructing propositions as being procedurally isomorphic to what is being represented by them.

Foulkes postulates the activation of distant units in order to account for the diversity of dream content, there being, he believes, no single intention behind what we dream. I think Foulkes would agree that the manifest images are the wrong place to look for unity of intent. Free association is probably the best tool available for revealing the actual semantic units which are activated, though there are conceptual problems with this method. However diverse the revealed sources of a particular dream turn out to be, that is so, only from the vantage point offered by the conscious mind, which is not the same condition in which these sources were generated. Another consideration is that there may be a number of reasons for diversity of dream content other than the underlying intention. For instance some meanings may be expressed by elements selected from a readily available repertoire or set, whilst other meanings might not be so easily expressed and may need elements selected from several different sets.

Stage 2.

The spreading activation of distant units does not proceed on a random basis however, but rather owes much to the consideration of mapping certain semantic forms

onto suitable syntactic structures.

This entails a consistency of thematic content at a conceptual rather than a perceptual level. An illustration of this would be those instances where composite images appear in dreams(e.g A person appears in the dream who is a cross between say your father and your bank manager). They are typically an amalgam not of similar perceptual features, but of similar meanings through which they are both seen. Overall this is implying that the form of an ongoing narrative imposes certain constraints on what may follow. In a similar vein if someone were to decide to write further stories of Sherlock Holmes, for example, they would probably find it necessary to adopt the literary style of the original Conan Doyle stories. Foulkes' hypothesis entails a mutually continuous feedback between the various semantic forms and the structures through which they are expressed.

<u>Stage 3.</u>

These (semantic-syntactic) structures are now translated into linguistic form.

The role of a verbal code in the planning and production of dreams was first suggested by Foulkes in his book 'A Grammar of Dreams'(1978). He proposes that speech and dreams share some common production routines. The evidence to support this is impressive.

a. The parallels between the Chomskyan view of deep and surface linguistic structures and the Freudian distinction between latent and manifest content. Chomsky and Freud see language and dreams respectively as arising from the transformation of an underlying form to its surface form of representation.

b. In both dreams and inner speech the person is simultaneously both encoder and decoder.

c. The role played by the phonetic value of words(i.e the sounds they make) in dream imagery.

d. Congenitally blind people dream in the form of speech(Kirtley 1975).

e. The relationship between linguistic disorder such as aphasia(absence of language) and the presence/absence of dreaming. Moss(1972) who suffered a period of aphasia for several months reported a cessation of dreaming during this period. Greenberg and Dewan(1969) reported that people recovering from aphasia spent proportionally more time in REM sleep than those not improving.(nb Evans 1979, interpreted this finding from the perspective that patients who are recovering well would have more REM sleep time, due to the greater amount of neural reprogramming taking place. Of course in this instance the reprogramming taking place will be of a verbal nature, so it is not possible to say whether the increased verbal ability led to the increase in REM time

or whether the increased verbal ability was as a result of the increase in REM time or, whether there was even some interaction between these two possibilities.)

f. The presence of linguistically complicated speech in dreams.

g. As verbal thinkers and speakers we employ highly complex cognitive-symbolic operations which, it is suggested(Foulkes 1981, 1982a), is a necessary prerequisite for dreaming.

h. The experimental modification of dream content by verbal stimuli(Berger 1963).

Stage 4.

Translation of linguistic structures into images, sound and affects.

In separately published work(Foulkes 1981, Kerr and Foulkes 1981, Foulkes and Schmidt 1982), it is suggested that the imaginal/affective expression of the underlying verbal forms is mediated by processes originating from the right cerebral hemisphere. The left hemisphere being responsible for the verbal mapping of the disinhibited memory schemata(stages 1-3 above).

One implication of Foulkes' model and a position which he himself explicitly takes is that the cognitive prerequisites for dreaming are not possessed by animals, except perhaps in a rudimentary capacity in some primates. Many people will no doubt disagree with this

position, citing as their evidence the twitchings of paws and whiskers of a favourite pet as it lies snoozing in front of the fire. There are however very compelling reasons for accepting Foulkes' view.

A. Behaviour exhibited during sleep even in humans provides no evidence of the nature of any mental activity accompanying it. Furthermore sleepwalking and sleeptalking occur in NREM sleep which is less associated with the act of dreaming. In fact individuals awoken from bouts of sleepwalking do not report experiences in line with their real nocturnal excursions.

B. Foulkes(1982a) found very low report rates of dreaming in his investigations of childhood dreaming. For example for children aged between 3 and 5 years the mean report rate was as low as 27%. Foulkes' conclusion already referred to in this thesis was that the children's REM periods would be frequently 'empty' of the organised experiences we call dreams. The nature of the correlations between the dream report variables and those assessing a wide range of other cognitive abilities strongly suggested that the low report rates obtained could not be explained by reference to the children's verbal skills or unease within the laboratory situation(Schwartz et al 1978).

C. The nature of the dreams that children do report

change with age. Early dreams are very uneventful with a preponderance of static rather than moving images, as if the brain is not yet mature enough to manufacture these. The first figures to appear in their dreams are also more likely to be strangers, not because children are more likely to encounter strangers-just the opposite in fact. Once again the most plausible explanation is that the brain is unable to reproduce detailed representations of familiar people in dreams until a certain level of development has been attained.

In suggesting that animals(or at least most of them) do not dream, this is not to say that information processing of some kind is not taking place during their sleep, but rather that we are not entitled to attribute to animals the kinds of experiences which human adults are accustomed to having night after night.

Appraisal

This model has without doubt a great deal of evidence in its favour, and has been meticulously constructed. Nonetheless there are a number of problems which it faces.

1. The data collected by Goldstein(1972) which indicated a greater E.E.G activation of the right hemisphere during REM sleep(whilst for NREM sleep the reverse was true) is difficult to reconclie with the view that most of the processes essential to dream

formation are localised within the dominant hemisphere. Goldstein's findings do however await replication.

2. An exhaustive phenomenological analysis of thousands of dreams by Hunt(1982) revealed that typical dream anomalies which depart from realistic settings most frequently involve;

> ..surface slippages in reasoning, narrative coherence and positive visual intrusions and distortions(1982 p.612).

Similar positive anomalies of speech and language production were noted as infrequent. He went on to conclude;

> If language anomalies function as a sort of natural tachistoscope for formation of experience and if the 'hallucinatory' anomalies of dreams show essential features of symbolic-cognitive processes then the roots of recombinatory cognitive activity in dreams are visuo-spatial rather than verbal propositional(1982 p.612).

Hunt's findings,interesting though they are, may turn out to be an addendum to Foulkes' model rather than a challenge to it. It is a mistake to see dream anomalies as the only results of symbolic-cognitive processes to directly manifest themselves in dreams. Many fables and myths for example function as symbolic reconstructions of aspects of life. What I might suggest here, as an attempt to reconcile Foulkes' views with Hunt's, is that only verbal material may symbolically \reorganise other verbal material and only visual-spatial processing may reorganise visuo-spatial material, and that both types

of symbolic processes may be present in some dreams.

3. Work by Cohen(1977) indicates that the degree of left hemisphere participation in dreaming increases later in the night. This certainly does not contradict the Foulkes model, but it needs to be explained within it.

4. One may take issue with the idea that there is no unitary intention behind what we dream. The whole phenomenon of lucid dreams, whereby some people can direct and control their dream experiences(Garfield 1976, Tart 1979) could well indicate that there is much more to be said about those very early stages in dream formation.

5. The latter stages of this postulated process, the translation of verbal structures to images, sounds and affects has as yet received very little attention.

6. Any future extension of these proposals will need to incorporate the finding(Kramer 1976) that people dream in persistent styles which seem to reflect aspects of their personality. The part played by personality factors in the structuring and shaping of dream content has yet to be elucidated.

The Cassette Theory of Dreams

Daniel Dennet's(1981) theory is less an elaborate set of proposals set out to provide a model of dream formation than it is a philosophical critique of the received view of dreaming as an experience we have during sleep. Nevertheless Dennet does introduce a measure of clarity into the thinking concerning the events which lead to the recall of a dream. This has resulted in an unusual and provocative hypothesis as to how we come to report having dreamt.

Dennet's argument proceeds as follows. The received view implies a differentiation between

1. The compositon of a dream.

2. Its presentation and simultaneous storage in memory.

3. The subsequent recall involving some kind of playback from memory.

These distinctions lead to a consideration of those dreams in which a rather involved narrative leads up to a terminal event(such as the arrival of the fire brigade) which upon awakening coincides with an external stimulus(such as the alarm clock ringing). Such dreams(henceforth referred to as 'alarm clock' dreams), because the elements within them do not undergo radical juxtaposition, Dennet contends can only be accomodated within the received view at a high cost-that of admitting the existence of precognition. That says

Dennet is "too high a price for most of us to pay"(1981 p.135). Consequently he sets about presenting us with an alternative model which could conceivably explain this kind of dream without recourse to the paranormal. This is the cassette theory. In it the recall of a dream entails three stages.

1. A non-conscious composition process which may be contiguous with REM sleep, but which can also have occurred at almost any prior time, waking or sleeping.

2. The results of this composition can be stored cassette-like in the brain for some future event, along with a whole library of 'undreamed dreams' and indexed dream endings.

3. On awakening the memorial contents we recall as a dream are inserted cassette-like from the dream library, contingent upon such factors as precedence of composition, degree of topicality of the waking stimulus and so forth. Lucid dreams are explained by the composition process leaving traces of itself in the recording. So the impression of having consciously directed and controlled the dream contents arises as an illusion due to recursive processing.

In Dennet's own words;

> Now we have a challenge to the received view
> worth reckoning with. It apparently accounts
> for all the data of the REM researchers as
> well as the received view does, so there is no
> reason for sober investigators not to adopt
> the cassette theory forthwith if it has any

advantages over the received view. And it
seems that it does: it has a simple
explanation of precognitive dreams(if there
are any) and it posits one less process by
eliminating a presentaton process whose point
begins to be lost(1981 p.138).

Appraisal

This sober investigator however will not be following

Dennet's prescription. There is a quite simple reason

for this. It has none of the benefits claimed for it.

Let us examine the advantages which the cassette theory

allegedly has over the received view.

1. It has a simple explanation for precognitive dreams.

In fact there are several tenable explanations for

'alarm clock' dreams, not one of which need imply

precognition and all of which are a good deal simpler

than the cassette theory. By lapsing into calling such

dreams precognitive, rather than referring to their

(apparent) appearance of being so, Dennet has already made

his mind up that there are only two alternative

explanations. One of them paranormal and the other his

own. Any one of at least three alternative explanations

can in fact be advanced.

I. Chance alone could explain it. After all these

dreams are not typical. Evans(1979) gives us a

comparable example. An American psychologist had a

dream about a friend whom he had not heard from for some

time. He was awakened from his sleep by the phone

ringing, only to find that it was his friend ringing him ,

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for no particular reason, from Hawaii. At first the psychologist was sure he had had a psychic experience. After a while he decided(being trained as most psychologists are in statistics) to calculate the odds against the event occurring by chance. He took many factors into account such as the number of dreams he had, the number of friends he had, the number of telephone calls he received, the number of other people who were dreaming, the number of friends they had etc. The result of his calculation was that although it was very unlikely that the experience would happen to him(or any individual), over the whole of the U.S.A several thousand people would be having such an experience on any given night or morning. It would have only needed for the phone to have gone several minutes earlier and the dream would have all the hallmarks of an alarm clock dream. Quite clearly an explanation of such dreams may lie with the laws of probability.

II. The seemingly illogical and unusual character of dreams by their very nature could allow the flexible incorporation of any stimulus into an ongoing narrative without severe disrupton of the scenario. There is evidence to favour such a view. Tart and Dick(1970) have shown that subjects given post-hypnotic suggestions to dream about certain topics were able to incorporate the suggested topic into a wide variety of settings.

Perhaps it is when the outside stimulus is so incongruent that incorporation simply doesn't occur rather than there be radical juxtaposition of the characters and objects in the dream.

III. It is possible that the association between the dream and the 'alarm clock' stimulus is the result of their common relationship to a third event. For example it could well be that the time at which the alarm goes off coincides with the time at which another regular event takes place, such as a no.35 bus passing by. The dreamer monitoring the external environment registers the sound of the bus which then acts as a cue, and is thereby prepared for the next event, the alarm going off. All these events being woven into an ongoing dream narrative as they happen. This of course depends on the person being able to monitor information from their environment whilst they are asleep. There is no doubt that people do this. Stories of parents sleeping soundly as Concorde flies overhead and yet waking quickly at the slightest sound from the baby in the next room are evidence of this.

2. Needless to say what has been said above weakens the case for a cassette theory severely. Nevertheless it still claims to account for all of the data of the REM researchers as well as the received view does. Arkin(1966) provided evidence that dream formation was

ongoing with REM sleep by giving subjects post-hypnotic suggestions to describe their dream as it occurs. In approximately 90% of the awakenings there was extremely close correspondence between the dream content and sleep speech output. If these subjects were not describing dreams they were experiencing, then what were they doing? 'Describing the stages of a composition process' is hardly a satisfactory answer. Why would the subjects mistakenly believe whilst they were asleep that they were experiencing something which they were not?

The cassette theory hardly provides the more parsimonious account of the data to hand. Far from it. It proposes that the recalled dream may be composed during REM sleep or it may not, and at the additional cost of denying the validity of the ultimate source of all evidence, that of our own experience. The logical conclusion of any account which seeks to deny the reality of dream experience in particular is the denial of all experience in general. After all, if our admittedly fallible introspection can be so in error that what we think we have been experiencing every night for years we have not really experienced at all, what basis have we for saying that we have truly experienced anything at all? Merely because memory is at times subject to distortion and our reported dreams and waking experiences involve a degree of confabulation and error

does not give one grounds for denying that someone experiences something that may not be objectively characterised in some other way.

3.   Dennet's mistake probably began when he characterised the processes leading to dream recall. To recap these were that the dream is first composed, then simultaneously presented and stored in memory, and then finally retrieved and recalled from memory. We can ask what reasons are there for supposing that the composition of the dream is separate to its presentation? Or for that matter that its presentation is separate to its being stored? All this can be avoided if we reject the notion that dreams are things we have. Dreams are experiences which take place during sleep. But we do not have them in any passive sense of the word. We construct them. And this act of construction is at once the composition, the presentation and the storage.

The Personal Construct Model of Dreaming

   Personal Construct Theory appeared at its inception as a complete formally stated theory(Kelly 1955), with the concomitant offer of an "invitation to adventure"(1955 p.xv). The presentation took the form of a fundamental postulate and eleven corollaries, through which the theory was defined. The intention was

to create a new psychology rather than just become
another sub-discipline within the already fragmented
subject of academic psychology. This is not the place
for a thorough review of the theory. That would be a
task fit enough to occupy a volume to itself. Those
interested in a more comprehensive treatment are
referred to Kelly(1955), Bannister(1970, 1977),
Bannister and Fransella(1978) Bannister and
Fransella(1980), and Mayer(1979). However if we are to
appreciate the way in which Kelly's theory has been
applied to dreaming we will need to know something of
its flavour.

I

Personal construct theory is a psychology of the
whole person. It is the antithesis of the traditional
approach within academic psychology of breaking down the
subject matter into perception, memory, learning,
motivation, personality, social psychology etc, wherein
the person has become 'segmented' and
'outlawed'(Bannister and Fransella 1980 pp.48-50).
Because the theory is about persons, it is reflexive in
nature. It addresses the actions of those who use the
theory and how they use it, experimenter as well as
subject. Its dialectical nature also presupposes that
it contains the seeds of its own destruction within it.
Construct theory can in principle lead to constructions

of the person which are outside the range of convenience(Kelly 1955) of the theory. Its questions and answers may lead us to questions it cannot answer. This is a facet of a good theory, in so far as a good theory poses risky questions.

The fundamental field of enquiry for construct theory is personal meaning(Fransella 1982). For doing this Kelly came up with the notion of 'constructs'. A construct is envisaged as a bipolar discrimination which a person makes between a set of elements within a particular context. These discriminations can be verbal, non-verbal or pre-verbal. Of principal importance is the fact that our constructs are organised. Each of us may be looked upon as if we were a personal construct system.

Within Kelly's corollaries construct systems are construed as being

1. Unique to each person.

2. Organised hierarchically.

3. Containing a variety of construct subsystems, which

4. May be inferentially incompatible with one another and which

5. Have a finite range of convenience(application).

6 They are subject to change dependent upon (a) experience and (b) the freedom of movement which the permeability of the construct(or construct system)

allows.

Kelly's theory is in many respects a *systems theory* of human behaviour and experience. With this in mind the issue of how dreaming has been viewed through its eyes is now ripe for examination.

II

A personal construct model of dreaming was initially put forward by the author(Roberts 1980, 1981, 1982) to rectify what was seen as the failure of the parent theory to address this realm of human experience. True enough, Kelly does make reference to dreaming on several occasions but always from a context outside of that in which it can be seen as a peculiarly unique form of human experience.

> From the standpoint of the psychology of personal constructs, it is not the dream as an entity or as a biographical event that concerns us...we are more concerned at the loosened construing which it represents(Kelly 1955 p.1037).

III

Given the very abstract nature of construct theory it may well have been possible for a dream theory in its name to have taken any number of different forms. That is the prerogative of the imagination. Be that as it may, the task before us is to judge the one proposed by the author. In order that this be appropriately done we must start by examining how the concept of 'self' has been understood in construct theory. This is crucial to

an understanding of the dream model.

Kelly refers to the self as a construct in as much as it is used to denote a group of events as being alike in a certain way, necessarily distinguished from other events; "The way in which they are alike is the self"(Kelly 1955 p.131). This has much in common with Novaks' description of the self as a network of relations with the world, or that common theme or abstraction running through a similarly patterned set of behaviours or experiences. Kelly takes this further.

> The self having thus been conceptualised, can now be used as a thing, a datum, or an item in the context of a superordinate construct...But what now is my 'self'? Is it an object fixed in space, or is it not the system of pathways I have opened up to movement? If it is the latter it is nearer to being a concept, or system of concepts than it is to being an object to be perceived. Perhaps the self-concept is not a concept about the self but rather the set of constructs perpetrated by the self. How's that for confusing the issue?(Kelly 1965 quoted in Bannister and Fransella 1971 p.145).

Perhaps Kelly had confused the issue! Bannister and Fransella(1971) speculate that this self as construct could be that "intuitive 'me-ness' or consciousness that permeates all our life"(1971 p.146). It was the author's contention that this interpretation was crucial to an understanding of the form in which we experience our dreams. Moreover it has implications for the traditional differentiation between elements and constructs.

If looked upon as that centre of consciousness, the
self as construct cannot form an element in the context
of some more superordinate construct without it losing
that defining quality which has distinguished it from
the set of self elements(i.e the differential
constructions of self according to certain contexts).
As such the self construct in order to retain its
identity apart from its self elements can only construe
and cannot be construed. As soon as some
metaconstruction is placed upon the 'self that I am' it
loses its characteristic 'I-ness' and passes from the
heart of being into knowledge. This is another way of
expressing what has been a major point within
existential philosophy; that the self cannot truly
reflect upon itself. Sartre expresses this eloquently.

> As soon as we posit ourselves as a certain
> being..then by that very positing we surpass
> this being(Sartre 1957 p.62).

So much for the old Greek adage 'know thyself'!

This then was the thinking that had resulted from
Kelly's original thought provoking discussion. We are
now ready to proceed with an exposition of the construct
model of dreaming.

IV

The Model

The hypothesis presented was that the experience of
dreaming could be understood as the consequence of a

radical alteration in the normal(waking) relationship between the two species of self which Kelly had described as 'the self as construct' and 'the self as element'. In order to simplify matters it was decided to refer to the construing self as the superordinate self, and the manner in which the self can act as an element as the subordinate self. The superordinate self is necessarily singular whilst in theory at least we can generate an indefinite number of subordinate selves. To clarify this distinction, the superordinate self is constituted existentially whilst the subordinate selves are constituted epistemologically. It would of course be possible to sub-divide these sub-selves still further into those incorporated into core structures and those somewhat more peripheral, but that need not concern us at present.

The alteration in the mode of relating between the two kinds of self was originally conceived of as a change in the degree of integration between them(Roberts 1981 p.61), the superordinate self becoming suspended from action. Kelly intended suspension to denote the act by which an element(or elements) became omitted from the context of a construct as a result of a revision in an individual's construct system. In the sense intended by the author, suspension describes a state whereby the construct itself becomes distanced from the contextual

elements it normally apprehends.   Several   consequences

were postulated as deriving from this state of affairs.

1.   The 'alienation' of the superordinate self presents

itself   fundamentally   in   terms   of   a   suspension   of

self(reflective) consciousness.   Sartre(1948)   commented

that as soon as the self attempts to   reflect   upon   its

own presence in any temporal dimension(past, present   or

future) a momentary wakening is brought   about   and   the

dream disrupted.

2.   The virtual absence of superordinate   self   activity

leads to disruption of the phenomenal continuity in   the

dream.   Dreamers may find themselves   subject   to   rapid

transportation between different scenes, or there may be

sudden shifts in the thematic content of the dream.   The

discontinuity   only   becomes   apparent   upon   subsequent

waking contemplation of the dream.   As we find ourselves

transported   from   scene   to   scene   in   our   dreams,

consciousness of past events is certainly   absent.   "So

long as we are dreaming the dream its story line is   our

reality and our sole reality"(Rechtschaffen 1978, quoted

in Foulkes 1981 p.5).   Support for the   contention   that

alteration in the manner of   self   apprehension   affects

the quality of experience, in ways similar   to   dreaming,

comes from Cartwright's(1966) studies   of   drug   induced

hallucinations.   The lack of a single organising self is

also characteristic of some   individuals   designated   as

psychotic(see Laing's 1960 case history of 'Julie').

Cappon's(1959) and Langs'(1966) observation that

schiziophrenics report greater fragmentation and scene

changes in their dreams is further support for the

hypothesis.

3.   Thus without a superordinate perspective there is

no consistent centre from which to experience.

Consciousness moves ffom self to self.

> Things fall apart; the centre cannot hold;
> mere anarchy is loosed upon the world.
> W.B. Yeats(1982 p.211).

Mair(1977) presents a perspective from which a person

can be considered to live through many selves, with each

construct being potentially the centre of an alternative

self.   With such a multitude of selves no longer under

the auspices of the superordinate self they can now go

about their own acts of construing in the dream world

free from the constraints of acting and experiencing in

certain ways.   They may entertain thoughts and

activities not usually admitted to waking consciousness.

A dream may thus contain extreme expressions of violent

or sexual behaviour.   Within Mair's conception of this

'community of selves', some may be found to persist,

others may be transitory or some may even work in teams.

One could postulate that scene transitions within dreams

arise not only from a primary suspension of

superordinate construing, but secondarily because this

allows the possibility of various teams of selves to work in shifts, each team being responsible for producing the subject matter of different scenes.

4. Changes in the boundaries of subordinate self activity are changes in the contextual boundaries within which they operate. This implies that the permeability of the construct system will be affected. This construct permeability refers to the capacity of a construct to subsume new elements to its context or, as Fransella(1982) points out, to reconstrue previously suspended elements. With permeability increased, the construct system is offered the maximal possibility of change. It would allow a means whereby the most recent thoughts and experiences could become incorporated into the construct system.

Appraisal

A. Dream Formation

The model may be summarised as involving the following sequence of stages.

1. A change in the nature of the relationship between superordinate and subordinate selves. This leads to

2. A lack of conscious reflection, and to

3. Unfettered subordinate self activity in

4. An unrestricted contextual milieu.

5. The increased permeability of the system which results from this allows for the reconstruction of

suspended elements and the incorporation of new elements
into the construct system.

I

A change in structure is therefore posited to be
responsible for determining a change in process.
However the theory does not specify what brings about
this change in self structure to begin with. Obviously
it arises in some way from the special conditions of
sleep. As sleep is a physiologically determined state,
it seems reasonable to suppose that an explanation for
this initial change in self structure cannot be given at
the same level of abstraction as those terms in which
the model is couched. However it may be possible to
suppose that psychological factors play some role in
this affair. The theory could add the proviso that the
structural change is confined to those areas of the
construct system most in need of revision; that in
Kellian terms demonstrate the poorest predictive
ability. Bannister(personal communication) does suggest
that in dreaming it is only the major themes which are
being reviewed. If so, then it would seem logical for
the focus of revision to be localised.

II

Kelly chose to ignore the concept of the unconscious
and instead opted to talk about construing taking place
at different levels of awareness(Fransella 1982). This

decision is also implicit in the above framework. The
different subselves enjoy objective existence as
construers but only potential existence as lived
existential realities. Construing as such is not
synonymous with consciousness. Cognitive psychologists
are familiar with this notion in those experiments in
which semantic processing is demonstrated to be taking
place outside the stream of attended
consciousness(Lindsay and Norman 1972).

III

There is an interplay between structure and process
continuing through several levels of abstraction. The
structural changes taking place in the personality give
rise to changes in process which in turn are manifested
in structural changes in the dream content(both the
manifest and the latent content).

a. The change in reflective capability is said to lead
to discontinuity in the dream content.

b. This discontinuity may also arise secondarily from
the patterns of multiple self activity(e.g whether they
work in 'teams').

c. The increased permeability of constructs are
reflected in the pattern of thoughts underlying the
dream which forms the associative matrix revealed by
the method of free association(Foulkes 1978, Roberts
1980).

The reorganisation in cognitive structure which the permeability changes entail furnishes a means for dreams to integrate new information. This provides a plausible means to account for the presence of a day residue(Freud 1978). This is a necessary feature for a dream theory to capture. There are a number of sources of empirical evidence to indicate that the incorporation and reorganisation of information during dreaming are important functions. Witkin and Lewis(1967) found that dreams following emotionally intense pre-sleep stimuli tended to highlight the more distinguished aspects of those stimuli. They also found that dreams which were most likely to be forgotten were those that followed the presentation of threatening pre-sleep stimuli. Presumably the construct system finds it harder to integrate these(i.e these threatening events lie outside the range of convenience of the person's available repertoire of constructs). Findings of a similar nature are reported by Cohen and Cox(1975) and Fiss et al(1977). Greenberg et al(1983) concluded that REM sleep has the function of incorporating specifically emotionally important experiences into the stream of memory via making connections with emotionally important memories from the past.

B. Dream Exploration

The format of the dream theory implies something about the manner in which we use our dreams to elaborate our construct systems whilst we are awake.

In an earlier article I described how free association could be reconstrued from the perspective of construct theory.

> In terms of the constructs employed here it
> can be seen as a state of suspended reflection
> in which the same kinds of unusual matchings
> as occurred during the dream can occur once
> again. When two constructs are associated it
> may be due to the range of convenience of the
> elements they subsume overlapping or their
> both being able to be subsumed within the same
> range of convenience of another construct.
> Failure to associate two constructs with each
> other when this is necessary to successful
> free asociation may be due to the above
> conditions not being met, owing to heavy
> contextual restrictions placed upon construct
> use(Roberts 1981 p.62).

Besides interpreting one's dreams in the classical Freudian way, one can also discover meanings inherent in them by the method of comparing and contrasting the elements present in different dreams. It was proposed;

> Continued exploration over time will start to
> yield recurrent representations for certain
> peoples, objects, and events so that knowledge
> of our own personal symbolic language will
> expand(Roberts 1981 p.62).

By an examination of the different contexts in which these recurrent elements appear one could begin to discover the transcontextual meaning of certain constructs(Fransella 1982 p.49).

C. Limitations of the Theory

Without doubt the construct model of dreaming maps out a potentially rich program of research. Its focus of interest is on the structural nature of processes deriving from organisation of the personality at a highly abstract level, and how these relate to observed manifest properties of dreams. It embodies many of the important systems concepts; hierarchy, communication, structure, relationship, pattern and process. However it would be a mistake were we to conclude that construct theory by itself will be sufficient to encompass all the aspects there are to dreaming. It has already been seen that the initiation of the structural changes with which dreaming is thought to originate, is largely outside of the investigative competence of construct theory. Its emphasis on dreaming in relation to a lack of conscious reflection may render it unsuitable for dealing with lucid dreams. Its strength lies in the potential it has for investigating the elaboration of personal meaning through dreaming. However it is doubtful that all aspects of dream content can be understood solely by reference to meaning. Studies of dream series may lead us to 'recurrent peoples, objects and events' which will enable us to uncover the set of meanings which the unique language of the dreamer is expressing. The pattern may help us to reveal the origins of the

meanings, but can the meanings help us to understand the
origin of the pattern? That I would contend is a
question whose answer we must seek at another level of
resolution. It is an issue we shall be returning to in
due course.

Conclusion: Cognitive Dream Theories

Although the theories which have been reviewed in
this chapter are in some senses very different from one
another they do share a number of features in common.

1. All start from the position of wishing to explain
the reported experiences of dreams which people give.

2. Following on from Freud, all distinguish between the
experienced manifest dream and the non-conscious
processes which give rise to it.

3. Dreaming is considered as a formal rule—governed
process. These rules may be the instantiation of
something analogous to a computer program(Evans), a
sequence of semantic-syntactic procedures following a
regular order(Foulkes), or a symbolic-logical type
system in which a set of consequences are derived from a
given premise(Roberts).

4. Dreaming is construed as a process consisting of a
set of operations functioning to reorganise information
within the cognitive system.

5. The results of disinhibition of semantic memory in
the cognitive-symbolic model functionally resemble the

effects of increased permeability within the construct model.

The differences however are also significant.

1. Foulkes' cognitive-symbolic model includes a stochastic component to the dream process in contrast to the construct model which would impart some rhyme and reason to the initial memorial contents selected for further 'dream work'.

2. The rules of operation in the computer and cognitive-symbolic models are seen as following a different 'logic' to that, followed by the waking mind. The construct model attributes a greater continuity between the logic of the waking and sleeping minds, in that both are essentially active in comparing and contrasting elements within their available environments.

3. The cassette theory differs from the other models reviewed, in as much as the others all attribute reality to the subjective experience of dreaming. The cassette theory would seek to deny this.

4. The models have their strengths in providing explanations for different aspects of existing data. The computer model for instance is on much stronger ground in explaining the data from REM deprivation studies(e.g rebound effects, greater sensorial vividness on recovery from deprivation) than the personal

construct model. This deals more successfully with dream structure than it does the qualities exhibited by particular sensory modalities during dreaming.

Within this section(part two) a varied and intriguing number of theories have been contemplated and criticised. The task for the systems approach is to now gather these diverse strands of knowledge together, to review their range of application, and if possible to point toward their future integration within the framework which it offers.

PART THREE

An Ecology of Dreaming

Man might be better understood if he were viewed within
the perspective of...the interplay of the durable and
the ephemeral.

<div style="text-align:center">George Kelly</div>

There could be no fairer destiny for any...theory than
that it should point the way to a more comprehensive
theory in which it lives on as a part.

<div style="text-align:center">Albert Einstein</div>

The involuntary nature of image, of metaphor is the most
remarkable thing of all; one no longer has any idea what
is image, what metaphor, everything presents itself as
the readiest, the truest, the simplest means of
expression..Upon every image you here ride to every
truth.

<div style="text-align:center">Friedrich Nietzsche</div>

CHAPTER SIX: A SYSTEMS THEORY OF DREAMS:

A FORMAL PRESENTATION

In order that the work presented in the previous

section may be fully incorporated into the systems

perspective, we will now need to present more precisely

the systems theory of dreams and the postulates which

can be derived from it.

The Theory

The proposal stated at the beginning of part two was;

The experience of dreaming may be envisaged as
the emergent property of a hierarchically
organised, multilevelled set of information
processing operations. These operations
interlock the structurally stable uppermost
layers of the human personality with a lower
level set of non-conscious cognitive processes
upon which it is supported.

The Postulates

The above theory, in conjunction with the review

conducted over the last three chapters, gives rise to the

first postulate.

1. Those theories already in existence function as

limiting cases of a more comprehensive systems theory.

These theories address different levels of complexity of

the phenomenon(dreaming) under investigation.

The additional postulates are;

2. Dream content may be ordered into a hierarchical

system of increasing structural complexity.

3. This structural hierarchy derives from a hierarchy

of different processes which have given rise to it.

Before examining each of these postulates in further detail, we may at this juncture remark that two distinct isomorphisms have been proposed.

1. The processes assumed to constitute the act of dreaming map onto the systems theory.

2. These processes are mapped onto by the structural features of dreams.

If we represent the structure as the set of relations 'S' , the processes as the set of relations 'P' and the theory as the set of relations 'T' then mathematically we can represent the relations between them by S—>P—>T.

As these three postulates will form the subsequent program of research, we will elaborate them in greater detail.

1. Those theories already in existence function as limiting cases of a more comprehensive systems theory. These theories address different levels of complexity of the phenomenon(dreaming) under investigation.

The dream theories reviewed fall into three levels of description or abstraction.

a. Structural aspects of Personality.

b. Rules governing the manipulation of symbolic information.

c. Neurophysiological operations.

Level a.

Into the first category we would place the psychoanalytic dream theory and the personal construct model. Both are essentially attempting to derive the structural features of dreams and the processes whereby dreams are produced by reference to an interplay between relatively stable and durable aspects of the psyche. The similarity between some of the concepts in these two models was discussed by the author(Roberts 1980) in an earlier work. In relation to our current interests the main area of overlap is found in the outcome of the negotiation between the censor and the primary processes of thought in the Freudian model, and the similar functional relationship contained in the construct model between the superordinate self and the construing activity of the subordinate selves.

Level b.

Evans' computer model and Foulkes' cognitive-symbolic model both address levels of functioning occurring chiefly below consciousness. In both these schemes a series of rules(program) or operations(cognitive-symbolic) are responsible for transforming information deriving from a lower internal(memorial) source into another form which becomes available to consciousness as the manifest dream.

Level c.

At this level physiological events are hypothesised to account for the existence of the dream in the first place(reciprocal interaction model: Hobson and McCarley). The almost dependable occurrence of a psychological event at a fixed time of the circadian rhythm is assumed to be triggered by biochemical factors. Hobson and McCarley attempt to derive some of the parameters of manifest dream content(predominance of particular sensory forms, bizarrness, scene changes etc) from lower level processes, but readily admit that a higher level description in terms of psychological factors is necessary to complement this.

Clearly the different models are all addressing themselves to valid but quite limited domains of the dream experience. It would be impossible even in principle to hope for any one of them to be a fully comprehensive theory of dreaming. Such a 'one level ontology'(Broad 1980) would be a contradiction in terms. No matter how thorough the knowledge of physiology or biochemistry, a complete knowledge of events at this level can never explain the existence of problems at a level above it; i.e the psychologival level, and that is precisely the level at which the dream appears to us as a problem to be solved. This is analogous to the situation existing in the hierarchy of sciences.

Biology for example cannot be explained as physics and chemistry. The existence of problems at that level(e.g evolution, reproduction, natural selection) cannot be reduced to problems of chemistry and physics. The problems are an emergent property at that level of complexity. To date only systems theory is in a position to adopt the multilevel approach which dreaming warrants, and which will be required to explain it in a way which does not fragment it. Too much fragmentation Bohm(1980) warns, and we may take the content of our thought for "a description of the world as it is".

2. Dream content may be ordered into a hierarchical system of increasing structural complexity.

An outline of this hierarchy follows together with a formal presentation in set theoretic terms.

Table 6.1

Hierarchy of Dream Structure

Level   Unit of structure

    1.   The Dream.

    2.   Scenes within dreams.

    3.   Repeated elements(images/themes)

     (i)   within a single scene.

     (ii)   over several scenes.

     (iii) over several dreams.

    4.   Unique elements(images/themes)

Mathematical description of content hierarchy.

Let D= set of all dreams collected in a series.

   S= set of scenes within dreams.

   R= set of recurring elements present in a scene.

   Rw= set of elements repeated in a scene

   Rs= set of elements repeated in several scenes.

   Rd= set of elements repeated in several dreams.

   Un= set of unique elements.

From these relations we can derive a number of simple equations with which to provide a mathematical description of the hierarchy.

(6.1) $n(D) =< n(S) < n(R) < n(Un)$.

This equation formally represents the hierarchical system of dream content and will hold true for all dreams except for the class of recurring dreams in which $n(U)=0$ and therefore $n(R) > n(Un)$.

The time course of the reappearance of these structural units may be obtained by substituting t for n. This gives:

(6.2) $t(D) =< t(S) < t(R) < t(Un)$.

(6.3) $n(R) = n(Rw \cap Rs \cap Rd)$.

This denotes that the set of recurring elements consists of three intersecting subsets of different categories of recurring elements.

(6.4) $t(Rw) < t(Rs) < t(Rd)$.

The different sets Rw, Rs and Rd represent increasing

time courses between their reappearances.

The total number of elements(E) present in a dream is given by:

(6.5) $E=n(S)\times[n(Un)+n(R)]$

This formalism has the benefit of giving a precise definition of the relationships present between the various aspects of dream content. It also provides a fundamental starting point for considering the relationships between the set of processes which produced the hierarchy. Its application to empirically obtained data in the course of this work will provide a test of its utility.

An interesting consideration which derives from this presentaton is that it becomes possible to consider two dreams entirely different in their actual content but which have identical structures to one another such that:

$n(S_1)=n(S_2)$, $n(R_1)=n(R_2)$, $n(Un_1)=n(Un_2)$ etc.

Such dreams we may say possess a common syntactical structure. Although in quite a different sense than that intended by Foulkes(1982b), we may now see a dream as involving the mapping of a semantic content onto a syntactic frame.

3. This structural hierarchy derives from a hierarchy of different processes which have given rise to it.

Having shown that the contents of dreams can be

arranged into the structural hierarchy above then this
third postulate can be logically deduced from it.
Within hierarchy theory(a branch of mathematical systems
theory) it is proposed that;

(i) Higher level units are concerned with larger
portions(broader aspects) of the overall systems
behaviour.

(ii) The decision period of a higher level unit is
longer than that of lower units.

(iii) A higher level unit is concerned with slower
aspects of a systems behaviour(Mesarovic et al 1970).

One would expect a hierarchical set of dream
processes to therefore manifest itself via the temporal
aspects of the behaviour resulting from them. As dream
content exhibits the necessary time series(see equation
6.2) and arises from the dream processes then the third
postulate follows automatically from this. For example;
the transition between scenes in dreams is a much slower
transition than that between the flow of images which
constitute the elements of those scenes. This entails
that the processes responsible for initiating scene
transitions follow a longer time course than those
responsible for image transitions.

The empirical work which now follows will attempt to
extend the fruitfulness of this theory and elaborate it
to incorporate a wide range of phenomena existing at

different levels of dreaming. The structure of this work will follow the structure of the theory.

A. The Form of Dreams.

Work under this heading will begin with the most abstract levels of description applicable to dreams. From such general descriptive terms investigation will proceed by examining high level sources emanating from the dreamer's personality which may shape or influence the nature of the features concerned. The overall perspective of this series of work will be to obtain knowledge of the connections between those enduring and persisting means of processing which we conventionally describe as 'personality', and the nature of dreaming.

B. Scene Changes.

Moving down the structural hierarchy we will investigate alternate proposals which have been suggested as being responsible for the abrupt transitions of scene which often take place during dreaming. The work here will contrast models from differing levels of organisation to see which(if any) provides a plausible means of explanation.

C. Dream Content

At the lowest level of the content hierarchy we will focus upon the actual substance of dreams. As one of the notable aspects of science is its dependence upon repeatable events the investigation of the laws and

principles operating at this level of organisation will
focus upon those themes and images which are repeated
throughout a dream series, in the hope that an
understanding of how this happens will provide us with
clues to the underlying mechanisms in dream formation.

Systems theory is an attempt to construct an ecology
of dreaming. Theoretically therefore it not only
concerns the processes of dream generation, but also what
these processes mean to the people who are generating
them. The latter parts of this work will consequently
peer into the realm of dream interpretation. This can
be seen as yet another level of complexity above and
beyond that of the final form of the produced dream.
Although in principle this could be extended ad
infinitum to include all social and political structures
which shape the events that people dream about, the
present study will be restricted to those events more
usually considered as being within the province of dream
psychology.

The conclusion to this will be a re-evaluation of the
knowledge obtained in these areas with a view to giving
some tentative suggestions as to how the processes at
these different levels of organisation combine to form
the dynamic interplay of processes that is the act of
dreaming.

CHAPTER SEVEN: THE FORM OF DREAMS

No one but me can hear the mental din
of clashing thoughts and images that fight
A bloodless, ghostly fight to determine
Which hordes of phantoms have the right
To a monopoly of me. I am
A would be refugee from any kind of violence.
But here I'm in a jam
I'm motionlessly fleeing from my mind.

I'm devastated by a dreary war
That may be only manure from my brain
But it goes on. I can't remember what it's for
There's none to whom I dare complain.

R.D. Laing.

Does everybody dream the same way? How do we characterise dreams? These are questions which lay people as well as scientists have raised in their pursuit of the curious. Systems theory views dreams as consisting of various levels of structure. We can therefore look upon questions of this kind as attempts to provide very general universal descriptions of dreams. We however are not merely content with providing such descriptions but explaining them. The more abstract the level of description, the higher the levels of processing we would hypothesise as being responsible for the manifestation of the features described(providing of course that that the description is valid).

Following the explosion of dream research instigated by Aserinsky and Klietman, Hall and Van de Castle(1966)

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set out to derive a comprehensive set of scales to classify and categorise all varieties of dream content. This they hoped would "do for the dream's manifest content what Freud did for the latent content". These scales have proved to be of only limited value, although they have served some useful purposes in comparing the contents of adults' to children's dreams, men's to women's etc. The bare cataloging of dream content has also been employed for comparing night dreams to hypnotic dreams(Hilgard and Nowlis 1973). More thorough efforts to assess the psychological dimensions of the dreamer's experience have been made by Hauri, Sawyer and Rechtschaffen(1967). Their factor analytic model aimed to reduce the assessment of a dream report to eight questions, each one said to cover a major dimension of dream experience.

1. How intense and unreal is the dream?

2. How much is the dreamer as a participant actively influencing what is going on?

3. How pleasant is the dream?

4. How much verbal aggression is there?

5. How much physical aggression does the dreamer display?

6. How much heterosexual activity is there?

7. Is the dream more perceptual or conceptual?

8. What time in the dreamer's life is the manifest

content of the dream associated with?

This method allows one to correlate variations in dream content to variations in nosological group(e.g groups with different psychiatric diagnosis). Such an approach could in principle be used to elucidate the mechanisms behind particular dimensions of dream experience. Unfortunately because the assessment of any particular dream tends to be done by people other than the dreamer, there appears to be little or no opportunity for the subject to say what the relevant dimensions to his/her experience are, nor for them to give their own opinion as to what position their dreams should occupy on these dimensions. This is a consequence of what McGrath(1967) sees as the main limitation of factor analysis; namely that by itself it lacks a prior logic as to what should be put in for analysis in the first place. Furthermore the dimensions put forward by Hauri et al make no differentiation between the form and content of dreams. This distinction, as we saw earlier, was an important feature of the activation-synthesis model of dream generation(Hobson and McCarley 1979). Watson(1982) sees form as referring to the particular modes in which content is presented. This concurs with Hobson and McCarley's contention that form exerts a constraint upon the contents selected for inclusion. However no empirical work has demonstrated that this

dichotomy is one that can be reliably applied to dreams. The distinction is one in the level of description applied to the manifest dream. As systems theory is applied to dreaming on the basis of different levels of abstraction, it is important that we be certain of the validity of this most general of distinctions before it is used as a starting point in our efforts to seek an understanding of the processes inherent in dream production. This forms the rationale behind the first experiment reported here. We must first determine if the 'dimensions of dreaming' are indeed universal, whether they deal with formal parameters, devoid of any specific content which they cover, or if on the other hand dream dimensions are, like meanings essentially idiosyncratic, difficult to map from the private individual realm of meaning to the public collective realm(Harré 1982).

As the issues faced here concern individual realms and dimensions of meaning, and we are addressing a level of description which our theory supposes derives from the higher stable modes of processing associated with personality, it is the author's contention that problems at this level can best be empirically answered using the framework and tools which personal construct theory provides.

The first experiment will be asking several

questions.

1. Is the distinction between form and content a valid
and reliable one to be made, which remains so across the
multitude of styles in which people dream, and which has
relevance in relation to the way in which subjects
characterise their own dreams?

2. Following the rationale behind much factor analytic
work espoused by Brown and Sime(1982); do dream
experiences, although encompassing an infinite number of
individual patterns, fall within a limited range of
profiles?

EXPERIMENT 1

METHOD

<u>Design</u>

1. Each person will provide a set of dream reports collected at home which will provide the basis for eliciting constructs from subjects. These will then be subjected to a simple content analysis in which each construct will be allocated to different categories by several independent judges.

The allocation of constructs to categories(of either form or content) will be the main subject of the analysis. The degree of concordance between raters will be assessed on the basis of this allocation. The overall frequencies with which each category is selected will be analysed by means of a chi-square test. This same test will also be used to see how consistently all the raters allocate the constructs to each category.

2. A repertory grid consisting of home recorded dreams as elements and the constructs elicted from these will be analysed by Slater's(1972)Ingrid program. The subjects' grids will be examined in relation to parameters of dreaming suggested by Hauri et al.

<u>Subjects</u>

Nine subjects in all participated(five female, four male). All of these were volunteers. Mean ages were 24.7 years for the females and 26.2 years for the males.

Six of the subjects were postgraduates and two were undergraduates at the University of Leicester. The remaining subject was a professional musician. Data collected from one of these subjects during an earlier piece of work(Roberts 1980) was available, and so this subject provided two pieces of data separated by an interval of twenty months. This subject will subsequently be referred to as S1a and S1b.

Materials

1.   Instruction sheet for recalling and recording dreams(see appendix 1).

2.   Commodore 8032 microcomputer.

3.   Commodore printer model 2022.

4.   Repertory grid program(see appendix 2).

    The grid program contained the elements to be used for a particular grid within data statements. The elements for the grid denoting people's dreams were listed as dream 1, dream 2 etc up to the total number of dreams each person had recorded.

Procedure

A.   To begin with subjects were given an instruction sheet for recalling and recording dreams at home. This suggested using either a paper and pen to be kept within easy reach of the bed before falling asleep, or a tape recorder from which the reported dreams could be transcribed onto paper at some later time. In actuality

all subjects opted for the paper and pen method. There
are several possible reasons for this; the absence of an
available tape recorder, a wish to avoid the increased
time which transcribing would necessitate, or even a
lack of privacy to use a tape recorder for this purpose.
In addition to the instructions detailed on the sheet,
subjects were verbally instructed that although there
was no time limit applied to this part of the experiment,
they would be expected to regard their dream diaries as
being complete once between nine and fifteen dreams had
been recorded. It was reasoned that these were the
parameters within which a suitably sized grid would be
constructed.

B. Having completed their dream diaries at home,
subjects came into the Psychology Department to complete
a repertory grid. Administration of the grids took
place in private cubicles within the Psychology
Department at Leicester University to ensure privacy for
subjects. Each subject was asked to familiarise
themselves with the set of dreams they had recorded
prior to commencing the grid procedure, so that lengthy
re-reading would not be required as triads of elements
were being compared and contrasted. Step by step
instructions for completing the grid were displayed onto
the screen of a Commodore 8032 microcomputer according
to a program devised by the author (see appendix 2). A

seven point rating scale was chosen although the program

allows for the value of the rating scale to be newly

chosen each time it is run. Unique random triads

adhering to the minimum context card form(Bannister and

Fransella 1978) were displayed in rows on the screen

together with instructions to enter a way in which two

of the elements were alike and thereby different from

the third. Next, the manner in which the third element

differed was requested. Where necessary verbal

clarification of the instructions was provided by the

experimenter. Each subject was encouraged to take as

much time as they wished over their replies. All the

responses were typed into the computer by the

experimenter in order to save time. Once all constructs

had been elicited they were displayed onto paper for

permanent record. Instructions for rating each element

in turn on each construct were then displayed to the

subject on screen, and once again, where appropriate,

verbal clarification was provided. The rating procedure

having been applied, the matrix of raw data was printed

onto paper and the program terminated. This matrix then

formed the input to the Ingrid program for subsequent

analysis.

C. The total list of dream constructs compiled from the

completed grids of subjects were then presented

independently to four raters(RR, KH, CCF, ND) whose task

it was to designate each construct as referring to either the (F)orm or the (C)ontent of the dream. If raters were unable to decide they were allowed to allocate the construct concerned to an (U)ndecided category.

Results

1. FORM AND CONTENT

The number of dream constructs elicited from all subjects totalled one hundred and twenty one. These can be found listed in appendix 3. The following tables give the results for inter-rater agreement in assigning these to the categories of Form(F), Content(C) or Undecided(U).

Table 7.1

Number of Category Matches Between Raters

	R2	R3	R4
R1	90(74.3)	58(47.9)	84(69.4)
R2		69(57.0)	83(68.5)
R3			65(53.7)

1. Raters; R1=RR, R2=KH, R3=CCF, R4=ND.

2. Figures in parentheses indicate number of matches expressed as percentages.

If we look at the overall levels of agreement attained by each rater we find the following.

Table 7.2

Mean Levels of Agreement Achieved By Each Rater

Rater	Number of Matches	%	S.D
1	77.3	63.88	17.01
2	80.6	66.66	10.69
3	64.0	52.89	5.57
4	77.3	63.88	10.69
Overall mean	74.83	61.80	

The level of agreement attained by rater 3 seems to be
substantially below that of the others. The reasons for
this become apparent upon examination of the frequencies
with which the various raters have used each category.

Table 7.3

Frequencies of Each Category Used By Raters

Rater	Form	Content	Undecided
R1	27	83	11
R2	36	74	11
R3	77	34	10
R4	39	77	5

$x^2=57.71$ for 6 df, $p<0.0005$.

This significant association of rater with allocation of
construct seems to be due to rater 3 assigning many more
constructs to the form class than to content.   This
failure to use the categories in the same manner as the
other raters would appear to be the reason for the low
rates of agreement achieved by this rater.   If we

exclude the data from rater 3 on this basis, we find there is no longer a significant association between rater and allocation of construct to category.

$x^2=5.499$ for 4 df, p=n.s

In other words three of the raters are using the distinction between form and content in a consistently alike manner. If the levels of inter-rater agreement are now recalculated excluding the data from rater 3 there is a notable increase in the levels of agreement for each rater accompanied by a decrease in the variation.

Table 7.4

Mean Levels of Agreement Achieved By Each Rater

Rater	Number of Matches	%	S.D
1	87.0	71.90	4.24
2	86.5	71.49	4.95
4	83.5	69.00	0.71
Overall mean	85.67	70.80	

The overall level of agreement between these raters of approximately 71% is, in the opinion of the author, a satisfactory indication that to distinguish between descriptions of dreams in terms of their form and content is indeed valid, and provides an acceptable basis from which to explore the origins of this distinction.

2. THE DREAM CONSTRUCTS

Although the validity of the form-content distinction has been provisionally accepted, it is important to see how the personally assessed 'cognitive styles' of the dreamers themselves relate to this. Examining the relationships between individual dream constructs may shed light on whether the formal parameters of dreams embody significant personal meanings. It is crucial to consider this in relation to the question of whether dream dimensions are universal. If the forms of dreams pertain to their semantic features, then an important clue will have been unearthed regarding the origins of the processes which underl the features of dreams which these constructs depict.

(A) Contructs Correlating

First of all constructs from selected subjects will be considered. Only those correlations between constructs which are non-trivial will be presented here. A minimum level of statistical significance($p<0.02$) has been set. This level was chosen in order to keep to a low level the number of spurious correlations which may occur in a large sized grid.

Constructs Correlating   r   p

Subject 1b

'To do with the family v Moving away from the past'

   with 'Reassuring v Worrying'   0.763   <0.01.

   with 'Positive contents v Unhappy contents'

                                     -0.685   <0.02

This seems to indicate that a concern with this person's

family life, particularly with how it has been in the

past, is being reflected in the dreams.

Subject 2

'Had great impact v Disjointed'

   with 'Inconsequential v Meaningful'

                                     -0.932   <0.002.

Subject 3

'Upsetting v Experientially Passive'

   with 'Has my Father in v Strange and Horrible'

                                     -0.794   <0.002

'Warm atmosphere v Very Concrete'

   with 'Independence v Sheltered' -0.790   <0.002

The themes reflected by these constructs revolve around

activity/passivity with parental figures. One of the

interesting constructs produced by this person was 'Have

active relationship with Mother v To do with present

time'.

Subject 4

'Vivid v Fuzzy'

   with 'The presence of familiar scenes or novel places

v Unfamiliar places'   0.804   <0.01.

Subject 6

'I end up with a feeling of confidence in my power   v   I

feel powerless'

   with 'Confidently standing up for myself   v   Passively

allowing others to determine my situation'

                                     0.927   <0.02.

   with 'My words have great power v Where   I   don't   say

anything'   0.633   <0.02.

'Tremendous enjoyment of change v Fear of change'

   with 'Controlled systematic violence v   Ragged   direct

spontaneous violence'   -0.728   <0.01.

A further cluster of constructs would appear to be

related to another aspect of the activity/passivity

dimension.

1. 'I'm involved and anxious in the present v An

observer of foregone events'

2. 'A sequence of surprises v An organic unfolding of

events'

3. 'I'm taken unawares v This is the final revelation:

there can be no more surprises'

4. 'Emotionally involved response v Discriminating adult

observation'

The intercorrelations between these are;

r^{12}=0.871, p<0.002

r^{23}=0.694, p<0.01

r^{34}=0.631, p<0.02

This individual appears to be preoccupied with change

and the manner in which events unfold.

                                            r   p

Subject 7

'Bizarre v Not bizarre'

  with 'Irrational behaviour from others v Rational

behaviour from others'   0.759 <0.02.

Subject 8

'About being home v About being out'

  with 'Impending disaster v All mixed up'

                              -0.745 0.02.

This person is a young mother and many of her dreams

featured elements of anxiety centered around her child,

particularly losing her.

Subject 10

'Bizarre v Not bizarre'

  with 'Symbolic v Concrete'   0.854   <0.002.

(B) Dimensions

    As can be seen from the constructs obtained(see

appendix 3) there are a number which may be grouped

under the factor analytic headings.

1. INTENSITY AND REALITY OF DREAM

Constructs distinguishing between the dreams on the basis of how real or unreal they were, were found to be difficult to place exclusively in either the form or the content categories. Those deemed to be referring to form by the two raters highest in agreement are however more noticably independent of reference to the events in the dream. Examples are; 'Bizarre v Realistic', 'Fantasy v Realistic', 'Very symbolic v Concrete'. Compare these to those which more obviously relate to specific content; 'Had magic in v More like everyday life', 'Supernatural v Not supernatural', 'Based on something that has actually happened v Unlikely'.

2. ACTIVE PARTICIPATION

While some of the constructs do refer to the dreamer actively trying to influence events(e.g 'Am being kept waiting v Am trying to escape', 'Absence of self awareness v Am sorting things out and taking effective action'), an equal proportion simply signify the dreamer's degree of activity or emotional involvement(e.g 'Have active role v Passive', 'Emotionally involved response v Discriminating adult observation').

3. PLEASANTNESS/UNPLEASANTNESS

Conceptually it is difficult to extricate some of the

constructs within this category from the heading which

follows. This is in accord with the factorial model in

which aspects of physical aggression loaded moderately

negatively on the pleasantness factor. Of the present

collection of constructs this subdivision accounted for

more than any other(24/121). Examples from this class

are 'Beautiful and uplifting v Depressing and boring',

'Positive contents v Unhappy contents' and 'Made me feel

good v Little emotion attached to it'.

4. HOSTILITY/AGGRESSION/VIOLENCE

Although the constructs did not distinguish between

verbal and physical aggression, a relatively high

number(9/121) made reference to violence or aggression

of one kind or another(e.g 'Involve aggressive

situations v Not aggressive', 'Very violent v Anxious',

'Controlled systematic violence v Ragged direct

spontaneous violence'). Two of the subjects reported

dreams involving imagery of a nuclear holocaust,

arguably the most aggressive and violent of all actions.

This was reflected in one of the constructs, 'About end

of the world v Not about end of the world'. One does

need to remember that overt display of violent or

hostile actions within a dream by itself tells us

nothing about the underlying motivational intentions of

the dreamer. The violence we employ in our imagery can

sometimes be metaphorical expressions of quite different

meaning. A dream of the author's illustrates this point

particularly well. In this dream a mushroom cloud

emanating from a distant atomic explosion witnessed from

a beach suddenly transformed itself into a gigantic

shell. On awakening this was interpreted as awaiting a

'bombshell' in connection with certain matters. Of

course the fact that some images are now capable of

functioning as metaphors for quite different meanings

indicates the extent to which the imagery of nuclear war

for instance has entered our imaginative vocabulary.

5. SEXUAL ACTIVITY

    Only one construct explicitly differentiated between

dreams on this basis('Sexual v Non sexual'). There was

very little sexual activity reported in the dreams as a

whole. This is contrary to what one might expect on the

basis of the large amount of variation(16%) which the

heterosexuality factor accounted for in Hauri et al's

work. One could argue that the differences between this

result and those in the present study stem from the

different methods of report collection(REM dreams were

collected in the earlier study). However what evidence

there is(see Winget and Kramer for a review of this)

suggests that there is usually a greater incidence of

sexual interaction in home dreams than in those

collected from the laboratory. It may well be the case

that the explanation for the discrepancy in the current

results is due to the fact that some of the subjects
were known to the experimenter, and that they may
therefore have felt embarrassed about reporting dreams
of a sexual nature.

6. THE PERCEPTUAL OR CONCEPTUAL NATURE OF DREAMS

Several constructs referred to the clarity of
dreams(e.g 'Vivid v Fuzzy', 'Very lucid v Not lucid',
'Vivid/intense v Not very clear') which is in agreement
with the factor analytic model. As is evident in the
correlations this dimension has personal significance
for some people, which must be borne in mind. This
partly concurs with Freud's view on the representability
of manifest elements.

7. TIME IN THE DREAMER'S LIFE IN WHICH THE DREAM IS SET.

Some of the constructs explicitly make reference to
the time in which the dreams were set(e.g 'To do with
the past v Orientated toward future'), whilst others
referred to the way in which events were temporally
structured(e.g 'Time relationships distorted v In here
and now'). It is possible that these aspects of the
manifest content belie quite different origins in the
dream processes. The temporal structure being an aspect
of form as opposed to content.

Discussion

The results of this experiment indicate that the form-content dichotomy is a valid and reliable one. However the situation is not as simple as had been previously thought. Many of the personal constructs elicited from subjects, of a type previously thought of as simple formal parameters of dream content, are in fact imbued with idiosyncratic meanings. We can illustrate this by reference to a number of parameters usually considered to be unambiguously referring to form.

Dream Bizarreness

A notable example of this is provided by a contrast in the use of constructs between subjects. For subject 10 the construction of bizarreness was seen in terms of how symbolic or concrete a dream was, whilst for another subject(7) it primarily involved rational or irrational behaviour from the characters in the dream. For subject 10 therefore it is conceivable that the symbolic representations construed as bizarre might involve actions and events which on a surface level appear rational in some sense. Hypothetically it is possible that one person could find it bizarre to dream of their grandmother doing the shopping, given that they have not seen her in years and consider her to be of little immediate importance, whilst for another person only the manifest rationality of the actions of the dream figure

would be influential in determining the attribution of rationality. Given such instances we must be extremely careful before proclaiming the universality of any dream dimensions.

Clarity of Representation

As is shown in the results, subject 4's dreams rated on the construct 'Vivid v Fuzzy' were related to the presence of familiar scenes or novel places. This could be because the more memorable the scene the more vivid it seems, rather than the reference being to the intensity of visual imagery per se(in which the most vivid and intense scenes involve familiar scenes). If the latter is true, then the fuzzy dreams including scenes of novel places would involve a deficiency of information processing routines associated with the vivid construction of scenes from memory. We would then be making some general statement about the processes involved in dream construction for that person rather than describing their ability in reporting dreams accurately from memory. However on the available evidence meaning has become inextricably entangled with the issue of representability.

Dream Continuity

The degree of continuity exhibited by the dreams of subject 6 were for him an expression of certain individual meanings. Those dreams involving a sequence

of surprises were those in which he was involved and anxious in the present. The continuity may thus be an expression of how well what is being dreamt about can be construed, as well as the indication of the operation of basic cognitive processes. Similarly for subject 2 whether the dream was of great impact or disjointed related to how inconsequential or meaningful it was. In this case its disjointedness could be the result of a lack of motivation to remember fully an apparently inconsequental dream event. In earlier chapters the issue of dream continuity was related to transitions between sensory or motor pattern generators(Hobson and McCarley(chapter 4) and to higher level personality structures in the personal construct model(Roberts chapter 5). When we move on to consider this level of structure in a later chapter an empirical test will be presented, which will hopefully enable a choice to made between these competing explanations.

None of the constructs elicited from the subjects who participated in this experiment demonstrate clearly that formal parameters of dream content can be considered apart from the meanings in the dreams from which they derive. It would seem to be unjustifiable therefore to refer to them as universal dimensions of dreaming applicable to all peoples of all cultures. What are we therefore implying about the construction of dreams?

Hobson and McCarley's view was that the form imposed a degree of constraint on the expression of the contents. This has not been supported. However it is undoubtedly true that dreams are often described by use of a limited number of categories. They may be said to vary along a set of common dimensions; bizarreness, clarity of representation, coherence of structure, and temporal structure etc, as long as it is remembered that ultimately these cannot be understood without reference to the meanings of the dreams to which they apply. In some respects they may be looked upon as emergent phenomenon, that cannot necessarily be understood simply from a knowledge of the dream construction processes. On the weight of the evidence here, two candidates remain (of the eight proposed by Hauri et al) for parameters that may be derived from the actual production routines of the dream. These are temporal structure and dream continuity. We will investigate the origins of these when we eventually consider levels of dream structure intermediate to their overall form or specific content. Before we do so however, we might wish to consider whether there are any manifest features of dreams which are influenced by personality structures? A possibility is the degree of complexity of a dream.

It has been shown that many of the measures of dream content are inextricably linked to their meaning. The

material activated from memory which forms the substance of these meanings must be subject to certain constraints. This follows from the finite processing capacity of the brain. By itself this ensures that the entire contents of one's memory do not become simultaneously available for reprocessing whilst dreaming is in progress. Although this factor places a limit on the amount of material present in a dream, it does not suffice to explain the diversity of that material. Consequently this must be due to factors other than processing capacity. Current hypotheses are that variations in the range of material (below some upper limit determined by processing capacity) are either randomly determined(Foulkes 1982a) or else stem from factors associated with the structural integrity of the personality(Roberts 1980, 1981).

A possibility consistent with this latter position is that the complexity of the relationships associated with the numerous facets of selfhood determines the complexity of the meanings appearing in a given person's dream. Put another way, the contents of a dream mirror in their complexity the multidimensional character of the self. This influence could operate via the selection of material from areas of memory which are in need of revision; where the predictive implications of a set of constructs are weak. Thus a set of loosely

related constructs will denote an aspect of the self that is weakly structured.

This postulate forms the basis of the next experiment. The premise upon which it is based asserts that selfhood and networks of meaning are in fact different levels of description of the same activity in the brain. As regards the issue of whether the initial stages of dream production are randomly determined or not, the following experiment will not conclusively decide this. However it is generally acknowledged that when one is dealing with complex systems, the purposefulness or goal directedness of a system's behaviour is always much easier to spot the further up the hierarchy one is examining it from. If dream complexity does turn out to be related to personality factors, then this would strengthen the case for thinking this aspect of dreaming to be non-random.

This will be investigated empirically once again through the use of repertory grid technique. Roberts(1980) devised a 'multiple self' grid which provides a means for eliciting the components of meaning within which the self is embedded. It has been seen that this method can be emloyed effectively with dreams serving as the elements. The purpose of the experiment will be to see if the completion of two such grids produces results of comparable complexity in each.

EXPERIMENT TWO

METHOD

Design

This is a repeated measures design. The analyses to be performed are given below. .

1. Both dream and self grids will be analysed by Slater's Ingrid program to yield a matrix of inter-correlation coefficients.

2. From each grid the number of correlation coefficients significant at the two per-cent level will be abstracted as a measure of the degree of complexity within a grid. A correlation will then be calculated, comparing the number of these correlations in each type of grid.

Subjects

These were the same nine subjects who participated in experiment one. As before data is included from one of the subjects that was obtained on an earlier occasion. Thus ten score pairs will be provided in all.

Materials

1. Commodire 8032 microcomputer.

2. Commodore printer model 3032.

3. Repertory grid program(see appendix 2).

4. Subject's dream diaries from experiment one.

As before, the elements were included within data statements in the computer program. For the multiple

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self grid these were as follows.

a. Myself as son/daughter.

b. Myself as brother/sister.

c. Myself as spouse(boy/girl friend).

d. Myself in my occupation.

e. Myself as I would like to be(Ideal self)

f. Myself as a neighbour.

g. Myself as a friend(with men).

h. Myself as a friend(with women).

i. Myself when alone.

j. Myself in a group.

k. Myself in authority.

l. Myself as an adult.

These elements were chosen to represent a cross section of the roles one takes in organising one's experience. They are not intended to be exhaustive. The set broadly covers familial, occupational and peer roles in the social sphere, as well as one's roles.

Procedure

The repertory grids completed from subjects' dream diaries were those obtained from experiment one. Within a short period(no more than four days) after completing this grid subjects completed a multiple self grid. The short time span was essential given that possible changes in the nature of personality could occur over a

longer period and thereby constitute a source of error.
The procedure for completing the grids follows that
outlined in the previous experiment.

Results

TABLE 7.5

Number of Correlations Constituting Primary Clusters in
Dream and Multiple Self Grids.

	Dream Grid	Multiple Self Grid
S1a	1	6
S1b	10	35
S2	5	28
S3	5	30
S4	5	7
S5	3	9
S6	9	17
S7	3	10
S8	1	5
S9	2	8
Mean	4.4	15.5

$F_{max}=13.316$, $p<0.001$.

Owing to the non-normal nature of the data it was
transformed by natural logarithms.

$F_{max}=1.266$, $p=n.s.$

With the variances now being in a permissible range a
linear correlation can be computed.

$r_{sd}=0.798$, $p<0.01$.

This result provides some support for the suggested correspondence between the complexity of dream meanings and those concerning the self.

Discussion

It could be argued that the relationship between the size of the clusters in the dream and multiple self grids is not due to any tendency to structure one's dream meanings in accordance with the meanings that circumscribe the self, but rather to a generalised tendency to structure all one's meanings in a related fashion. Thus no matter what the pool of elements are which form the area of investigation the constructs which differentiate them will always be internally related to a similar degree of complexity for any one person. This is tantamount to advocating that the manner in which one semantically structures the world is of the order of a trait. This notion has some similarity to that of 'cognitive complexity'(see Bieri 1955, Adams-Webber 1969, Honess 1976) in that it gives rise to the suggestion that people vary along a continuum in the extent to which they are able to construe all aspects of their world(n.b in the case of cognitive complexity, the ability to construe the social world) in a multidimensional way. Were this to be the case then the result obtained could not be taken as support for the view that the complexity of the sense of

self influences the complexity of dream content. There
are however philosophical grounds for doubting that
cognitive complexity is an adequate explanation for the
results. It seems irrational to suppose that all the
various construct subsystems which make up a person's
personal construct system can be equated in terms of
their complexity. Bannister and Fransella(1971 p.111)
argue;

> A person could well be extremely cognitively
> complex in relation to other people and yet
> simple when dealing with his family(or subtle
> when pondering paintings but crude on the
> topic of cats).

Honess(1976) likewise makes the point that the
complexity of any construct subsystem is really only
properly judged by the degree of complexity in other
subsystems and not in absolute terms. Despite the
strength of these arguments, they may not be necessary in
the present case in that further analysis of the grid
data may help to resolve the issue.

First of all the complexity exhibited within each of
the grids is markedly different. The number of
significant correlations on each grid differ greatly(cf
the means of 4.4 and 15.5 for the dream and self grids
respectively).

t=3.778 for 9 df, p<0.01(2-tailed).

Thus strictly speaking each grid exhibits vastly
different degrees of order and complexity. It is the

variation in the complexity of each type that is related. For the dream grid to exhibit less order is what one might expect from even a casual examination of dream material. We do generally regard the thought forms present in dreams as being very loosely structured in comparison to waking mentation. This does provide a degree of validity to what the grid is intending to be measuring.

Secondly if one is proposing(as adherents of the cognitive complexity hypothesis might) that the present results merely demonstrate that subjects are imposing a comparable degree of order on any two grids irrespective of the content, then one would expect that by treating each grid as if it were really two grids(i.e as split half grids then)the degree of reliability between the two halves of the self grid will be proportional to the degree of reliability between the two halves of the dream grid. If on the other hand one views the related order between the two grids as arising from a causal connection underlying them which depends on the actual contents of these grids then there is no reason to suppose that the construct pattern stability between the two grids should be in any way related.

To test this, all the grids provided by the subjects were divided into two grids, with each grid consisting of half of the elements from the parent grid selected on

a random basis. Linear correlation coefficients were
then computed between all combinations of constructs on
each of the half grids. For each type of grid a
reliability coefficient was then computed between its
split half forms. These are shown in the table below
for both dream and multiple self grids.

TABLE 7.6

Reliabilty Coefficients Between Split Half Forms of
Dream and Multiple Self Grids.

	Dream Grid	Multiple Self Grid
S1a	0.308(*)	0.523(***)
S1b	0.522(***)	0.148
S2	0.406(***)	0.853(***)
S3	0.114	0.785(***)
S4	0.488(***)	0.238
S5	0.234	0.159
S6	0.329(**)	0.191
S7	0.064	0.493(***)
S8	0.022	0.476(***)
S9	-0.017	0.006
Mean	0.247	0.387

1. Asterisks denote level of statistical significance.
*(0.05) **(0.01) ***(0.002).

$F_{max}=2.132$, p=n.s.

$r_{sd}=-0.049$, p=n.s.

As well as there being no relationship between the

internal reliabilities of each-form of grid there is
also no significant difference in the degree of
reliabilty between the split half forms of each grid.
t=1.258 for 9 df, p=n.s.

Conclusion: The Form of Dreams

Previous researchers have proposed a number of
different dimensions to provide a universal set of
parameters within which all dream content could be
included. From the perspective engendered by systems
theory it is thought that, if valid, the origins of such
dimensions would need to be explained. In accordance
with the hierarchical model proposed in chapter six,
these parameters were seen as covering very abstract
components of dream content. When such descriptions
were personally provided by the dreamers themselves they
were found by judges to reliably differentiate between
the form and the content of dreams. On closer
inspection many of the formal parameters were found to
embody significant personal meanings. Thus they cannot
be fully considered independent of what they mean.
Because of this they cannot be considered as universal.

This presents difficulties for the view that form
constrains the expression of content during dream
construction. However in the case of two of the
parameters(temporal structure and dream continuity), the
question was left open for future consideration(see

chapter eight) as to whether or not they originate from processing that takes place during dreaming. Evidence supporting a causal role for form in the weaving together of the myriad images and elements that make up the content was obtained in the second experiment, in which dream complexity was found to be associated with the complexity of relationships involved in defining the self.

Summary

Overall then, formal descriptions of dreams have been found to be mainly dependent upon semantic factors. These forms may or may not reflect aspects of the processing routines which constitute dreaming. The systems theory of dreaming in this context is concerned only with those forms which genuinely reflect dream processes. Other categories more properly reside under the umbrella of secondary revision. These are forms of thought imposed by the waking mind upon the dream in an attempt to impose a degree of order on the experience that was not present during its initial construction.

In conclusion, an understanding of the determination of form at the highest abstract level is restricted to the evidence concerning dream complexity and the complexity of one's sense of self. This is consistent with the notion that abstract durable features of the psyche shape, and are reflected in, the higher levels of

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dream processing; a postulate derived from systems

theory.

CHAPTER EIGHT: DREAM SCENES

The study of surface structures of dream content ought to have a special status within cognitive psychology.

D.B. Cohen.

While the clocks of the midnight hours are squandering an abundance of time I shall go, farther than the shipmates of Ulysees to the territory of the dream, beyond the reach of human memory.
From that underwater world I save some fragments, inexhaustible to my understanding.

J.L. Borges.

The second level in the hierarchical organisation of dream content(see Table 6.1) is that concerning changes between scenes. To date two specific proposals have been made which purport to explain this manifest feature of dreams.

1. Abrupt scene shifts are reflections of a transition between one active neurophysiological subsystem to another. These subsystems are envisaged as either motor pattern generators or specific sensory systems(Hobson and McCarley 1979).

2. Scene shifts are due to a transition between high level psychological subsystems(as opposed to the low level systems just suggested), construed in terms of different selves.

The forthcoming experiment will attempt to decide between these alternatives. To obtain data which is

pertinent to the subself hypothesis, repertory grid methodology will be used. Obviously it is not possible to obtain direct physiological recordings from different motor pattern or sensory systems in human subjects, so a somewhat indirect attempt will be made to gather measurements relating to these. It is proposed instead to obtain data on subjects' ability to perform mental rotations of images. It is necessary that a brief explanation be given as to why this task has been chosen.

Foulkes(1982b) provides anecdotal evidence from two subjects who were able to report dream narratives, though of a generally or totally non-visual character, and who also had a waking cognitive deficit in performing mental rotations of objects. When asked to determine if test figures presented at various angles of rotation were identical to a standard test figure, both subjects were simply unable to perform the sort of mental rotation necessary to the task. This suggests that the activation of the visual sensory modality in dreaming is dependent upon the kind of cognitive ability just described. Variations in this ability may therefore denote variation in the activation of the visual sensory system.

Foulkes' evidence is of the all or none variety. Might we not expect more subtle effects to be detectable

between the dreams of people who are able to perform rotations with varying efficiency? It follows that the more rapidly one is able to perform rotations and by so doing thereby create new, transformed spatial configurations on the basis of existing information, then the more scenes one could create in a given unit of time. Transitions between scenes would therefore consist of transitions between information sets that become available to processing routines involved in the construction of visual scenarios. From this one might predict that longer dreams would contain more scenes. This is not as obvious as it first seems. Longer dreams could arise by the extension of a fixed number of scenes. This hypothesis extends the Hobson and McCarley hypothesis to a deeper level. The transitions between different physiological subsystems, rather than being between different sensory systems, may thus, strictly speaking, be between different information sets upon which sensory processing systems act. It is a reflection of a more fundamental level of neural activity.

Instead of the Thurstone space test which was used with the subjects mentioned by Foulkes, those in the current experiment will be given the 'Visuo-spatial Little Men Test' (Acker and Acker 1982). This test was originally devised for the purpose of discriminating

neurosurgical patients with right parietal lesions(Ratcliff 1979). It entails that a subject makes left/right discriminations on a figure which is rotated along two axes; the head up v head down axis and the face forward v face backward axis. In order to perform successfully at this task and arrive at the correct orientation, subjects must perform mental rotations on the figure. Ratcliff has demonstrated that the ability to do this is localised in the right hemisphere. This adds weight to the Kerr, Foulkes and Jurkovic(1978) hypothesis that dream visualisation is mediated by the right hemisphere. The time taken to do this will be taken as the dependent measure to be correlated with the dream data. It is reasoned that this will provide a more discriminatory measure than simple accuracy scores, which could become confounded with ceiling effects in the event of many subjects performing with total accuracy.

It has been shown that scores on the Little Men Test correlate well with raw scores on the Block Design subtest of the W.A.I.S(Ratcliff 1979). This is of interest because Foulkes(1982b) found children's performance on the W.I.S.C Block Design test to be a consistent cognitive correlate of the reporting of dreams from ages five through to fifteen.

To determine the contribution made to scene changes

brought about by activation of different motor pattern
generators the dreams will also be scored by the method
given in Hobson and McCarley(1979). In this one
computes the proportion of dream verbs expressing lower
extremity movements. It is legitimate to expect that if
Hobson and McCarley's hypothesis is correct, then
variations in motor pattern activity would accompany
transitions between different sections of the dream.

Supplement/e to the issue of scene changes, it was
decided to see whether the temporal structures of the
collected dreams were in any way related to the degree
of activity reported in them.

EXPERIMENT 3

METHOD

Design

This is a repeated measures design.

1. All dream reports will be rated on a number of dream parameters by two raters. Reliability coefficients will be computed between the two raters both in terms of the overall number of dreams and in terms of the mean score per subject per dream.

The parameters are;

a. The length of the dream reports.

b. The level of activity of the dreamer.

c. The proportion of verbs expressing lower limb movements.

d. Temporal structure(i.e whether there is a discernible time element present).

e. The number of dream discontinuities.

2. Subject to satisfactory indices of reliability being obtained the following correlations will be made.

Dream discontinuity v

  i   R.T on Little Men Test.

  ii Proportion of verbs relating to body movements.

  iii Dream report length.

  iv A grid measure of self structure integration(see Roberts 1980). This will be the mean inter-element distance from the ideal self.

Temporal structure v

   i   Proportion of verbs relating to body movements.

   ii   Degree of subject activity.

Subjects

    Ten subjects(seven female and three male) volunteered
to take part in response to notices placed at various
locations around the University campus. All the
students were undergraduates at the University of
Leicester. Mean ages of the subjects were 19.4 years
for the females and 19.33 years for the males.

Materials

1. SLE series 100, 10 channel Electroencephalograph.

2. SLE Input headbox with stand.

3. SLE electrode impedance tester.

4. One 500ml bottle E.E.G recording ink.

5. Two boxes single part continuous E.E.G recording
paper(305x249mm).

6. Airmec 4 channel display oscilloscope(type 729).

7. One 2-way heathkit intercom system.

8. One tape recorder and microphone.

9. One relay switch for remote control of tape
recorder.

10. Ten C-60 cassettes.

11. Ten silver chloride recording electrodes.

12. Several tubes electrode gel.

13. Several tubes electrode adhesive.

14. One 1 litre bottle acetone.

15. One 5ml disposable syringe with blunt needle.

16. Cotton wool.

17. Commodore model 8032 microcomputer.

18. Commodore model 8050 dual drive floppy disk.

19. Commodore model 2022 printer.

20. Bexley Maudsley Automated Psychological Screening (BMAPS) and Bexley Maudsley Category sorting test(BMCS) diskette.

21. N.F.E.R Nelson patient keyboard.

22. BMAPS and BMCS test manual(Acker and Acker 1982).

23. Repertory grid program.

Procedure

1. The subjects were asked to arrive at the Psychology Department on a pre-arranged date approximately thirty minutes to one hour prior to the time they would usually go to sleep. This would allow time for the subject to become aquainted with the experimental setting and to be wired for electrophysiological sleep monitoring.

Once the subject indicated s/he was ready to be prepared for electrophysiological recording s/he was asked to change into night attire in the adjoining sleep room and then return to the laboratory for electrode attachment. Standard electrode placements as indicated by Rechtschaffen and Kales(1971) were used. Having attached the electrodes the subject then returned to the

sleep room and got into bed before having the electrodes plugged into the designated positions in the headbox immediately behind the bed. Electrode resistances were tested once more and all facial electrodes taped to the skin so that they would remain in place during the night. Finally it was ensured that the subject had sufficient freedom of movement. In the laboratory adjoining the room the various indices of physiological activity were monitored simultaneously on the E.E.G machine and the four channel oscilloscope.

Table 8.1

Recording Scales For Sleep Monitoring

Channel	Derivation	Gain(uv/mm)	Time Constant(sec)
1(E.E.G)	C3A2	7	0.3
2(E.E.G)	C4A1	7	0.3
3(E.M.G)	Fp1Fp2	3.5	0.03
4(E.O.G)	Sp1N	7	0.3
5(E.O.G)	Sp2N	7	0.3

The subject's first night of sleep was undisturbed to allow for adaptation to the laboratory environment to take place. The next night awakenings were made several minutes into each REM period(Fig.1) and, following the procedure laid down by Foulkes(1962), subjects were questioned regarding any mental activity which had been occurring prior to being awoken. The dream reports were initially tape recorded and later transcribed.
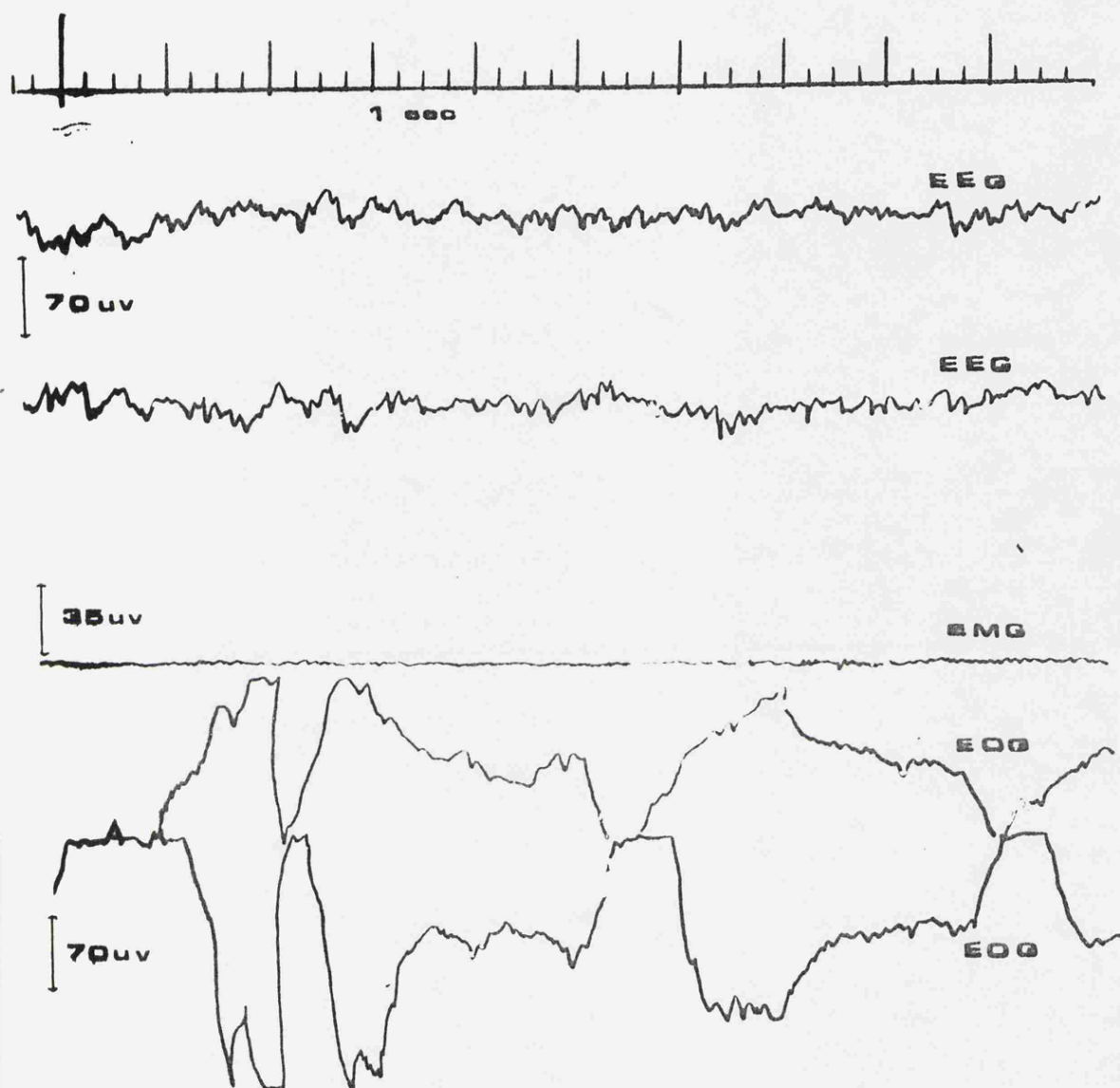
Fig.1 Electrophysiological recordings taken during stage
REM of sleep. E.E.G refers to electroencephalograph,
E.M.G to electromyograph and E.O.G to electrooculogram.

One of the ten subjects actually spent three nights in the laboratory owing to the failure of the recording equipment on the second night. Information regarding the number and timing of these can be found in appendix 4. Normally only one subject per week provided data so that the experimenter could catch up on lost sleep between each recording session and therby remain as alert as possible when running the next subject. On two occasions it was necessary to run two subjects in one week in order to avoid the difficulty of obtaining subjects during the approaching vacation period, when few people would be available.

2. Within two days of completing the first part of the experiment subjects returned to complete the Visuo-Spatial Little Men Test (one of the BMAPS tests) and a repertory grid.

The Little Men Test was loaded into the computer from a protected diskette. A specially placed keyboard was placed over the original keyboard of the CBM 8032 microcomputer being used. This enabled rapid classified responses to be made when required. In this test a figure appears on the computer screen holding an object in one of its hands. The figure may appear in any of four orientations.

a. Upright and facing outwards.

b. Upside down facing outwards.

c. Upright and looking away.

d. Upside down looking away.

The task for the subject is to indicate as quickly as possible(within a maximum time limit of fifteen seconds) by pressing one of two keys whether the object is in the left or the right hand of the figure. Before undertaking the test proper four practice questions were given. Full instructions to ensure that each subject understood thoroughly what was required of them can be found in Acker and Acker(1982 pp35-36). Following the preliminary questions the experimenter checked on the subject's ability to identify the orientations of the figure, and as a final check each person was asked to state in their own words what they thought they had to do in the experiment. Subsequently the subject went on to complete the test questions which consisted of thirty two trials, involving eight trials on each of the four orientations randomly presented. Although the subjects were aware that they had up to fifteen seconds to respond, all responded in times much shorter than this. At the end of the test results were output to the printer.

   Following a short interval of one or two minutes the subject then completed a multiple self grid, following the procedure laid down in earlier experiments.

3.   The dream reports were later transcribed onto

individual cards. These cards were then shuffled into a
random order and two persons(the experimenter and K.H)
rated each of the dream reports along a nine point scale
on each of the dimensions listed below(1=left hand pole,
9=right hand pole).

a. Long v Short

b. Activity v Passivity.

c. Time discernible v Not discernible

In addition each rater was requested to indicate for
each dream

d. The number of changes of sequence. These were
defined as sudden shifts in scene or thematic content
without a smoothing or transition through logical
explanation, i.e sequences which do not logically follow
each other or which lack continuity because of implied
but missing episodes(see Winget and Kramer 1979
pp162-164).

e. The percentage of dream verbs expressing bodily
movements. This is scored almost exactly according to
the procedure described by Hobson and McCarley(1979).
The only difference being that Hobson and McCarley
restrict themselves to movements of the lower
extremities. In the opinion of the author, movements
involving the hands and arms are just as indicative of
motor pattern generator activity and deserve to be so
scored.

The procedure for scoring this variable is as follows.

For each of the dreams.

A. Score the total number of verbs appearing in the dream report. Exclude purely descriptive verbs such as 'to be' and 'have' etc from the total verb count.

B. Score verbs relating to bodily movements. Relevant verbs would include walking, running, climbing, picking, stroking etc. Verbs such as 'go' that describe a change of location from one clearly defined spot to another are also to be scored as long as it is the case that the change in location of the dreamer has been brought about by that form of muscular activity. An example of this would be where the dreamer reports "going down the road".

C. Finally express the fraction B/A as a percentage.

Results

All the dream reports, details of awakenings and subject data can be found in appendix four. Overall 46 awakenings were made. Dream reports were obtained on 38 of these occasions, giving a report rate of 82.6%.

1. INTER-RATER RELIABILITY

Owing to the excessive numbers of tied scores correlations were computed using Spearman's rank correlation coefficient.

Table 8.2

Correlations Between Raters on Dream Parameters.

rho is computed over ratings on all dream reports(n=38).

rho(2) is computed on mean scores for each subject per dream(n=10).

PARAMETER	rho	p	rho(2)	p
Long v Short	0.695	<.002	0.776	<.02
Activity v Passivity	0.587	<.002	0.864	<.01
Movement verbs	0.591	<.002	0.830	<.01
Time discernible v Not discern'	0.494	<.01	0.681	<.05
Number of discontinuities	0.417	<.01	0.561	<.10
Mean correlation	0.557		0.742	

All of the variables achieve acceptable levels of significance and can therefore be utilised in the main analyses.

2. RELATIONSHIPS BETWEEN DREAM PARAMETERS AND REACTION TIMES ON VISUO-SPATIAL LITTLE MEN TEST

Table 8.3

Mean Scores/Subject for Dream Parameters and Reaction Times

For each variable, row 1 contains the ratings from K.H and row 2, the ratings from the experimenter(R.R)

	Subject									
	1	2	3	4	5	6	7	8	9	10
Length	7.00	5.25	5.00	6.50	7.00	6.50	6.20	8.00	5.40	6.0
	7.00	5.25	5.25	6.75	7.25	6.00	6.60	6.60	6.00	4.0
Active	5.00	6.00	3.75	7.25	6.00	6.50	6.80	5.00	5.40	2.5
	6.33	6.00	4.25	6.50	5.50	6.50	6.40	4.00	5.20	3.5
M.Verbs	4.73	17.5	24.5	43.9	25.8	0.00	7.78	53.6	12	31.4
	4.73	9.15	29.8	18.1	17.5	0.00	2.84	18.3	3.6	11.6
Time	7.66	6.75	4.75	8.00	6.75	9.00	6.80	8.40	8.00	7.5
	5.33	4.50	3.00	4.50	3.25	6.00	5.00	5.20	3.80	5.0
Scenes	1.00	1.50	2.50	1.25	0.50	2.00	2.60	1.40	1.00	3.0
	0.33	2.00	1.50	0.50	0.25	0.00	0.60	0.80	0.40	1.5
R.T's	2.81	1.39	1.32	1.84	2.44	3.90	0.97	1.47	2.15	1.5
Accuracy	32	25	32	25	30	26	32	30	32	32

Table 8.4

Mean Inter-Element Distances from Ideal Self

Subject no.									
1	2	3	4	5	6	7	8	9	10
0.949	1.094	1.097	1.015	1.081	0.884	0.139	0.981	0.9	1.27

Overall mean =0.941

Table 8.5

Correlations Between Dream Continuity and Selected Variables

Correlations for each Rater

Variable correlated with Dream Continuity	K.H rho	p	R.R rho	p	n
1. Reaction time	-0.573	<0.10	-0.821	<0.01	10
2. Movement verbs	-0.027	n.s	0.458	n.s	10
	0.029	n.s	0.163	n.s	38
3. Long v Short	-0.461	n.s	-0.640	0.05	10
	-0.450	<0.01	-0.495	<0.002	38
4. Ideal self distance	-0.167	n.s	0.61	<0.10	10

Table 8.6

Correlations Between Temporal Structure and Selected Variables

Correlations for each Rater

Variable correlated with Temporal Structure	K.H rho	p	R.R rho	p	n
1. Movement verbs.	-0.055	n.s	-0.491	n.s	10
	-0.079	n.s	-0.296	0.01	38
2. Active v Passive	0.230	n.s	0.309	n.s	10
	0.202	n.s	0.283	<0.05	38

Discussion

The evidence gathered from this experiment leads to several important conclusions.

1. First of all the degree of dream discontinuity is significantly correlated with reaction times on a task involving mental rotation of a figure through three dimensions. This supports a modified activation-synthesis model.

2. The current findings necessitate a modification in the activation-synthesis hypothesis in as much as the results suggest that scene changes involve transitions between different subsystems of information upon which the visual sensory modality acts, rather than between different sensory modalities per se. It is possible that the same operations in other sensory modalities produces similar effects. It is certainly the case that some such elaboration of the findings is necessary in order to account for the presence of structural breaks in the dreams of people who may be sensorily deficient(e.g congenitally blind) in a particular modality. This requires further investigation.

3. The postulated process is further supported by the significant correlations existing between the length of a given dream report and the number of scene changes in that dream. The nature of the statistical evidence is

impressive if one considers that the tendency for any subject to respond rapidly on the Little Men Test at the expense of accuracy would tend to obscure differences in the true ability levels of the subjects. Incidentally this relationship refutes the hypothesis generated by Evans' computer model(discussed in chapter five) that longer dreams would exhibit greater narrative coherence.

The findings indicate that the speed of spatially transforming visual information affects the amount of material that becomes available for dreaming about. It also suggests that the material which goes to form the additional scenes exists in discrete sets. The degree of similarity between these information sets selected for further processing will of course depend upon factors other than one's ability to transform information into new spatial configurations.

4. The correlational data failed to support the activation-synthesis model in respect of motor pattern generator activity. However Hobson and McCarley(1979) argued on the basis of their evidence that two processes are at work- one determining whether motor activity is present or not, and the other determining the frequency with which it is reported. It could therefore be said that the method of analysis employed above for correlating the number of movement verbs with the number of scene changes only deals with the second aspect.

Consequently it would be possible for motor pattern generator activity to be involved in producing scene changes without showing a positive correlation in terms of degree. Therefore if instead of correlating these two variables, we simply look to see whether the presence of movement verbs in a dream report is associated with the presence of a scene change, then we obtain the following figures.

Table 8.7

Association between Scene Changes and Presence of Motor Activity Reported in Dreams(figures indicate number of dreams).

I.   Rater =RR

	Scene change	
	present	absent
motor activity	10	8
no motor activty	9	11

$x^2=0.106$, p=n.s.

II. Rater =KH

	Scene change	
	present	absent
motor activity	20	7
no motor activty	7	4

$x^2=0.064$ p=n.s

These results also fail to show any evidence that the activation of motor pattern generators influences

whether or not a dream is broken into discrete scenes.

4. Predictions from personal construct theory that high level self structures were responsible for scene changes were not confirmed. At a purely theoretical level one could still argue that fragmentation of the subselves at this higher level could increase the efficiency of information processing at the lower level. In certain 'split brain' patients functional isolation of the hemispheres has been found to increase the processing capacity of each individual hemisphere(Gazzaninga 1970). If an analogous process were taking place in the current context, one would expect to find a positive correlation between the measure of self structure integration and the speed on the reaction time task. However although the size of the relationship is in the predicted direction(rho=-0.309), it is clearly non-significant.

II

Turning now to the supplementary question of the temporal structure of dreams. From table 8.6 above it can be seen that there is an indication from one of the raters that motor pattern generator activity makes a slight contribution to the temporal structure of the experienced dream. This was not confirmed by the second rater. Although the presence of an effect would concur with Ornstein's(1972) belief that our experience of time(in any mode of consciousness) is not primarily

given, but is dependent on the manner in which events unfolding through it are constructed, it would be unwise at the present time to view this data as providing supporting evidence.

Obviously the temporal structuring of dream events is a whole topic for further research by itself. As part of such a program, the extension and further elaboration of the methodology employed here might furnish the means by which the many components which lay behind it will be unravelled. A thorough discussion of the science of temporal experience is outside of the scope of the present work. However the notion that time is constructed on the basis of the events that signal its evolution affords an important insight into the dream experience. Because we are used to structuring time on the basis of the order experienced in events during waking, the sometimes very different order inherent in dream events allows for the possibility of us construing outside of the usual framework. This, when considered in conjunction with the contiguity of dreaming and sleep, and the metaphorical association of sleep with death, throws light on why it is that dreams have almost universally been taken to have magical and mystical significance- experience at variance with the temporal quality of wakefulness and in a state seen as being akin to death.

CHAPTER NINE: DREAM CONTENT

RECURRING IMAGES

We will now move on to a consideration of the contents of dreams rather than their form or thematic structure. The focus of this study will be those recurring images and themes which appear throughout a dream series. Since laboratory monitoring procedures made possible the study of nightly dream sequences, surprisingly few researchers have directed their energies towards this area. Dement and Wolpert(1958) were the first to make the observation that the dreams of a single night were related. They advanced two broad classes of explanation to account for this.

1. The interuptions to ongoing dreams required by the REM monitoring procedure led to an unnatural continuity by forcing each dream in a series to carry on from where its predecessor left off.

2. The continuities observed reflect the natural pattern of dreaming.

Offrenkrantz and Rechtschaffen(1963) in a further study noted the similarities in the events from night to night and suggested the presence of a cyclic relationship as a general characteristic of sequential dreams. The presence of similarities across nights does much to discount the artefact hypothesis(1. above) but the preoccupation with collecting nightly dream

sequences primarily for purposes of interpretation has meant that the implications of such continuities between dreams with regard to models of dream formation have not been sufficently explored. Given the period of time these experiments were performed, this is perhaps not surprising, but it is somewhat disappointing that the work has not been followed up. Kramer et al(1976) did collect dreams from college students over twenty consecutive nights as part of a larger study, and were of the opinion that the question of whether there is order amongst the dreams of a given night was 'a point worth pursuing'(p.781). They were content to conclude, however, only that dreams evidenced non random processes. They did not consider what the nature of these processes might be.

The present study aims to pursue the question of whether dream sequences exhibit cyclical relationships via an examination of the patterning of the recurring contents during the course of a dream series. It will be asked how such repetition can be explained from the perspective of modern cognitive psychology.

EXPERIMENT 4

METHOD

Design

This is a single subject design. An attempt will be made to model the data obtained from the experiment using the formal system of sets derived in chapter six from systems theory. It is hoped that this will cast light on the formal mechanisms by which dream material recurs.

Subjects

One subject only took part, a 19 year old male undergraduate student in the second year of a psychology course at Leicester University who had volunteered.

Materials

The equipment used for E.E.G monitoring as in the previous experiment plus

1. Commodore 8032 microcomputer.

2. Commodore printer model 2022.

3. Repertory grid program.

Procedure

The subject was asked to arrive at the Psychology Department approximately thirty minutes to an hour prior to the time he would usually go to sleep. On arrival on the first night the subject was shown the equipment which was to be used and talked with informally so that it would enable him to relax as much as possible in what

are admittedly unusual circumstances to be getting a night's sleep.

As before standard electrode placements were used and the subject's first night of sleep was allowed to go undisturbed so that adaptation to the laboratory environment could take place.

On each of the following four nights(the subject spent five nights in the laboratory in all), awakenings were made several minutes(on average; 7 mins 40') into each period of REM sleep, and, following the procedure laid down by Foulkes(1962), questioned as to the nature of any mental activity which had been occurring prior to being awoken. From nineteen such awakenings over the four nights, a total of eighteen dream reports were obtained. These reports were initially tape recorded and subsequently transcribed. The experimenter and the subject later went through the transcribed reports and noted the presence of any elements(images or themes) which were repeated.

Results

The transcribed dream reports can be found in appendix 5. Six elements were found to be present on more than one occasion. These are listed below.

a. Motor vehicle.

b. T.V screen.

c. River/Water.

d. Presence of Sinister atmosphere.

e. Tree/Garden.

f. Girl.

The frequencies with which these appeared over the four nights are shown below.

TABLE 9.1

Frequency of Recurring Elements

Night

Element	1	2	3	4	Totals
a.	2	2	1	2	7
b	1	1	1	1	4
c.	2	1	1	0	4
d.	3	1	2	0	6
e.	2	0	1	1	4
f.	1	1	2	1	5
Totals	11	6	8	4	29

Analysis of variance on this data revealed no significant variations between either nights $F_N(3,15)=1.176$ or elements $F_E(5,15)=0.706$.

The positions in the dream series which the elements occupied were noted.

TABLE 9.2

Positions of Recurring Elements in Dream Series

	NIGHT			
	1	2	3	4
	1 2 3 4 5	1 2 3 4	1 2 3 4 5	1 2 3 4 (Dream no.)
a.	X X X X		X	X X
b.	X	X	X	X
c.	X X	X	X	
d.	X X X	X	X X	
e.	X X	X		X
f.	X	X	X X	X

n.b 'X' denotes presence of element.

From the above table it can be seen that the dreams of the series can be coded in the form dream 1=cd, 2=bcd, 3=adef etc, as they relate to recurring elements. Two main questions can be asked regarding this series.

1. How might the content of this series be explained?

2. Does the above series provide any evidence of a pattern in the nature of the dreaming process?

It is proposed that what needs to be explained here is the transition between the contents of successive dreams in the series. On the basis of the formalism provided in chapter six it was thought that set theory might be applied to come to a better understanding of this.

We can look upon the contents of each of the dreams as $n(R)+n(Un)$ where n is the number of elements in each class present in that dream. As we are primarily concerned with recurring elements at this moment, we will

concentrate on the set R.

We can now designate the dream series as the series of sets $R_1+R_2+R_3\ldots\ldots\ldots R_{10}$.

We can approach the problem of explaining this series from the perspective of the operations that are required to turn set R_n into set R_{n+1}.

We can do this as follows.

For each dream

1. Let $M_n=R_n$ (the contents of the manifest dream).

2. Let $S_n=$ the set of remaining recurring elements in the series.

3. Let $C1_n$ be the subset of M_n to be deleted between M_n and M_{n+1}.

4. Let $C2_n$ be the subset of S_n to be added to M_n.

In fact $C1_n$ and $C2_n$ can be precisely defined in retrospect as:

(9.1) $C1_n=(M_{n+1} \cap S_n)$.

(9.2) $C2_n=(S_{n+1} \cap M_n)$.

Therefore at the beginning of the series($n=1$) $M_n=c,d$ and $S_n=a,b,e,f$.

We can now envisage the transition between any two dreams in the series M_n to M_{n+1} as involving the transfer of items into and out of set S. Between dream 2(b,c,d) and dream 3(adef) for instance elements 'b' and 'c' are deleted from set M_2($C1_n=b,c$) and elements 'a', 'e' and 'f' are added

from set $S_2(C2_n=a,e,f)$.

Each such transition between dreams can be seen as involving the following set theoretic operations.

(9.3) $M_n=M_n-(C1_n)$

(9.4) $S_n=S_n+(C1_n)$

(9.5) $M_{n+1}=M_n+C2_n$

(9.6) $S_{n+1}=S_n-C2_n$

The transition: $M_n-->M_{n+1}$ can thus be expressed as:

(9.7) $f:(M_n,M_{n+1},S_n,S_{n+1})/$

$M_n-(M_{n+1} \cap S_n)+(S_{n+1} \cap M_n)=M_n+1$.

Additional points worth noting are:

a. The sum of M_n and S_n are constant:

(9.8) $n(M_n)+n(S_n)=k$.

b. The total no of items(I) transferred to and from M_n is given by:

(9.9) $I= n(C1_n)+n(C2_n)$.

If we apply this to the actual dream series we obtain the table below.

<u>Table 9.3</u>

Contents of Postulated Sets at Different Stages of the

Dream Series.

Dream(n=)	M_n	S_n	$C1_n$	$C2_n$	I
1.	cd	abef			
			/	b	1
2.	bcd	aef			
			bc	eaf	5
3.	eadf	bc			
			adf	/	3
4.	e	abcdf			
			e	a	2
5.	a	bcdef			
			/	d	1
6.	ad	bcef			
			d	bc	3
7.	bca	def			
			bca	f	4
8.	f	abcde			
			f	/	1
9.	/	abcdef			
			/	e	1
10.	fe	abcd			2
			e	d	2
11.	fd	abce			
			f	bc	3
12.	bcd	aef			
			bcd	a	4
13.	a	bcdef			
			a	/	1
14.	/	abcdef			
			/	/	0
15.	/	abcdef			
			/	/	0
16.	/	abcdef			
			/	abf	3
17.	abf	cde			
			bf	e	3
18.	ae	bcdf			

Given that once a dream series has been obtained and
that the relationship between recurring elements from
dream to dream can be orderly expressed, one is entitled
to ask 'What exactly does this transition between sets

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constitute in psychological terms?'

First of all it seems to support Offenkrantz and Rechtschaffen's belief in a cyclical relationship between dream elements. In mathematical terms alone the recurring elements are being recycled between two sets M and S. It is proposed that this process of transferring elements between sets is a mathematical analogue of the information processing operations taking place between dreams. The possible psychological means of this will be discussed shortly. However if there is a psychological reality to this, then we might expect there to be a relationship with one or more variables associated with the subsequent dreams. To investigate this possibility the measure 'I' was compared with the lengths of the dream reports(D). The comparable data is presented in the table overleaf.

Table 9.4

Comparison of Dream Report Length with Number of Items

Transferred Between Sets

Dream	Items transferred(I)	Report Length(D)
2	1	93
3	5	202
4	3	89
5	2	68
6	1	57
7	3	101
8	4	102
9	1	173
10	1	43
11	2	153
12	3	177
13	4	57
14	1	64
15	0	49
16	0	37
17	3	268
18	3	111
mean=	2.18	108.73

It was decided to compare the natural logarithmic transformations of this data. There are two reasons for this.

1. As it stands the data violates homogeneity of

variance, $F(2,17)=1961$. The log transformed data however does not, $F_{t}(2,17)=1.1068(p=n.s)$.

2.   In the light of the report by Cohen(1980 p.17) of a reliable relationship between the log duration of an REM period and the log duration of the preceding period of NREM sleep.

(nb as $\log_e x$ is not computable if $x=0$, x was set at 0.01) The linear correlation performed on the log transformed data was found to be statistically significant($r_{t_d}=0.586$ $0.01<p<0.02$).

Thus there would seem to be valid grounds for imparting to these set theoretic operations a degree of psychological reality.

Discussion

The discussion will focus on three principal questions arising from this experiment.

1.   Is the model testable?

2.   What does the mathematical consistency of this model of recycling elements actually refer to?

3.   How do these operations relate to the other levels of processing involved in dream production?

1. Testability

The question of what it means to model systems behaviour mathematically has been raised in other quarters, notably in connection with Thom's catastophe theory(see Woodcock and Davis 1980, Saunders 1980).

Sheldrake(1983) notes that models of this type do not usually enable quantitative predictions to be made. Of the current model this is true. The nature of the relationships between the sets of elements in successive dreams, exact though it is, is not predictive. However it does show that they exhibit a certain kind of order. Hitherto such order has not been clearly modelled in dream psychology. In fact the question asked for so long has been whether dreams even exhibit order. The relationships encapsulated in this representation are in fact axiomatic. The question of the testability of the model relates more to the psychological models which can be constructed on the basis of the mathematics. In this sense the model is very easily testable. In obtaining any dream series one merely needs to calculate the numerical values for 'I' between each pair of successive dreams and seek to correlate these values with empirically obtained data from REM dream reports.

2. Psychological Reality

That correlations exist between aspects of the model and empirically determinable variables derived from dreaming strongly suggests that these set theoretic formulations have some counterpart in the real world. The titles of the sets were in fact chosen with this in mind.

(a) Set M obviously refers to the recurring contents of

the manifest dream. This was the position from which
the model was initiated.

(b)   Set S functions in the model as a storage facility
for future elements.   It is almost inevitable that this
should lead to the proposal that it represents a human
memory store. Moreover the relationship embodied in
equation(9.8);

$n(M_n)+n(S_n)=k.$

could refer to the maximum capacity of this store.   The
psychological proposal, therefore, is that recurring dream
elements have been recycled from a limited capacity
store.

(c) Sets C1 and C2 function in the model to transport
elements between the storage set and the manifest dream
set.   These could represent a pathway or channel between
the two or perhaps a buffer.

One of the features in the data which has not yet
been commented upon is that the last recurring element
appearing in the dreams of one night is always in the
first dream of the next night in which recurring
elements appear.

<u>Table 9.5</u>

Relationship Between Recurring Dream Elements from Night

to Night

Successive Nights 1-2 2-3 3-4

Last recurring elements a   f   a

First recurring elements   ad fe aef

The probabiity of this occurring across each of the

three nights can be calculated post-hoc. From night one

to two this probability is 1/3(two out of six elements

appear on night two). For night two to three it is also

1/3, and for night three to four it is 1/2. The overall

probability of this occurring on all of the three nights

is therefore (1/3)x(1/3)x(1/2)(p=0.055). This further

supports the supposition that the elements are being

recycled in some way, and it also suggests that the

elements may be held in some kind of storage buffer prior to

occurring on the following night.

As it stands the actual mechanics of how this model

would function have not been spelt out. How, for

instance, are the elements transferred between sets?   In

information processing terms this could occur serially

or in parallel. The author has in fact constructed a

computational model of this process with the addition of

several features. This envisages processing as linear

and sequential. Items are transferred between sets one

at a time rather than in parallel. This leads to

correlations between the computational process and the dream report data of a comparable magnitude to that already reported. Readers interested in following this model in its fine detail are referred to appendix six.

3. Levels of Processing

This model of recycling elements presented here sounds a rather mechanical affair. However it is obvious from the data that psychological factors must play a part in (i) the selection of the set of elements which comprise the recurring elements in this series and (ii) the moment at which they do make their reappearance. A short analysis will reveal the second of these points more clearly.

In the dream series elements are found to occur either singly or in groups of two, three or four. It is a simple matter to calculate the probabilities of any particular combination of elements within any of these groups.

1. Given n different objects(here n=6 elements) one can find the number of combinations of r objects by the formula $^nC_r = n!/(n-r)!r!$

For r=1 the number of combinations is 6, for r=2 it is 15, for r=3 this equals 20 and for r=4 it is 15.

The observed combinations of elements within each group are given below.

Table 9.6

Observed Combinations of Elements

No of elements appearing together.

	1	2	3	4
Actual	a	ad	bcd	aedf
Elements	a	cd	abc	
observed	e	ef	bcd	
in each	f	fd	abf	
group		ae		

The probability of obtaining at least the observed frequency(f) of the most commonly occurring combination can now be calculated using the binomial theorem.

$$p = \sum_{i=o}^{P} {}^{n}C_{i} \times P^{i} \times Q^{e-r} \text{ (Siegel 1956).}$$

where n=frequency of most common combination, i=group, P=1/(no of combinations), Q=(1-P).

There are only two groups of obvious interest here. These are group 1 in which the element 'a' appears twice, and group 3 in which the elements 'bcd' occur in combination twice.

The probabilities of obtaining a frequency equal or greater than these amounts are;

For group 1, f=2 p=0.131.

For group 3, f=2 p=0.014.

This indicates that the combination 'bcd' occurring twice in the series, given the number of three element combinations that did appear, is extremely unlikely to have happened due to chance. One may suggest therefore that they were selected to appear together owing to the

action of a non random process. A plausible reason for these elements occurring so frequently may well lie in their symbolic referents. The two dreams in which they appeared are given below.

Dream 2(Night One)

It was night and something was about to happen to me again(It was like watching some sort of t.v series cos) there flashed up some words on the screen, like the thought it was a printed page with a quotation.."don't be afraid of the rainbow fish", and I was afraid of some sort of devil. Some demons or something were running around and I was wasn't going to let them get me.

I was in the river I think. I was in a tree and I was saying some kind of chant, sort of about being scared of the rainbow fish.

Dream 12(Night Three)

I was watching this trailer off, for new t.v serial. These four Pakistanis were in this Ford Escort in the middle of Hyde park lake(I don't know how it got there). I think it was to the Thames to start off with and they crashed into it. They started to drown and this bloke in a boat went up to them, told them to get out, so they all looked at him and got out and then this boat wasn't anywhere to be found and they had started swimming. Then they were getting themselves away some big eel was rubbing, wrapping itself round the boat and I could feel

this eel doing it to me so that's when I became part of the thing. Then I was just about to get to the shore, this thing wrapping itself around me(god it felt real, never had an eel wrapping itself around me) Oh the slime. It was wrapping itself around my stomach. I was thinking don't struggle or it'll pull you under or something.(It was like a real serial someone over dubbing) someone was saying it(like a B.B.C trailer) "This is the story off..." I don't know what his name was.

Clearly the contexts of the two dreams are very different indeed. Does this mean that the underlying meanings of the elements also varies, or that several different settings are needed to express the multiple components of their meanings? How this change in context affects the meanings is a question that cannot be answered at the present time. For those readers who wish to think about the meanings of the dreams in this series, then by all means interpret them. Neither the validity that such interpretations may have, nor their usefulness in understanding the individual psychology of the dreamer, will negate what truth there may be in suggesting that these elements arise via recycling from a limited capacity store. The quite surprising thing is that one does not require to know what they mean in order to comprehend the order that is present in them.

Without doubt there are many aspects to these dreams which a purely mathematical model alone cannot and does not explain. Nevertheless this is not a valid argument against the utility of such a model. It is the whole point of systems theory that many interlocking levels of explanation will be required. The contents of dreams are amenable both to an analysis in which they are treated as purely formal abstract elements as is the case here, and to a *psychoanalysis* in which their meaning is of paramount interest.

Addendum

I

One could raise a number of objections against the conclusions which are being offered here. First of all it might be said that a sample size of one is too small a base from which to make any valid generalisations applicable to the population. There are several grounds on which one could refute this objection.

(A) The nature of the mathematics involved has produced a formalism that apriori describes and is applicable to any series of elements drawn from a limited pool and produced in various combinations over a series. In our case this series happens to be referring to recurring dream elements. Of course the psychological model that has been derived does not enjoy the same protection from this argument. It does however enjoy the benefit of

having a statistically significant relationship in its favour. This, as has been noted, is easily open to experimental verification or refutation in any subsequent study.

(B) The history of psychology is replete with examples where quite valid theoretical frameworks have been elaborated on the basis of a single subject. Ebbinghaus's famous work on memory is one such instance. The general acceptance of the framework as a useful one must, of course, come from work with other subjects. The chief point that the author would stress in the defence of this approach here however, is that in order to make real progress in dream theory methods of this sort(i.e single subject) may need to be resorted to. Foulkes(1982a p.270) makes a similar case in arguing that "The traditional group sampling methods of experimental psychology may simply be scientifically inappropriate in any serious attempt at understanding dreams".

(C) The data in the present model derives from REM dreams. Fontana(personal communication) comments that such a model would need to make reference to how mentation in NREM sleep affects matters. This is a valid argument. One has to accept that by only sampling REM dreams one is missing out potentially valuable data. However REM sampling has been shown to be the most

favourable(from a statistical point of view) methodology for obtaining dream reports in number. Until a system is devised which involves sampling from both REM and NREM sleep during the same night, and which yields higher report rates the problem will remain.

However there are other issues stemming from the issue of NREM mentation. It could well be the case that elements are reappearing in NREM dreams as well. The same process may be taking place throughout sleep but under different general conditions. The implication of the model, however, is that it takes time to plan and produce dreams. Accordingly they will only arise periodically. Perhaps herein lies the reason for the association with REM sleep. Both are periodic phenomena contingent upon processes which, though different in themselves proceed at similar rates.

(D) The final question to be asked is whether the patterns in the data are artefactual, arising from the interuption to REM dreams, with each dream being forced to continue from where its predecessor left off? We noted earlier that the presence of similarities across nights does much to discount this hypothesis. The widely separate interval between the initial appearance of the combination 'bcd' in dream two and its reappearance in dream twelve is just such evidence. However even should there be some truth in this, surely

dreams do sometimes continue the work of earlier ones anyway and this in itself is in need of explanation.

II

After this lengthy consideration of the recurrent contents of dreams, the question naturally arises as to how unique elements make their way into a dream. The author holds the view that the determination of unique dream images is not the simple task it might at first be thought. It does, of course, depend upon the time span within which one wishes to study a dream series. The longer this is, then the more accurate will be the classification of elements, assuming that much recycling of dream material takes place within a short period.

Although repeated elements have been given a separate treatment, there are no grounds for thinking that they serve different functional needs to unique ones. All dream elements must start their 'lives' as unique elements, and for this reason alone if for no other it seems reasonable to suppose that repeated elements are those which place greater processing demands upon the person. The repeated routines of waking life revolving around reproduction, friendships, vocations, food gathering etc, emphasise very important aspects of our lives. Why should this not also be the case with dreams?

We can all recall having dreamt about quite trivial

material from time to time. This need not mean that the dream which contained them was meaningless. Instead we can look on them as opportunities taken to tie up loose ends and complete our thinking, on matters which have attracted our attention for moments during the day.

CHAPTER TEN: DREAM INTERPRETATION

The central issues of our trade are those of meaning and
within the vast array of meanings that the human
imagination generates, some of the most compellingly
attractive...are dreams.

L.Hudson.

The subject of dream interpretation has already been
met when discussing psychoanalysis. Professional
psychologists invariably contemplate dream
interpretation in this context and tend to regard it as
being outside scientific interest. This is an
assumption which has gone unchallenged for the better
part of this century. The proposal to be entertained
here is that the topic of interpretation can be
incorporated into a context that is neither
psychoanalytic nor unscientific. Starting from a
different premise, Hudson(1985) has arrived at a similar
position.

Using systems theory, dreaming has been envisaged as
a multilevelled hierarchical set of interconnected
processes. So far it has been convenient to view this
system largely as if it were isolated. We know, of
course, that it is not. Dreams exist in a social milieu
too. People have been communicating their dreams to one
another for millenia. From this larger perspective
dream construction constitutes a subsystem of processes

occurring within an individual human being amidst the social world in which that individual lives. Our dreams take shape in a particular culture at a particular time in history. All our mental adventures in the midnight hour are bound by these constrictions. The hierarchical scheme presented in Table 6.1 can be extended to include these aspects.

Table 10.1

Hierarchy of Aspects to Dreaming.

1. The cultural value given to dreams.

2. The social understanding and interpretation of dreams.

3. The individual interpretation of dreams.

4. Dream recall.

5. The Dream.

6. Scenes within dreams.

7. Repeated Elements(images/themes).

    (i)   within a single scene.

    (ii)   over several scenes.

    (iii) over several dreams.

8. Unique elements.

Dream Recall

Dream recall forms the interface between the dream as a personal and as a public product. It is the precondition for any attempt to understand how dreams arise and what they mean. Although it is rather obvious

to say so, the question of what a dream means to oneself and to others only emerges once it has been recalled. This in conjunction with the complex array of questions that can be addressed to recall are what characterise it as a new level of complexity. The whole area of dream recall is, in fact, one that has received a lot of attention.

It has been established that the timing and speed of arousal are important determinants of recall ability. The longer the time elapsed since the end of an REM period, the poorer the recall(Dement and Wolpert 1958), and sudden rather than gradual awakening is more conducive to good recall(Goodenough et al 1965).

Goodenough et al(1959) decided to compare in the laboratory those people who claimed to dream every night(good recallers) with those who claimed they hardly dreamt at all(once a month). Good recallers recalled dreaming 93% of the time they were awakened from REM sleep compared to 53% for the infrequent recallers. Both groups of subjects had the same number of REM periods per night, though the dreams of the poor recallers tended to be shorter in duration and less dramatic in quality. This study must, alas, remain inconclusive because of the fact that it was conducted before the Foulkes(1962) study that indicated a tendency for some subjects not to regard all of their mental

experiences during sleep as dreams. The most significant work in relating personality characteristics to recall has been reviewed by Hudson(1985). The major theme of this review concerns the distinction between divergent and convergent thinking.

Austin(1971) found that divergers recalled their dreams almost twice as often as convergers. Moreover the patterns in their REM sleep were consistently different. Convergers slept less overall, tended to go into REM sleep earlier in the night, to concentrate their REM sleep into the earlier part of the night, and to spend less of their time with their eyes still(i.e quiescent). Hudson concludes;

> It is as if the convergers need their REM sleep -and their dreams- more urgently than do divergers; and they work this need through more expeditiously. Yet it is the converger not the diverger who is the more likely to forget the thoughts that his dream sleep contains...The diverger it seems accomodates the apparently irrational aspects of his experience, musing on it, weaving it by one means or another into a story or argument. He assimilates, intellectualises, rationalises. The converger tends in contrast, to segregate his irrational imagery; to block it at the natural boundary between sleeping and waking thought(Hudson 1985 p.139).

Dream Intepretation

In contrast to dream recall, interpretation has received little serious scrutiny. However there are signs that this may at last be changing. Hudson considers the findings referred to above as central to

his proposals for constructing a systematic and coherent strategy for dream interpretation. He outlines three basic principles which he believes form the ingredients for a scientific discipline of dream interpretation.

1. The ambiguities of dreams can be read as if from a piece of poetry.

2. That dreams are linked to the waking context of the dreamer.

3. That individuals differ in the nature of the 'traffic' they allow between their waking and sleeping minds.

Another name is therefore added to the list of distinguished writers who have insisted that the matter of dream interpretation is not a question of following a simple algorithm, the end point of which sees one arrive at a complete understanding of a dream. The philosophy behind dream dictionaries and the like have never been entertained seriously by either analytically orientated or academic psychologists. In the modern parlance, dream interpretation, whichever method one follows, is heuristic. Not only is it risky and fraught with ambiguity but even when it is successful it may lead to multiple meanings being found behind the employment of a set of dream images.

A systematic discipline of dream intepretation need not be totally concerned with what a dream means. This

is not to say that it will not be an important aspect of it. By this it is meant that instead of the ultimate aim of a 'science' of hermeneutics being the disclosure of meaning, the focus of enquiry could fall upon those factors which help or hinder individuals or groups of people in elucidating meaning from a dream.

In keeping with such an approach Roberts(1980) reported an experiment which looked at the variation in ability between several individuals in following a chain of free association from a dream which they had each recalled and recorded at home. On the basis of the results, the suggestion was made that the more differentiated a given person's notion of themself was, the more easily could they loosen the hold which their waking context of thought imposed, and proceed to re-enter the shifting patterns and trains of thought from which the dream had been created. It might well be the case that this facet of personality is associated with the extent to which one thinks divergently. This might very well have become the subject of the next experiment. However given that the goal of this thesis is to elaborate a systems approach to dreaming, this will instead concern a project which is more properly suited to this end. This work will be on a topic that has arguably received even less systematic investigation than that connected to the individual's search for

knowledge from her own dreams. I refer to the social

environment in which virtually all dream interpretation

occurs.

From Artemidorus to Freud dream interpretation has

given rise to the social role of 'dream expert'. This

has tended to reinforce the notion that there is an

exclusive core of true meaning which a dream contains

and which must be uncovered for the interpretation to be

correct. Further it has led to the elevation of the

issue of truth above that of the use to which meanings

derived from dreams are put. More restrained followers

of the dream expert philosophy hold that the dreamer's

interpretations are vital to arriving at the final

interpretation but that this is best left to an outsider

who is learned in the art of interpretation, who because

they have nothing invested in repression of the vital

meanings is more able to see the whole picture. In the

more dogmatic forms of this philosophy which can

regularly be found occupying space on popular book

stands, the associations of the dreamer are dispensed

with entirely. Such efforts may provoke great interest

amongst the public but must be considered to have a

detrimental effect upon the advancement of a serious

psychology of dream interpretation.

The position favoured by the author is that, there

being no universal symbolism, there is therefore no

reason why an outside party can be expected to produce
an unequivocal reading of a dream. Some symbols and
their significations without doubt may have more valency
in some cultures than others, and of course various
possible meanings which may be suggested for a dream
will be found to have more or less relevance. This is
not to imply that because to one person(an analyst let
us say) certain meanings are obvious whilst to
another(e.g the dreamer) they are not, that the latter
lacks insight. If we are to develop a coherent
understanding of what is involved in such two-party
situations then we must begin to look on it as a social
process and not confine attention to the content or
veracity of the interpretations. It has long been
observed(see chapter 3) that in psychoanalysis the
dreams of clients undergoing analysis often come to
employ symbols in accordance with the theoretical
persuasion of the analyst. The first steps towards
understanding this process will need to begin from the
separate perspectives which each party initially brings
to the dream. In reality the transformation of one
image set to another to represent the meanings
underlying dreams must be enormously complex, even
before one considers the issue as to whether the use of
another image set distorts the meanings intended to be
conveyed by the original set. Stokes (1981 personal

communication) argues that there is nothing inherently wrong in the use of a shared symbol system between client and therapist as long as real communication is taking place.

> It is...an advantage if both therapist and patient speak the same language! Provided that is that the main emphasis is on what is being communicated.

In this experiment I hope to see whether two people, one of whom is the dreamer do use the same language. This will take the form of looking at whether the verbal labels a dreamer uses to impart meaning to her dreams can be used by another person to refer to the same meanings which they connote for the dreamer. If they can then there are grounds for agreeing with Stokes that shared meaningful communication can at least proceed from an initial position of mutual understanding. If on the other hand there is no consensus as to what meanings are contained within the dreamer's descriptions, then there must be scant hope that real communication will be able to proceed in its absence, in a language, which will be foreign to the dreamer to start with and which is supplied by the therapist!

The restricted setting of this experiment will consist of the dream constructs elicited from a dreamer that are then employed by a second person. At issue will be whether the constructs are used in a manner which is consistently different from how they were

originally. As an earlier experiment found dream
constructs pertaining to form to be significant carriers
of personal meanings one could look here for an
indication as to whether the two people are construing
the meanings of the construct labels in a similar
fashion.

EXPERIMENT FIVE

METHOD

Design

1. The dream grids completed by the subjects in experiment one will be compared to the same grid completed by another person as they thought the original person(the dreamer) would have done. Each such pair of grids will be analysed by the DELTA program(University of Manchester Regional Computing Centre 1981) which is suitable for the analysis of pairs of grids aligned by both element and construct. The output from this program will be considered in two specific ways.

(A) The actual level of correlation between each pair of grids will be given. From this a mean value of the overall level of correlation achieved can be computed. The mean level achieved by five raters each of whom will rate two different grids will also be calculated.

(B) Those constructs on the grid which do correlate significantly between dreamer and external rater will be divided into those referring to form and those referring to content. A less stringent level of statistical significance has been chosen($p<0.10$) for the construct correlations to ensure that there are a sufficiently high number of observations to form the basis for a comparison between the observed number of correlations and the number expected theoretically on the grounds of

the actual numbers of constructs referring to form or content. As there are only two classes of event being considered(the nature of the construct),and the relative theoretical frequency distribution is known, or at least can be well approximated to, a calculation of the probabilities associated with the observed number of correlations for a particular class of construct can best be made using the binomial distribution. A Chi-square test would also be suitable although this woud be less sensitive.

Subjects

In addition to the subjects who provided the data for experiment one, there were five subjects who acted as raters; N.D, C.F, R.A, K.C and N.S. Four of these people were research students whilst a fifth was a full time member of the academic staff. All of the raters were from the University of Leicester and had had previous experience in the use of repertory grids.

Materials

1. Subjects dream diaries obtained from experiment one.

2. Ten repertory grids constructed in the fashion devised by Kelly(see Bannister and Fransella 1977 p.24). Each grid was the same as one created by the subjects in experiment one. Dream constructs were listed row by row adjacent to an empty table whose columns were headed by a number designating the dreams from one of the dream

diaries to be evaluated on the constructs.

3. A sheet for each rater containing instructions on how they were to complete the grids given to them(see Appendix 7).

4. The DELTA computer program for the analysis of pairs of repertory grids aligned by both element and construct. Although only available at the University of Manchester Regional Computing Centre the program could be accessed via the 'midnet' service linking the University of Leicester Cyber 73 computing facilities with those at Manchester.

Procedure

1. The five raters were each given two grids to complete. On each grid the elements(dreams) and constructs(dream constructs) came from one person who had provided both in the course of a previous experiment. The task for the rater was to complete each grid as she thought the original person(the dreamer) would do. None of the dreamers were known to the raters Instructions were given as to how this was to be done. Ratings were made on a seven point scale as in the original grids. On completion each pair of grids was then submitted for analysis.

2. Prior to making sense of the results of the DELTA analysis, a decision had to be made on which constructs were referring to form and which to content. For this the decisions reached by the two raters in experiment

one who exhibited the greatest degree of agreement were taken. As this level(74.3%) was not perfect, in the event of a disagreement, the decision of that person was taken whose choice concurred with the decision reached by the third rater. In the event of both principal raters being unable to decide whether the construct was referring to form or content, that construct was excluded from further consideration.

Results

1. CORRELATIONS BETWEEN DREAMERS AND RATERS

Table 10.2

Correlations Between Dream Grids

Dreamer	Rater	r	n	p
1a	N.D	0.188	9	n.s
1b	N.D	0.272	14	n.s
2	R.A	0.562	12	<0.10
3	C.F	0.544	14	<0.05
4	K.C	0.537	13	<0.10
5	R.A	0.408	10	n.s
6	K.C	0.519	13	<0.10
7	N.S	0.489	10	n.s
8	C.F	0.023	10	n.s
9	N.S	0.370	15	n.s

Overall mean   0.391 As n differs for each dreamer a

significance level for this figure cannot be given.

Table 10.3

MEAN LEVELS OF CORRELATION FOR EACH RATER

Rater	Mean Level of Correlation
1. N.D	0.232
2. R.A	0.484
3. C.F	0.283
4. K.C	0.527
5. N.S	0.430

From the variation in the sizes of these correlations

it is apparent that raters differ in the extent to which they are able to look at other's dreams through the 'eyes' of that other person. Only one rater(K.C) achieved a reasonably consistent amd moderate level of correlation in both the grids she completed.

These results clearly indicate that there are differences in the use of the dream constructs. We may now see if these differences relate to the nature of the constructs themselves.

Table 10.4

Number of Signifcant Correlations(p<0.1) Between Dreamer and Rater According to Type of Construct

DREAMER	RATER	TYPE OF CONSTRUCT	
		Form	Content
1a	N.D	1	0
1b	N.D	0	4
2	R.A	1	8
3	C.F	0	10
4	K.C	2	6
5	R.A	1	2
6	K.C	0	8
7	N.S	2	4
8	C.F	0	2
9	N.S	1	8
Total		8	52

This proportion needs to be compared to the relative proportions of form to content in the total pool of constructs. From the total pool seven constructs were excluded due to lack of agreement between the raters. Of the 114 that remained it was agreed that 31 referred to form and 83 to content. The theoretical probability(P) of a construct referring to form is therefore 31/114(0.272), and the probability(Q) of a construct referring to content is 1-0.272(=0.728).

As N is greater than 25 and NxPxQ is greater than 9(i.e 22.57) then it is legitimate to use the statistical test based on the normal distribution, as under these conditions there is a close approximation between the normal and binomial distributions(Siegel 1956 p.40).

The z-score for the obtained number of correlations for formal constructs is -2.267(p=0.0232, 2-tailed). From this statistically unlikely result it would appear that the nature of the dream constructs influences the extent to which a second person is able to understand how the dreamer is using them and what they mean by them.

Discussion

From this last experiment some conclusions of wide ranging significance can be drawn. This experiment demonstrated that even when a second person is provided with the dream constructs elicited from another person and the dream material they were derived from, they invariably use them in a manner which is distinct to their original use. One is hereby given an indication of the difficulties which perforce must abound in a clinical situation where one person not only tries to comprehend the framework provided by another person when they recount their dreams but also tries to subsume that framework within their own. If, as seems likely from the results presented here, there is difficulty for the second person in even understanding what the dreamer means by the constructs he supplies with his dreams, there can be but forlorn hope that the further act of construing and incorporating what the dreamer has provided into some larger theoretical framework has much validity. Given that none of the raters in this experiment were professional therapists, it is always possible that much higher degrees of concordance could have been manifested between the dreamer's and the raters's grids had that been the case. It could thereby be an empirical question as to how capable of construing a client's perspective a therapist is in comparison to

other psychologists or lay persons. Although the question remains open the results of this experiment do not suggest grounds for optimism.

As for the nature of the constructs themselves influencing the processes which aid misunderstanding, this would seem to centre around formal dream parameters. There are probably two reasons for this. First of all, as was discovered earlier, these kinds of constructs may imply very idiosyncratic meanings which may or may not be revealed by the associations which they have with other constructs. In contrast, where dream constructs refer to the manifest content of the dream, in isolation to their symbolic reference, only relatively shallow levels of public meaning are being dealt with. The more one is moving away from obvious content in describing a dream, the more likely are undisclosed meanings to be implicated with the terms one is using. Secondly, though related to this point, formal constructs are in many ways more global and abstract, less tied down to a specific context. There is consequently more scope for outside parties to provide a context which is of their own making. This once again implies that it is a mistake to strive for a standard set of parameters against which all dreams can be appraised.

The subsuming of the client's context is, however, only

one stage in a dialectical process whereby the dreamer

may eventually come to take on the therapist's

framework. This could possibly be investigated in a

series of stages.

1. As in this experiment, examine how the interpreter

construes with the dreamer's framework.

2. Look also at how the dreamer initially construes with

the therapist's framework.

3. Over various intervals of time, comparisons could be

made between the degrees of meaning(via cluster

analysis?) which each initial framework(dreamer's and

interpreter's) offers the dreamer when it is used by

her/him.

4. In order to control for the changing nature of the

person's dreams over the intervals, one could collect

several sets of dream reports, and compare the meanings

which each different set of dream constructs elicited

provides.

By thus obtaining dream constructs from the dreamer

appropriate to each time at which dream reports are

sampled, one can compare the changes in the meanings of

the subject's dreams in relation to the changes in

meaning which the therapist's constructs provide. Such

a methodology, in combination with relevant personality

data obtained at various points in the course of the

study, might lead to an elucidation of the critical

factors behind the process of change and more generally
those factors which lead to one person adopting the
framework of another. For instance, it might be the
case that relatively complex and already elaborated
construct systems around dreaming act as a defence
against the revision of the dream construct system into
a different language. How such new construct systems
influence and act on the dreaming process then becomes a
further issue for consideration.

Conclusion

The adoption of a systems approach to the area of
dream interpretation highlights particular issues which
exist at this level of complexity, and which may be
investigated with the same methodological principles
employed at other levels. Merely because one has now
entered a realm which has hitherto been considered a
province of intuition and artistic insight, does not
preclude the bringing to bear upon the subject of
thought which has both precision and rigour. Having a
commonality of theory at the level of both process and
understanding, allows for the possibility at some future
time of unravelling how the understanding derived from
one's dreams influences how we go about dreaming the
dreams we do.

PART FOUR

Summary and Overview

To explain all nature is too difficult a task for any
one man or even for any one age...I do not know what I
may appear to the world; but to myself I seem to have
been only like a boy playing on the sea shore..while the
great ocean of truth lay all undiscovered before me.

Isaac Newton

CHAPTER ELEVEN: A DREAM

(I) There is no longer any doubt. The
fascists are beginning to gloat and swagger
with the confidence of power. They are across
in the other bar, joking about us. They're
wearing uniforms, dull green with brass
buttons. We feel isolated, uncertain of their
numbers. We wear OUR uniforms with silver
buttons, buttons of moon metal. We feel
provocative and frightened. Elaine is with
me. I am an anarchist, a criminal. We're
both for the chop. There will be parties and
more parties until one day we meet the fascist
mob. The Nazi leader is bold and raises his
glass, reciting an old German drinking song:
Let us be friends today-
Who knows what we shall drink tommorrow.

(II) I am allowed a glimpse into the future.
The front door of a house opens to reveal a
long corridor. But no- it is a vertical
shaft. The door was covering a gap in the
ground. Down in the middle of the shaft a
young child is strapped in mid air. I will
approach, smash open the door and hurtle down
the shaft until I smash into the child and
kill it..

(III) I am in front of my parent's house. I
have to shrink and become really tiny so I
begin to scale myself down according to
mysterious organic laws until I am just a tiny
mannikin in front of the basement window. And
even now I cannot enter.
You cannot hope for love.
Saturn blocks out even the Sun.

This thesis has been an attempt to explain

experiences like that described above, which people

regularly report having night after night. A dream such

as this is a challenge for us to use our theoretical

tools to reach towards an understanding of experiences

of this character. From here onwards I will use this

dream(from subject 6's dream diary in Experiment One) as

an example to illustrate a number of aspects of dreams which the approach advanced in these pages hopes to explain.

The starting point in the work was the identification of a hierarchy of levels to dream content. Several were identified and subsequently empirically investigated. Using the framework which this provides I will proceed to examine our specimen dream, and to review the application of systems thinking. As a reminder these levels are;

1. Dream Form(including complexity and temporal structure).

2. Scene changes

3. Recurring images

4. Unique images

The issue of dream interpretation which was included at a level above that of dream processes will be considered later.

The Form of Dreams

(a) The dream quoted undoubtedly involves the interweaving of a complex succession of images and themes. The main objects within it include uniforms, buttons made of moon metal, drinking glasses, houses. The people are the dreamer and a female friend(who are identified as being an anarchist and a Jew respectively), various Nazis and a young child. The

actions in the dream centre around sensations of fear, drinking, potential and/or realised violence and a transformation of bodily size which leads to a final poignant poetic reflection.

The identification of this variety of images in itself tells us nothing of their origin, nor of the synthetic act by which they were combined into an ongoing narrative. The first experiment in the series however produced evidence that the very complexity of the meanings contained in a dream was associated with the complexity with which a dreamer viewed themself. In the field of Gestalt psychotherapy Fritz Perls and others have employed a related notion. In a therapy session each dream image is employed as if it was an aspect of the client's self. Using this method very powerful emotional themes have been found lying behind quite prosaic dream images. However one interprets this, the evidence seems compelling that dream images represent distinct aspects of personality. The psychotherapeutic work not only identifies personality components with dream images, but also draws attention to the nature of the relationships between them. This implies that factors at a high level of abstraction are involved in the selection of images to represent relationships between concepts that are important to the person. In terms of what we have discussed in earlier

chapters this necessarily implies that the activation of
dream images is not random and that contrary to Hobson
and McCarley(see p.83) it is the activation of memorial
contents that must determine which sensory or motor
systems are activated and not vice versa.

(b) The temporal setting of the dream is ambiguous. The
presence of Nazis makes obvious reference to the recent
historical past, and yet the dream contains an episode
in which the dreamer is allowed a glimpse into the
future. There is obvious difficulty once awake in
categorising such temporal reference, because it will be
invariably catalogued from a perspective which knows of
no such possibility when awake. Inevitably it will be
construed as an act of imagination, whereas within the
dream it is reality.

Experiment Four suggested that motor activity in a
dream may contribute towards the sensation of time
passing in a dream. This is clearly insufficient to
render intelligible the temporal components to this
dream. It is much more likely that the origins of an
imagined future lie in thoughts which the dreamer has
already entertained during the waking hours and which
have passed into memory.

The manifestation of time in dreams is more than a
simple one-dimensional affair. Consider the following
aspects.

a. How the the passing of time in the dream is remembered upon awakening.

b. How actions in the dream contribute to the origins of temporal awareness.

c. The effects which sudden discontinuities of action in the dream contribute to this awareness(or lack of it).

d. The temporal content of the dream.

(i) The time in the dreamer's life from which the representational elements are drawn.

(ii) The time(if any) in which the projected action takes place.

A psychology of dreams which hopes to comprehend the nature of dream experience must aim to eventually incorporate all of these aspects into its theoretical schema.

Scene Changes

There are two abrupt scene changes in the specimen dream. The first scene elaborates thoughts and images the dreamer has about fascism. In the second the dreamer is allowed a glimpse into the future. The final scene begins from the dreamer's parents' house and proceeds to alter the spatial dimensions from which events are experienced, concluding with a short piece of prose 'You cannot hope for love, Saturn blocks out even the Sun'.

Evidence from Experiment Four strongly indicated that such changes are derived from discontinuities between the contents of underlying sets of information from which visual configurations are concocted, contingent upon an individual's efficiency in processing the information visually. The origins of the contents of each scene of course lie outside the province of the explanation proffered for the scene changes themselves. The question of course that does remain and needs to be addressed at this level is: Why should these particular information sets be ordered as they appear to be to follow one another sequentially? There are at least three possibilites.

1. The order is random.

2. Successive sets are semantically related. The order is an expression of activity underlying all dreams with the sets selected for inclusion chosen in order to conserve or maintain an optimum level of 'semantic-syntactic' order (Foulkes 1982a). Discontinuities could arise when suitable imaginal elements cannot be found to express desired semantic relationships. In the case where dreams exhibit no discontinuity, this may be because transitions between the information sets go unnoticed because of the similarity between them. An alternative explanation for the latter example is that processing is inefficient and

only one information set has been represented in a
dream.

3. Successive sets are neither randomly ordered nor
related. Scene changes may arise when processing of one
set of information has been completed and another
completely independent set of information is chosen as
requiring immediate attention.

4. Some combination of 2. and 3. Semantically related
sets may be folowed by entirely dissimilar sets, once
their processing has been completed.

Recurring and Unique Images

The dream at the beginning of this chapter was one
recorded by the subject at home. Therefore we do not
have any record of those dreams which preceded or
succeeded it. The chances of mistakenly classifying
recurring dream images as unique must be greater than
when using REM laboratory collected dreams.
Nevertheless because this subject did provide a rich
collection of dreams(fifteen in all) it is possible to
pick out several recurrent images from the series that
are present in this dream.

1. Many of this subject's dreams show a preoccupation
with acts of violence. Indeed this much was said from an
examination of his dream constructs. The theme of
fascism is present in several of the dreams. The theme
of violence is elaborated through the collection of

dreams by references to soldiers, psychopaths, prisons, and overt hostility on the part of the dreamer himself.

2. Sex is also a predominant theme. Some of the dreams involve sexual activity.

3. Several of the dreams contain a person 'Elaine' whom one would suspect the dreamer had a close relationship with in waking life. Also 'Women' as a group are a recurring theme in the series.

4. The playing, hearing and composing of music occur throughout the collection of dreams. This is hardly surprising given that this dreamer is a professional musician.

5. The imagined future is also a feature in whole or part of several dreams. This is construed in the dreams either in terms of the political 'shape of the future' or the technological face of tomorrow.

Just by listing these several themes it is already difficult to resist positing ideas of what the dream might mean. We would already feel inclined to say that the repeated presence of these themes and images signifies the depth of their meaning to the subject. Of course we must be aware that we do not dream of everything that is important to us. In fact we sometimes dream of apparently quite trivial and non-sensical things while some obviously more important issues go undreamt. Of all places, one must counsel

caution here however. It is the unfinished business which attracts our attention during dreaming not simply what is important. Furthermore what is truly important to us must include what is important at a non-conscious level also.

In a short series of REM dreams covering only a few nights, the reappearance of several elements was modelled on the basis that they were being recycled, possibly from a short-term store. If this is true, then the meaning behind the images may constitute only half of the story. Unless they can be completely processed in a single dream, their reappearance, it was thought, could be brought about largely by a purely formal mechanism. Further evidence was adduced in the same experiment however that some of the combinations of recurring elements that did appear cannot be accounted for solely on the basis of items being recycled without reference to their meaning. This points to semantic factors being able to override the workings of simpler formal processes.

Another intriguing possibility is that the repeated combination of the same elements signals the creation of new meanings during dreaming. If that were so, then the issue of what dream images meant before their appearance poses decidely tricky problems.

Before we move on to consider the interpretation of

this dream, we will need to discuss the ways in which
the processes which have been proposed at various
levels(to account for dream complexity, abrupt scene
changes and recurring elements), combine in a dynamic
interplay and simultaneously carry out the functional
requirements of dreaming.

I

The determination of the hierarchical structure of
dream content does no more than lay down the constraints
within which dreaming must exercise its functional role.
In the 'root definition' of dreaming which was given at
the beginning of Chapter Six, emphasis was placed on the
structural activities which characterise dreaming. This
enabled greater clarity to arise regarding the formal
description of dream content wholly or partly
independent of its meaning. It is now time to consider
how the processes which have been identified at various
levels can aid in the execution of dream function.

The critical review undertaken in Chapters Three to
Five highlighted several broad functions which dreaming
fulfills.

1. To reorganise/revise subsystems within an
individual's cognitive system in the light of newly
acquired information.

2. To integrate emotionally important information into
long term storage.

3. To maintain or enhance the ability to think divergently and adaptively.

We must first consider whether these functions could arise 'unintentionally', as a consequence of processes operating without reference to the semantic content of the information that is being handled. In other words have the functions of dreaming been genetically hardwired into the brain specifically for those purposes, or have they arisen 'latently' due to the action of processing routines which have been designed for more primtive functions? In the conceptual framework provided by systems theory this question can be asked much more succinctly. Are dream functions emergent properties of dream processes?

II

The functions served by dreaming have usually been viewed separately from the search for adequate descriptions of the events that are taking place. It is proposed that these now be brought together. In order to attempt this, we must finally consider one aspect of dreaming that has not been touched upon.

For several hours each night the brain keeps up a steady output of images which merge and flow in a state of constant flux, defying any attempt to impose stability on them(see Worsley's 1983 discussion of lucid dream control). This flow may be interupted by abrupt

changes in the contents of the images which constitute this flow. A comparison with waking perception can shed some light on the functions served by this continual manufacture of visual images.

Experiments have demonstrated that when an image is optically stabilsed for instance by attaching a small mirror to a contact lens on the eye, vision fades to a blank homogenous field, with the image degrading in meaningful chunks(see Lindsay and Norman 1977 p.41 and Gregory 1977 p.58). This indicates that the construction of a percept is being interrupted several stages into the information processing hierarchy by a feedback mechanism originating from an already meaningful construction of the percept. Now it being the case that during wakefulness a continuous stream of new visual information is required via saccadic movements of the eyes to ensure that image degradation does not occur; we may well expect that in order to dream visually the sleeping brain may need some compensatory mechanism to inhibit the feedback process. The continuous generation of an internal source of new visual imagery would ensure that adaptation to existing visual scenarios cannot take place.

The preliminary hypothesis to be examined is whether the following processes are sufficient to carry out the functional requirments of dreaming. At the very least

an answer to this, in either direction, should point the way toward future elaboration of the systems conception of dreaming initially presented and which spawned the empirical work in this thesis.

In their logical order of occurrence, the processes to be considered are;

1. The disinhibition of relationships between/increased permeability of/ concepts selected for additional processing.

2. The action of personality factors(presumably acting prior to the visual transformation of existing information) to influence the degree of complexity of oneiric images. This could be the influence determining the range of

3. The further activation of material on the basis of conceptual, phonetic and propositional similarity to the originally activated material.

4. The packaging of information which forms the basis for subsequent images into discrete packets.

5. The continuous manufacture of images to ensure that information passes into consciousness in a visual form.

6. The mechanism whereby a subset of these images regularly recurs. This latter process takes place between successive dreams.

Our question is: Could such a sequence of processes acting upon an initially random source of information

carry out the functions of dreaming detailed above?

III

The author's tentative answer to the above question lies in the affirmative. In wishing to expand upon this let me present a hypothetical situation in order to render more fully intelligible what is meant by this reply.

Suppose for a moment that dreaming consists(contrary to Foulkes' hypothesis but in agreement with the author's personal construct proposition) of the initially deliberate activation of a region of memory for revision and reorganisation. Compare such a situation with one in which the contents had been randomly determined. In either case the networks of meaning, their implications and relationships with other concepts would be altered by a comparison with phonetically, conceptually and propositionally similar items. Extending the range of meaning of any set of concepts could well lead to increased flexibility of action stemming from the active employment of those concepts during waking life. However if the initial set were to be deliberately selected then the improved flexibility that would be given would be more readily applicable(and therefore of greater relevance) in ongoing waking behavioural situations which may very well have prompted the choice of contents to begin with.

Thus revision would lead to a more rapid effect on observable behaviour. The choice of a random set might only lead to a noticeable difference in behaviour once that set became activated in a given situation, which given the capacity of human memory might be a very long time indeed. It could well be possible that such a state of affairs could not exert a sufficently strong effect during the length of an individual's lifetime for dreaming in this form to have persisted through natural selection. Certainly it is the case that over increasing periods of time the difference between the effects of two different models(random v selected) would be multiplied.

Of course the mere fact that one 'design' for dream construction is more efficient in meeting the functional requirements that dreaming does possess is not concrete evidence in favour of that design being the one found in nature. The fact however that such a small difference between two models can produce such a potentially large observable difference must weigh heavily in favour of the more efficient model.

IV

The function of integrating emotionally important information into long term storage could take place during the stage of spreading memorial disihibition. This could occur during the activation of

propositional(or conceptual or phonetic) sequences, and might involve the construction of markers between pairs of items which increase the probability of their connection at a future moment when any one of the items is being accessed during waking. Not only are the means by which this could happen totally unknown but it also logically entails the need for a further process by which genuinely useful new connections could be distinguished from arbitrary ones so that memory does not become cluttered with irrelevant pathways.

Readers' attention may be drawn to the similarity between these hypothetical operations and those suggested by Crick and Mitchison for removing unwanted parasitic modes of thought excited during dreaming. The principal differences between these ostensibly similar notions are that the processes suggested here are derived from the functional abilities of dreaming and not vice versa. In addition, the process of decreasing the probability of particular connections is in this case only a component of the very same process which ensures that new cross-contextual connections between propositions are established. In Crick and Mitchison's model, the 'unlearning' process is the primary raison d'etre of dreams. In the current account, the weakening of certain connections is a secondary act contingent upon a prior mode of activity which, far from being

'inappropriate' is vital for the fulfillment of the dream's functions.

V

If we are arguing that the main functions of cognitive reorganisation, incorporation of emotionally important information and improved divergent thinking can be carried out via the disinhibition of semantic memory under the influence of constraints issuing from personality factors, then it is a very reasonable question to ask what purposes the additional mechanisms that package latent dream information and recycle a subset of it, serve?

The packaging of information prior to dreaming is consistent with the notion that dreams involve acts of planning. At present one can only speculate how this combines with the disinhibition of units from semantic memory. It is possible that disinhibition begins from several distinct regions; sets of information evolving from each of these forming the basis, or the 'intention' behind each of the dream scenes. The value of such planning, i.e of selecting material for processing prior to experiencing dreaming could be the increased processing capacity which is available during REM dreaming when the brain is in a more activated condition. If none of these prerequisite processes for dreaming occurred outside of 'dream time' then less

would get accomplished from the processing in the time

that was available. The crucial assumption behind this

is that the brain has many tasks to perform whilst we

are asleep, dreaming being one of these, and that there

is a only a limited amount of time given over for

dreaming during sleep. Another possibility unrelated to

this is that the packaging of information somehow aids

the efficiency with which subsequent activation of

affects and images can occur.

Random subsets of information from particular dreams

might be recycled to form the basis of a random test of

the success of previous processing. If recycling was

designed to perform such a test then we would expect the

frequencies with which elements are recycled a given

number of times to be normally distributed. If a

limited capacity recycling mechanism is in operation(as

was suggested in Experiment Four), then we might expect

fewer elements to be recycled once than are recycled

several times.

Even with the small number of fundamental processes

that have been suggested there exists a number of ways

for them to combine with one another and still fulfill

the functional requirements of dreaming.

1. The disinhibition of semantic memory could proceed

randomly or by prior selection.

2. The packaging of information into discrete sets could

be to improve the efficiency of manifest dream processing or to aid further affective or imaginal processing. These two functional possibilities would be reflected in processes which are as yet unknown.

3. The selection of dream elements for recycling could in theory also proceed randomly or by deliberate selection.

The discussion of these possibilites will it is hoped foreshadow a future in which competing theories of dreams are subjected to critical tests in order to decide between them. The construction of alternative 'system designs' of dreaming followed by their critical evaluation and optimization with respect to the functional requirements of that system is a hallmark of systems thinking(Checkland 1985) and in the current work has developed directly from this approach.

We will now address the problem which Evans(1983) considers the stumbling block of all dream theories to date. What functions are served by dreams being conscious experiences? As we have seen, Foulkes is of the belief that consciousness must itself participate in the processes of change which dreaming brings about, particularly so since many of the functions attributed to dreaming ultimately manifest themselves in different conscious contents, forms, and means of self representation. Once again this is a matter upon which

one can only speculate. However, there is a simple means whereby a closely related issue could be investigated; the function of the visual representability of knowledge during dreaming. Kerr and Foulkes' (1981) finding that congenitally blind people and certain individuals with specific cognitive deficits are still able to provide highly fanciful narratives when awoken from REM sleep which have all the qualities of dream experience as reported by sighted subjects and yet which lack the visual modality, makes possible the construction of a simple paradigm whereby such individuals could be compared with subjects possessing normal dream ability, on a range of psychological measures. For example one might choose to compare each group(non visual and visual) in terms of their ability at divergent thinking. It is plausible that the visual modality allows greater ambiguity in representing propositions and therefore could extend the range of meanings originally coded in a proposition. This might then allow the range of possible combinations between the limited set of initially unrelated propositions to be extended. At present the field is wide open for future research.

Dream Interpretation

Now that a range of cognitive processes which might underlie our specimen dream have been discussed, it is appropriate that we should examine the meaning(s)

behind the dream. In many respects this issue has been touched upon already in connection with the intentionality(multiple or single) underlying the dream. Can the several themes present in this dream be traced to a single underlying theme?

The practice I will follow will be to present a reading of the dream from the author's viewpoint coupled with the dreamer's own understanding of it. This will give us a suitable platform for discussing several of the issues connected with dream interpretation which arose earlier in the thesis.

Author's Interpretation

My own interpretation will not be seeking to unravel a single message behind this dream but rather is intended to shed light on the broad aspects of this dream, and what meanings or significance it has. My own suppositions will be based not simply on this one dream, but also the others which the person recorded plus my own personal knowledge of him.

From my reading the dream concerns three principal themes. These being the issues of power, the future and the dreamer's relationship with his parents. The theme of power is one which came out in this person's dream constructs(see experiment one) and is clearly present in many of his other dreams. The imagery of fascists I would contend represents that part of his persona which

he feels could be dangerous or out of control. In this context it is interesting that in the dream the dreamer sees himself as "an anarchist, a criminal". This seeing of himself as dangerous is elaborated in the second scene, in which in an imagined future he might kill a young child. The child is located beneath the ground, an allegorical reference to the child 'buried within him' perhaps? By considering killing the child, he may be seeking to avoid, or deny the young child within himself. The 'fascistic' element of the personality might therefore be functioning as a defence against feeling as he did when a small child: isolated and alone. These feelings, the dreamer fears, may overtake him and if they do he is afraid of not knowing how he will behave. This finds expression in the link between scenes one and two: "Let us be friends today- Who knows what we shall drink tommorrow". Images of power to mask hidden feelings of powerless?

The final scene of the dream revolves around the relationship between the dreamer and his parents. The powerlessness, fear and isolation experienced by the dreamer can perhaps be traced to this source. At his parents house, he has to "shrink and become really tiny....until I am just a little mannikin in front of the basement window". One could speculate that this shrinking indicates that the dreamer's sexuality is one

aspect of himself that is difficult to integrate with his view of himself as a child in relation to his parents. With his parents he has always felt really small, that he "cannot hope for love". "Saturn blocks out the Sun". 'Sun' perhaps a symbol for son. The son(the dreamer) is blocked out. From a knowledge of the dreamer who is very interested in astrology, Saturn has significance in that its return every twenty eighth year is said to herald the beginning of a period of profound change in a person's life. This period of change may last three to four years beginning from the individual's twenty eighth birthday. At the time at which this dream was recorded(1982) the dreamer was in fact in the midst of his 'Saturn return'. It is possible therefore that the dream symbolises the belief that astrological influences are working against the son's successful return to his parental home. The "mysterious organic laws" by which he declines in size may thereby be referring to astrological laws.

The Dreamer's Interpretation

The nazis in the first part of the dream are bold and confident and increasing in power. They represent an aggressive masculinity. I am alienated from this power. There is no "brave silken clown"(*) here to mediate it, the fascists are "in the other bar". I cling to my mother's apron-strings, fearing my father, my

masculinity. Elaine is a mother figure and the moon rules the feminine with which I seek to identify. I have a sense of guilt that I have failed to grow out of this dependence on mother. My "provocative" defiance of the brutally masculine is vainglorious, based not on confrontation with the "other bar" but on its avoidance. In this sense I am a criminal, dishonest. It is I, in fact, that am parasitic, although I project this blood sucking image onto the nazi leader.

The second part of the dream explores this alienation from the masculine more fully. When the door opens(the woman opens her legs) what I first perceive as a corridor(the "horizontal" lips of the vulva) turns out to be vertical(the vagina). The child in the tunnel is still unborn. If I express my masculinity by penetrating the vagina with my penis I fear I shall smash into the child and destroy him. Insofar as I have failed to separate from my mother I cannot permit my masculinity expression - hence its distorted image as brutal, violent, cruel.

In the first part of the dream I considered the situation from the point of view of the young child, in the second from that of a sexually experienced man. In the third part of the dream the house has ceased to be penetrable. Even if I "scale myself down" and regress to infancy it is now too late to regain the privileged

sense of being loved and protected. The house is "my parents' house" - a more realistic view of their relationship as having its own boundaries, its separateness. It symbolises their otherness and my aloneness. This is very depressing, this structuring of limits, the power of Saturn. Despite the statement "You cannot hope for love" the poetry does in fact offer hope. "Saturn" as a symbol is a progression from "the nazi" as emblematic of the reality principle. By its very remoteness it is more accessible, more value-neutral, even if I don't yet know how to integrate it.

(*) From another dream in the same series.

Comparison   .

The two accounts given above contain many differences. On the basis of the experiment described earlier this was to be expected. However it is my belief that is not helpful to view these differences in terms of either account being the one true rendition of the dream's meaning. Hudson(1985) argues at great length that many interpretations each with emphasis on quite different themes are simultaneously possible for a single dream. Obviously I think the dreamer's own account must be considered of paramount importance because this reveals the perspective that the dreamer has on his own mental processes. The second account can

then be examined for whether the dreamer's own insights are also shared by the other person. The degree of consensus between the two accounts is also of interest. Not simply because this indicates the degree of insight which either has but more importantly because of the shared social reality which may be implied by it. When dealing with issues of meaning it is crucially important that where possible one adopts a relativistic position.

Turning now to the two accounts, what similarities and differences can we find between them?

At first sight the two accounts appear to be quite different. Both do, however allude to the separateness which the dreamer feels in relation to his own source of power. In the author's account power was construed in the rather undefined general sense intending to denote the ability for self determination, whereas to the dreamer it is seen in terms of the inherent power of masculinity. Another similarity is that both see the violent cruel expressions of power as originating from the unsatisfactory 'powerless' relationship with his parents.

The themes noted by the author of power, future time and the relationship with parents are still present in the dreamer's account although they are of a significance not recognised by the author, and are elaborated to a deeper level of meaning by the dreamer.

Overall the dreamer's interpretation places greater emphasis on the sexual dimension which is acknowledged in the final part of the author's account but which in the dreamer's forms the central theme throughout the dream. The astrological component of the dream was acknowledged by the author but once again its significance could only be more thoroughly understood from a reading of the dreamer's perspective.

It would be quite possible to devote a considerable amount of space to the relations between the two interpretations and even to expand upon the two sets of interpretations given, to set up a dialectic interplay between them. Whilst that would be of undoubted interest, it would take us away from the main purpose which the comparison was intended to serve. This was to concretely illustrate some of the difficulties and misrepresentations that can arise when one person attempts to ascribe meaning to the mental products of another. As in the experimental context the principal difficulties concern what meanings are to be given to the general parameters which are identified. In this case the issue of 'power' entailed a quite different set of meanings for either person.

Whatever the nature of the interpretations, the question must still be asked why the dream took place at the particular time it did. Much dream interpretation

falls short at this point. The numerous interpretations of Freud's dreams(which have probably been subject to more interpretation and investigation than any others) whilst no doubt valid in many ways, give no hint as to why that dream could not have occurred the next night or the following week, or for that matter the previous night etc. This is clearly a limitation in the method. It is possible that detailed interpretations of laboratory collected dreams could provide such answers although it is by no means certain. Dream interpertation renders dream events intelligible in relation to past meanings stored and created by a person. It cannot render predictive knowledge of what a dreamer's next dream wil be, although it could conceivably have something to say about what underlying motivations will be present. It is my belief that why a dream was dreamt at one particular time and no other could only ever be possibly determined if a full mechanistic knowledge of dream processes were available. Given the vast storehouses of memory which we all possess, and by virtue of the fact that this could never be completely imparted to an outside person, a completely predicitve mechanistic model is impossible.

Conclusion

Three questions remain to be asked prior to the conclusion of this thesis.

1. What kind of picture of dreaming has emerged from the current work?

2. How might the future development of dream psychology unfold?

3. How are the issues regarding scientific method to be evaluated in the light of the work presented?

I

Dreaming it was initially suggested could be viewed as the outcome of an hierarchically organised interconnected set of processes. This evolved into a picture in which different levels of dream content arise independently from different levels of processing. The functional properties of dreaming are seen as arising from the way in which these levels of processing combine. Just how far the adaptive functions of dreaming have been designed and how far they have arisen accidently cannot be said with any certainty. A more thorough picture of how dreaming fulfills human organismic needs requires that the epistemological indeterminacies at each of the posited levels be resolved. Only once this has been done will one be able to say whether further refinements are needed to the basic model put forward.

Of course many levels of processing intermediate to those major ones mentioned are involved in dreaming, but which themselves do not give any obvious hint of their

existence in the consciously experienced form of the dream. I refer here to the details of the processes underlying propositional, semantic, and phonetic analysis of activated memorial material. As Foulkes has argued, a knowledge of these processes will more likely come from developments in psycholinguistics.

While summarising the picture of dreaming we have painted, it must not be forgotten that dreams exist as one subsystem amongst others, both on an individual and on a social level. Relationships between an individual and his/her environment can therefore be elucidated from an examination of dream material, and may be one manner in which dream interpretation can be approached. In fact from a knowledge of social processes an examination of dream content may indicate some of the mechanisms of dreaming by revealing the ways in which these social relationships have been transformed in the dream. Likewise the ways in which social relationships are depicted in a dream may tell us something about the form of those relationships, which on a purely social level of analysis are not obvious.

II

Dream psychology already appears to have shifted back towards the consciously experienced dream as a focus of interest. However there is still a danger that attempts will be made to 'physiologise' the dream out of

existence. It is almost a truism that physiological dream theories attract more attention than their psychological counterparts, presumably because they are mistakenly seen as more fundamental. Even lucid dreaming which has recently attracted the attention of researchers has shown signs of being used to demonstrate particular forms of physiological activity that are taking place within it, rather than the more exciting challenge of the psychological explorations that can be undertaken in this state being taken up. The topic of dream control does not become scientific by virtue of its being shown to have physiological correlates(interesting as these may be). It is the systematic nature of the studies which can be carried out within this state that render it as suitable for scientific status or not.

It must not be forgotten that dreams above all else are conscious experiences. It is in this area that it is hoped a more systemic approach(in the manner of the present study) to dream psychology will develop. Dreaming has often been studied in a number of discrete ways; in terms of personality, physiological correlates, dream content, dream interpretation etc, as if these different strands of knowledge were entirely separate from one another. It is a difficult task, but it is the contention of this thesis that a better understanding

will emerge from an approach which examines these areas as different components of a single underlying form of action. As more and more questions are asked of traditional scientific reductionism, it is likely that a more integrative psychology of dreams will arise. Like physicists, psychologists may have to be content with a network of interlocking models, using different languages to describe different aspects and levels of reality(Capra 1984).

III

In the opening chapter a number of shortcomings in normal scientific method were discussed. To recap, these were a negation of existential statements as a suitable starting point for enquiry, the deficiencies in classical logic, the problem of how new theoretical perspectives evolve and the difficulties of using hypothetico-deductive reasoning alone when dealing with complex natural phenomena.

In the course of developing a systems theory of dreaming it has been necessary to rely in the first instance upon statements which pertain to the unique private character of someone's experience. This has been taken to be valid. Secondly dreaming has been approached simultaneously from a variety of perspectives, none of them taken to be more fundamental. This has been crucial in order to develop models of

dreaming at different levels of resolution; image, scene, or complete dream. In focusing at these various levels, different frameworks have been found to be better suited for dealing with the phenomena manifest at each particular level. Consequently descriptive models have been couched in terms of semantics, personality, mathematical set theory, information flow etc. It would be folly to repeat the mistakes of the past, and attempt to squeeze all of the phenomena into a single one of these frameworks. The issue which has been raised, and which a systems model may turn out to be best suited for answering, is how to build a global model in which the multitude of levels of dreaming are combined into a coherent dynamic interplay.

Scientific method has historically undergone numerous changes. There is no reason whatsoever that it shall not continue to do so. Many people are of the opinion that the next major development will be the inclusion of systematic, systemic ways of thinking when faced with certain problems which the older methods are not well suited to tackle. Systems thinking does not so much represent a radical departure from reductionist, analytic, deductive thinking, it in fact includes such thinking as one moment within it. The proposal of this thesis is that dreaming can best be investigated by such means.

APPENDICES

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APPENDIX ONE

Instructions For Recalling and Recording Dreams.

If you are using pen and paper to record your dreams, be sure to have them within easy reach of your bed before you fall asleep. If you do not keep them handy, you will probably lose your dream, for even should you feel inclined to search for them during the night, your dream will probably have vanished by the time you find them.

If you sleep alone you may prefer to use a tape recorder and transcribe your dreams onto paper later. I advise the use of the tape recorder method of collecting dreams wherever possible.

If turning on the light during the night is likely to awaken your partner, then keep a flashlight by the bed ans use this instead. Do not give yourself a tiny scrap of paper or a short length of recording tape.

Date your recording tape or paper in advance, and record your dreams as fully as possible, never dismissing a dream as being too trivial to record.

Thank you for your participation

Ron Roberts

APPENDIX TWO

Repertory Grid Computer Program

The following program is writen in microsoft basic to
run on any Commodore business machines. Instructions
within the program specific to Commodore machines are
print chr$(147) which clears the screen. In addition on
machines of this type when a number is being converted
to a string its length increases by one. Therefore if
the program is to be adapted to run on other machines,
the sections of the program which prints the selected
triad of elements to the screen(lines 155-166, and
subroutines beginning lines 600 and 700) will need to be
modified.

Stages in Execution of Program

LINES   FUNCTION

25- 45   Elements stored as data statements.

46- 57   Select grid parameters.

92-102   Random numbers used to generate element triad.

104-126   Each element triad stored in array.

128-138   Check if triads are unique.

139-151   Triads randomised for presentation.

152-166   Elements displayed to screen.

169-182   Procedure for eliciting constructs.

184-193   Elicited constructs printed.

195-220   Elements rated on each construct.

221-260   Completed grid data displayed.

```
10 rem Computer Program for Presentation

15 rem of Repertory Grid

20 rem Ron Roberts(University of Leicester 1982)

25 data dream 1,dream 2,dream 3,dream 4

30 data dream 5,dream 6,dream 7,dream 8

35 data dream 9,dream 10,dream 11,dream 12

40 data

45 data

46 print chr$(147);

47 print"        REPERTORY GRID"

48 print"        **************"

49 print:input"output to screen(3) or printer(4)";op

50 open 129,op,7

52 print:input"Number of constructs to be elicited";nc

53 print:input"Number of elements";ne:print:print

54 print"Dichotomous(A) or Rated(B) Grid":print

55 get r$:if r$=""then55

56 ifasc(r$)<65or asc(r$)>66then55

57 ifr$="b"then input"Number of pts on rating scale";p

58 print:print"********************************":print#129,

59 dim e$(ne),c$(nc),s$(nc)

78 rem read elements into array

79 for a=1 to ne

80 reade$(a):ifop=4thenprint#129,"element ";a;"=";e$(a)

81 nexta

82 rem input name
```

```
83 print:print"Please type in your name and then"

84 print"Press the key marked 'RETURN'"

85 inputn$

86 print#129,:if op=4 then print#129,"repertory grid for
";n$:print#129

87 print chr$(147):print"                    Hello ";n$

88 print:print"    The Computer is now generating"

89 print"    ";nc;" unique triads of elements"

90 print"    For the purpose of eliciting  "

91 print"    Constructs"

92 rem generate triads by r.n.d's

93 dim es(3):rem holds element numbers

94 for a=1 to nc

95 r1=0:r2=0

96 for e=1 to 3

97 j=int(ne*rnd(1)+1)

98 if j=r1 or j= r2 then 97

99 if e=1 then r1=j

100 if e=2 then r2=j

101 es(e)=j

102 next e

104 rem sort es low-high

105 for e=1 to 2

106 if es(e+1)>=es(e) then 109

107 te=es(e):es(e)=es(e+1)

108 es(e+1)=te:sw=1
```

```
109 next e

110 if sw=1 then sw=0:goto 105

112 rem put each rnd triad into array

113 rem

114 for e=1 to 3

115 h=es(e)

116 s$(a)=s$(a)+str$(h)

117 next e

118 next a

120 rem sort j$() into low-high

121 for a=1 to nc-1

122 if val(s$(a+1))>=val(s$(a))then 125

123 te$=s$(a):s$(a)=s$(a+1)

124 s$(a+1)=te$:sw=1

125 nexta

126 if sw=1 then sw=0:goto 121

128 rem check that the strings in s$

129 rem are unique

130 for a=1 to nc-1

131 if s$(a)=s$(a+1) then 135

132 next a

133 goto 139

134 rem if strings not different empty array

135 for a=1 to nc

136 s$(a)="":rem empty

137 next a
```

```
138 goto 94

139 rem shuffle lists of triads

140 print:print"     --------------------------------"

141 print:print"    The triads have been generated"

142 print"    and are now being shuffled  in"

143 print"    order to be presented randomly"

144 print"     ------------------------------"

145 for t=1 to 1200:next t

146 rem shuffle triad lists nc times

147 for q=1 to nc

148 ra=int(rnd(1)*nc+1)

149 tp$=s$(q):s$(q)=s$(ra)

150 s$(ra)=tp$

151 next q

152 rem print element triads

153 print chr$(147)

154 for i=1 to nc

155 print"ELEMENT TRIAD NO.";i

156 print"--------------------"

157 b$=s$(i)

158 for d=1 to 3 step 2

160 rem subroutine for string lengths 8&9

161 if len(b$)=8 then gosub 600:d=8:goto 167

162 if len(b$)=9 then gosub 700:goto 169

163 ad$=mid$(b$,d+1,2)

164 k=val(ad$)
```

```
165 print e$(k):print

166 next d

169 rem const't elicitation instructions

170 print"              INSTRUCTIONS                "

172 print"Enter a way in which any two of these"

173 print"are alike. There is no need to mention"

174 print"which two  these are; only  the way in"

175 print"which they are similar"

176 inputc$(i)

177 print:print"Could you now indicate the way in which"

178 print"the other one was differentY"

179 g$=" v "

180 input f$:print chr$(147)

181 c$(i)=c$(i)+g$+f$

182 next i

184 print chr$(147);:rem list constructs

185 print"          CONSTRUCTS ELICITED"

186 print"          -------------------"

187 for a=1to nc

188 print:print#129,a;"=";c$(a):print#129,

189 if  nc=10  or  a=nc  or  a=10    then    print:print"
Hit any key to continue      "

190 if a=nc or a=10 then getk$:if k$=""then 190

191 if a=10then print chr$(147);:print"CONSTRUCTS ELICIT
ED(cont)"
```

```
192 if a=10 then print"                 ------------------------
"

193 next a

195 rem ratings

196 dim rs(nc,ne)

197 for i=1 to nc

198 for j=1 to ne

199 if r$="a" then gosub 598:goto 215

200 printchr$(147);:print"RATE ON A";p;" POINT SCALE AS
FOLLOWS"

201 print"---------------------------------------"

202 print"Give this element a score between 1 &";p

204 print"A rating  of 1  would indicate that the"

205 print"element is seen very  much in terms of"

206 print"the description on the left."

207 print

208 print"A score of";p;"would indicate that it was"

209 print"seen  more in  terms of the description"

210 print"on the right."

211 print

212 print"Give a  score  of";(p+1)/2;" if  you  can't
decide"

213 print"between the  descriptions or if neither"

214 print"of them are felt to be applicable"

215 print:rem rating

216 printchr$(18);"RATING OF ";e$(j);" ON"
```

```
217 print:print;c$(i);"=";

218 input rs(i,j)

219 next j

220 next i

221 rem output finished grid

222 print#129,:print chr$(147)

223 print#129,"COMPLETED REPERTORY GRID"

224 print#129,"------------------------"

225 print:print#129," TABLE OF RAW SCORES"

226 print:print#129," Elements   =Columns"

227 print:print#129," Constructs =Rows"

228 print#129,

229 for i=1 to nc

230 for j=1 to ne

231 let u$=str$(rs(i,j)):print#129,right$(u$,len(u$)-1);

232 next j:print#129,

233 next i

240 print

245 if op=4 then close 129

250 print chr$(17);"thank you ";n$

260 end

500 rem

610 rem subroutine to print elements of string length 8

615 fora=1 to 6 step 2

620 ifa>4 then ad$=right$(b$,2):goto630

625 ad$=mid$(b$,a+1,2)
```

```
630 h=val(ad$):print e$(h):print

635 next a

640 return

650 rem

700 rem subroutine to print elements of string length 9

715 fora=2 to 8 step 3

725 ad$=mid$(b$,a,2)

730 h=val(ad$):print e$(h):print

735 next a

740 return
```

APPENDIX THREE

Classification of Dream Constructs

The following is a list of all the constructs elicited from the subjects who participated in experiment one. Below each construct is marked the category[(F)orm, (C)ontent, or (U)ndecided] in which it was placed by each of four judges, R1, R2, R3, R4.

1. Presence of threat v Absence of threat
    R1=C   R2=C   R3=F   R4=C
2. Presence of familiar scenes v Novel places
    R1=C   R2=C   R3=C   R4=C
3. Weird v Familiar
    R1=C   R2=F   R3=F   R4=F
4. About the future v No time present
    R1=F   R2=F   R3=F   R4=F
5. Very long v Relatively short
    R1=F   R2=F   R3=F   R4=F
6. Feeling confused v Felt at ease
    R1=C   R2=C   R3=F   R4=C
7. Very stupid v feelings of being trapped
    R1=C   R2=C   R3=F   R4=C
8. Escape from being trapped v Trapped but no escape
    R1=C   R2=C   R3=C   R4=C
9. Disguised v Things are normal
    R1=U   R2=F   R3=F   R4=C
10. Vivid v Fuzzy
    R1=F   R2=F   R3=F   R4=F
11. Uncomfortable v Not threatening
    R1=C   R2=C   R3=F   R4=F
12. Under enormous pressure v Weird
    R1=C   R2=U   R3=F   R4=C
13. Terrifying v Secure feeling
    R1=C   R2=C   R3=F   R4=C
14. Inconsequential v Meaningful
    R1=F   R2=U   R3=F   R4=F
15. Hve people I know in v Abstract people in
    R1=C   R2=C   R3=C   R4=C
16. Had magic in v More like everyday life
    R1=C   R2=C   R3=C   R4=C
17. Long v Short
    R1=F   R2=F   R3=F   R4=F
18. Had deep impact v Disjointed/Non memorable
    R1=U   R2=F   R3=F   R4=F

19. Theme of good v evil v No theme og good and evil
    R1=C   R2=C   R3=F   R4=F
20. Beautiful and Upifting v Depressing/Boring
    R1=C   R2=C   R3=F   R4=C
21. Had several different sections in v One idea in
    R1=F   R2=F   R3=F   R4=F
22. Had music in v No music in
    R1=C   R2=C   R3=C   R4=F
23. Was with Kevin v Wasn't acting as one of a pair
    R1=C   R2=C   R3=C   R4=C
24. Didn't have enough clothes on v Dress irrelevant
    R1=C   R2=C   R3=C   R4=C
25. Was self possessed v Felt inadequate
    R1=C   R2=C   R3=F   R4=C
26. Presence of Animals v No animals
    R1=C   R2=C   R3=C   R4=F
27. Has time element v No time element
    R1=F   R2=F   R3=F   R4=F
28. To do with the past v To do with the present
    R1=C   R2=C   R3=F   R4=F
29. Bizarre v Realistic
    R1=C   R2=F   R3=F   R4=F
30. Very violent v Anxious
    R1=C   R2=C   R3=F   R4=F
31. Positive contents v Unhappy contents
    R1=C   R2=C   R3=F   R4=F
32. Vivid/Intense v Very drab
    R1=F   R2=F   R3=F   R4=C
33. To do with the family v moving away from the past
    R1=C   R2=C   R3=F   R4=C
34. People I've never met in v Mostly people I know
    R1=C   R2=C   R3=C   R4=C
35. Have active role v Passive
    R1=C   R2=F   R3=F   R4=C
36. Very symboic v Concrete
    R1=F   R2=F   R3=F   R4=F
37. Long v Short
    R1=F   R2=F   R3=F   R4=F
38. Vague v More able to comprehend
    R1=F   R2=U   R3=F   R4=C
39. Enjoyable v Heavy
    R1=U   R2=C   R3=F   R4=C
40. Continuous v Fragmented
    R1=F   R2=F   R3=F   R4=F
41. Reassuring v Worrying
    R1=C   R2=C   R3=F   R4=C
42. Have fathe and sea in v Strange and horrible
    R1=C   R2=C   R3=U   R4=C
43. Have sister and element of anxiety in v To do with
    University
    R1=C   R2=C   R3=C   R4=C

44. Warm atmosphere v Very concrete
    R1=U   R2=U   R3=F   R4=U
45. Have active relationship with Mother v To do with
    present
    R1=C   R2=C   R3=C   R4=C
46. Concerned with education v Emotional
    R1=C   R2=C   R3=U   R4=C
47. Sub dreams v Concrete/Continuous
    R1=F   R2=F   R3=U   R4=F
48. Weird anonymous people in v Emotional
    R1=C   R2=C   R3=U   R4=C
49. With friends v Much shorter
    R1=C   R2=C   R3=U   R4=C
50. Travelling in them v No time element
    R1=C   R2=U   R3=U   R4=C
51. Frightened/Insecurity v Social
    R1=C   R2=C   R3=F   R4=C
52. Upsetting dream v Experientially passive
    R1=C   R2=C   R3=F   R4=C
53. Independence v Sheltered
    R1=C   R2=C   R3=U   R4=C
54. People against me v Fear of foreign things in my
    body
    R1=C   R2=C   R3=C   R4=C
55. To do with killing v Theme of absence
    R1=C   R2=C   R3=U   R4=U
56. I'm involved and anxious in the prsent v An
    observer of foregone events
    R1=C   R2=U   R3=F   R4=C
57. I end up with a feeling of confidence in my power v
    I feel powerless
    R1=C   R2=U   R3=F   R4=C
58. Absence of self awareness v I'm sorting things out
    and takng effective action.
    R1=C   R2=C   R3=F   R4=C
59. I'm taken unawares v This is the final revelation:
    there can be no more surprises
    R1=C   R2=C   R3=F   R4=C
60. Confidently standing up for myself v Passivly
    allowing others to determine situation
    R1=C   R2=C   R3=F   R4=C
61. Intense feeling of anger at oppressor v Almost lack
    of feeling and being in role of oppressor
    R1=C   R2=C   R3=C   R4=C
62. Controlled, pre-set, systematic violence v Ragged
    direct spontaneous violence
    R1=C   R2=C   R3=C   R4=C
63. Emotionally involved response v Discriminating
    adult observation
    R1=C   R2=F   R3=F   R4=C

64. Sequence of surprises v An organic unfolding of events
    R1=U R2=F R3=U R4=F
65. My words have great power v Where I don't say anything
    R1=C R2=C R3=C R4=C
66. A sense of the other as being intensely real and present v A sense of vagueness/distance of the other
    R1=C R2=F R3=F R4=U
67. I'm in a safe place but danger enters v I've left a safe place
    R1=C R2=C R3=C R4=C
68. Tremendous enjoyment of change v Fear of change
    R1=C R2=C R3=C R4=C
69. Very powerful v Nothing remarkable
    R1=C R2=C R3=F R4=F
70. Distasteful/Unpleasant v Scary but not gruesome
    R1=C R2=C R3=F R4=C
71. Involve aggressive situations v Not aggressive
    R1=C R2=C R3=C R4=C
72. Ridiculous v Not so bizarre
    R1=C R2=F R3=F R4=C
73. Supernatural v Not supernatural
    R1=C R2=C R3=F R4=C
74. Have mystical aura v Mundane
    R1=C R2=F R3=F R4=C
75. Involve danger v No danger
    R1=C R2=C R3=F R4=C
76. Very lucid v Not very lucid
    R1=F R2=F R3=F R4=F
77. Enjoyed in parts v Unemotive
    R1=U R2=C R3=F R4=C
78. Time relationships distorted v In here and now
    R1=F R2=F R3=F R4=F
79. More detailed v Less detailed
    R1=F R2=F R3=F R4=F
80. Moving v Remaining
    R1=C R2=C R3=F R4=F
81. About my mother v About other people
    R1=C R2=C R3=C R4=C
82. Involve death v Involve persecution
    R1=C R2=C R3=C R4=C
83. Involve food v To do with objects
    R1=C R2=C R3=C R4=C
84. Angry v Peaceful
    R1=C R2=F R3=F R4=F
85. Based on something that has actually happened v Unlikely
    R1=U R2=C R3=C R4=C
86. Alienation v Rejection
    R1=C R2=C R3=F R4=C

"

87. Happy v Sad
    R1=C   R2=C   R3=F   R4=F
88. Affects me v Doesn't affect me
    R1=C   R2=U   R3=F   R4=C
89. Socialising v Being ignored
    R1=C   R2=C   R3=F   R4=C
90. Despair v Hope
    R1=C   R2=C   R3=F   R4=C
91. Sexual v Non sexual
    R1=C   R2=C   R3=C   R4=U
92. Short v Long
    R1=F   R2=F   R3=F   R4=F
93. About end of the world v Not about end of the world
    R1=C   R2=C   R3=C   R4=C
94. Bizarre v Not bizarre
    R1=U   R2=F   R3=F   R4=C
95. Ominous v Not ominous
    R1=U   R2=C   R3=F   R4=C
96. Influenced by recent events v Not influenced by
    recent events
    R1=F   R2=C   R3=C   R4=C
97. Familiar setting v Unfamiliar setting
    R1=C   R2=C   R3=C   R4=F
98. Familiar characters v Unfamiliar characters
    R1=C   R2=C   R3=C   R4=C
99. Irrational behaviour from self v Rational behaviour
    from self
    R1=C   R2=C   R3=C   R4=C
100. Irrational behaviour from others v Rational
     behaviour from others
     R1=C   R2=C   R3=C   R4=C
101. Mundane v Not mundane
     R1=C   R2=F   R3=F   R4=F
102. Am panicing in v Has novel routine
     R1=C   R2=C   R3=C   R4=C
103. Nostalgic v Recent
     R1=F   R2=C   R3=F   R4=U
104. Disorganised v Has theme
     R1=F   R2=F   R3=F   R4=C
105. About death v About my baby
     R1=C   R2=C   R3=C   R4=C
106. Impending disaster v All mixed up
     R1=C   R2=C   R3=U   R4=C
107. Am being kept waiting v Am trying to escape
     R1=C   R2=C   R3=C   R4=C
108. Fantasy v Realistic
     R1=F   R2=F   R3=F   R4=F
109. Enjoyable v Boring
     R1=U   R2=C   R3=F   R4=F
110. About being home v About being out
     R1=C   R2=C   R3=C   R4=C

111. Repetitive v Original
     R1=F   R2=U   R3=F   R4=F
112. Short v Long
     R1=F   R2=F   R3=F   R4=F
113. Not very disguised v Heavily disguised
     R1=F   R2=F   R3=F   R4=C
114. Clear v Little awareness of what's happening
     R1=F   R2=F   R3=F   R4=C
115. Warning me v Concerned with self support
     R1=C   R2=C   R3=C   R4=C
116. Made me feel good v Little emotion attached
     R1=C   R2=U   R3=C   R4=C
117. Disconnected v Fluent
     R1=F   R2=F   R3=F   R4=F
118. Am more involved v More of a spectator
     R1=C   R2=C   R3=F   R4=C
119. Realistic v Bizarre
     R1=U   R2=F   R3=F   R4=F
120. To do with the past v Oriented toward future
     R1=C   R2=C   R3=F   R4=F
121. Vivid/Intense v Not very clear images
     R1=F   R2=F   R3=F   R4=C

APPENDIX FOUR

Dream Reports and Data from Experiment Three

KEY   S.A=Spontaneous Awakening

       N.A.M=No Awakening Made

Subject 1

Age 19 years.   Sex Female

NIGHT ONE   Sleep Onset 12.35 a.m

NIGHT TWO   Sleep Onset 12.48 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	3.12 a.m	5 mins 24 secs	Y
2.	4.20 a.m	6 mins 50 secs	N
3.	5.44 a.m	7 mins 40 secs	Y
4.	6.50 a.m	8 mins 34 secs	Y

DREAM REPORTS(Feb 3rd 1983)

Report 1 I was dreaming. Cream eggs.   It was cream egg, cream egg machine. I just got a cream egg out of a machine but I don't know what I was how or where I was or who I was with or what I was doing.

Report 2 My friend Penny was in this dream. I was at home but I was in my older house and we'd just moved. I was in my old house. It wasn't Penny it was Claudia I remember now and she was boiling a kettle in my dining room and we were about to have a cup of tea and we were playing a record really loud and watching 'Fame' on the television and we were siting round by the fire kneeling down by the table eating tea. My sister was in it.

Report 3 I dreamt about my(you know that) friend(Who

got her car jammed up last night. Well she was meant to

be going home to Devon today that's why she was so

annoyed) and we were in a practical lesson and someone

said "Well she can't go home anyway cos you've got a

practical" and that seemed to make her really very

happy(don't know why). She was going to skive it but

she didn't. Then we were watching television in the lab

and there was another tele I was watching and Angela

Rippon was singing on it and it was advertising her

album. The labs were actually in my old school looking

out across the playground.

Subject 2

Age 18 years.   Sex Male

NIGHT ONE   Sleep Onset 1.38 a.m

NIGHT TWO   Sleep Onset 1.19 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	2.44 a.m	4 mins 13 secs	Y
2.	4.03 a.m	6 mins 13 secs	Y
3.	5.19 a.m	8 mins 44 secs	Y
4.	6.54 a.m	16 mins 13 secs	Y

DREAM REPORTS(Feb 6th 1983)

Report 1 I was dreaming of something to do with

psychology and there was something salivating. Some

kind of animal. Some sort of test or something. I

can't remember if I was doing the test or not. I think

I was. I woke up with this word salivating on my mind
and some sort of traces of trying to remember something,
this experiment that was done.   I was   conducting
something. I feel like I was almost at the beginning of
a story almost and I'd read the first couple of pages,
but it was definetly something about salivating and
explaining to somebody else this stuff in the book.

Report 2 Dreams about adverts on tele. One for either
tea or coffee, had a funny name it was called
hemlock(that's obvious where I got that from, a girl was
drinking something like that in 'The Professionals') and
it was making this cup of tea, dried milk of all things,
popping it in, stirring it up, and then once a few
circumstances dreaming about adverts and the next minute
dreaming of something or other(I just find it all very
confused, well very mundane). Everything's all sort of
dashing about. There's mostly just me, maybe one or
two, seeing someone. Normally its just myself and I'm
thinking of things I've done already.   I've dreaming
about the car quite a bit, always thinking about the
car, things I'm doing st this particular time. Dreaming
of rainy days. I felt myself wandering through various
things. Cars was the main one.

Report 3 I was away with the army and I was going for
an interview. We're all in a waiting room and we all
went to get some food in this big warehouse and the

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thing that I wanted was at the top of the shelf and I remember distinctly there were lots of things all on the lower shelf of all things and the top it was something just pretty normal like beans or something and I wanted to get something from the top shelf and I couldn't get it. I kept trying to climb up and however hard I tried I kept falling down and then I was supposed to go to a lecture with this captain and I wore hard soft shoes which was against the rules and I just realised just before I arrived and I got in trouble for it and he sent a few people out for various reasons for not coming exactly dressed and I just arrived at the door. Waiting for army interview and he was calling me over the tannoy(same as you) and that was the bit I remember(a voice similar to yours) it was "McInnes, punishment missing your last lecture today for wearing wrong shoes" and as a result you know I felt that was an important lecture people want to go to, as a result I'd fail the day's exam and eventually the thing that I got, that I was after from the top shelf. I was after a certain ingredient I kept trying and I was sweating and I was falling and I think it was something silly like a creme egg. It was in a jar. There were lots of them all sown with buckles and I kept tying to get it and eventually I called a dead tall guy to come along and he climbed up and got it for me and getting this jar bringing it down

felt a great sense of relief. And then once we got it

realised it was on the ground and it was one of these

big squarehouse shelfing things in cash and carries. I

climbed just to get this one particular thing and it was

a boy from way back, one of the guys at the(5 years ago

not my last school, not even the one before that) my

last school but two. Then once I'd found, I'd seen what

it was, really stupid but there were also foods all

being mixed up. There were jars of things all mixed up.

There were jars of things lying open with other things

mixed in them, things that didn't belong together,

things like tables and they're filled with jars of, I

mean just for example say jam topped up with tomato

sauce or something. Ordinary jam jars and tins of food

and opened and topped up with something that didn't

belong in them and there was one that I thought of, it

was a big glass jar, and it was topped up with tomato

sauce and there was something in it like dried lentils,

dried soup making ingredient. I went to the next

lecture and after that I was dressed I'd go and get

changed into other clothes and go and get some tea, and

saw some of my friends that I'd met going round Europe

and they were sleeping and they had missed the lecture,

and people sort of going by but they'd missed this so

they got into trouble, and there were lots of girls in

it as well as hundreds all running round dressed in army

uniform, and then we all went for our tea and we were all cooking tea together.

Report 4 It was a fashion parade. Really boring. Some people walking up and down displaying clothes. It went on for ages. This big platform in front of us and there was something else I think I had been dreaming about. Don't know what it was but it was going throughout the day.

Subject 3

Age 18 years.   Sex Female

NIGHT ONE   Sleep Onset   1.00 a.m

NIGHT TWO   Sleep Onset 12.11 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	1.05 a.m	5 mins 14 secs	Y
2.	2.17 a.m	6 mins 23 secs	Y
3.	5.44 a.m	8 mins 14 secs	Y
4.	6.57 a.m	9 mins 38 secs	Y

DREAM REPORTS (Feb 9th 1983)

Report 1 All I can remember is sort of all in the dining hall in breakfast. We're talking. It's mainly to do with what were going to do during the day especially Meika. It was something to do with Meika but I can't remember what she was going to do. There was everyone there I think we were standing by the tea urn at the top of the tables. There's a big tea urn separate and other things separate about 10 yards away.

We were just standing up talking.

Report 2 There was a whole group of us and we were walking through the University(this bit here by the grass opposed to the Biology department, sort of in that direction towards town[points in that direction]) and we were gonna go up walk through Leicester and we were all arranging to go out again. Meika was there. Think I'd just been for a sauna before that.

Report 3 I was walking through town at home and I was doing an experiment, staying overnight but I hadn't got a toothbrush(well I have but I dreamt I hadn't) and anyway I told my dad my mouth tasted horrible and he sent me out to look for one and i found I was in this back garden(and its like our back garden, where our new house at home) and there's this fox. My dad was out with my only sister and this fox climbed into tree and started weaving a net. They fixed it up and made it into a trap sort of my dad so that when it went, went(sic) it spring and catch the fox up in the tree and then a great big insect came down and it had a wing span of about two and a half to three feet and it went upside down and it was like a helicopter with really long legs formed along the stalk or something but when it went upside down it just fitted into this trap and it looked like the same shape as a torch(you know these long black torches you get). Carried on walking cos I went out to

buy my toothbrush from this stationary shop and there's a card shop at home. I got to this place called Parson Street and I bumped into one of my friends who was there who I, just having a laugh about it and I walked through there and suddenly my toothbrush had appeared and I didn't need to buy one and I was standing there cleaning my teeth. There was all sort these lumps of weetabix and things.

Report 4 There was this party. It was in the Queen'S Hall. Lots of seats there and we were watching, I can't remember what we were watching but everyone wanted to get better place s they could see what was going on and there was one big thing about wearing blusher and sort of in half time everyone was swapping places and there was this lad called Quentin(who I don't like cos he's a big know all) and he was sitting in front of me and his head was in the and then girl called Brierly and another friend Jim from school. We went over to the into a side alley, no side aisle I really can't picture it as anywhere and I got out loads of blusher or it was more like war paint and it was just like we were laughing and don't be so stupid and put my head in the sink and washing it out off again.

<u>Subject 4</u>

Age 19 years.   Sex Female

NIGHT ONE   Sleep Onset 12.53 a.m

NIGHT TWO   Sleep Onset 1.09 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	3.24 a.m	4 mins 55 secs	Y
2.	4.50 a.m	7 mins(S.A)	Y
3.	6.15 a.m	10 mins 52 secs(S.A)	Y
4.	8.32 a.m	8 mins 30 secs	Y

DREAM REPORTS(Feb 17th 1983)

<u>Report 1</u> In a very kind of abstract way sort of someone playing around with a piece of paper.   Something like origami. Folding up bits of paper. It was very rare just this hand.

<u>Report 2</u> I remember going through a department store and looking at some sort of very kind of elegant but what we'd call grotty kind of old ladies', not old ladies', but sort of ladies' dresses and things and then remembering sort of seeing trendy students going down the road with make up on and sort of really trendy clothes and things like that and when you're with your friends you always sort of comment on things like "Oh God you know really kind of Oh I wonder how long it takes her to put on her make up and things like that.   I was on my own watching all this.

Report 3 I vaguely remember sort of sitting with a couple of friends I used to go around with at home. Catherine and Corin and we were, it was just quite sort of daily occurrence. I was just sort of chatting about..no it wasn't actually cos we it was sort we were talking about things that you don't really, alot of people a bit weird it's how you look like when you're reading a book and also this other girl came in, someone I know from college whose quite very intelligent but they're just girls who've went out to work when they're about sixteen and sort of all sitting cross legged on the floor and then I dreamt I was in this room and it was completely different cos it was like a kind of bedroom and it had sort of a table on the bottom of the bed. There's a lamp shade and a kind of jar full of pencils and things and a brush and a cigarette there. I just picked up the cigarette and that was it.

Report 4 Well I walked into, I came home from collegejust like to the halls of residence and like I started agreeing with something and there's a really nice room just how I like it and this line of them came in and they were quite sort of pally with me. Sort of old couple or something and then they had a grandchild who came in with somebody. I think I was watching them and I sort of worked it all out and I thought that and shifts of blond hair, this grandchild was just sitting

in the kitchen.

Age 19 years.   Sex Female

NIGHT ONE   Sleep Onset 12.09 a.m

NIGHT TWO   Sleep Onset 12.40 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	1.38 a.m	2 mins 25 secs(S.A)	N
2.	2.43 a.m	7 mins 20 secs	Y
3.	5.05 a.m	7 mins 11 secs	Y
4.	6.09 a.m	9 mins 02 secs	Y
5.	8.15 a.m	9 mins 31 secs	Y

DREAM REPORTS(Feb 24th 1983)

Report 1 I was riding a bike through Victoria park.   I know I'm on the bike but I can't feel the bike.   It's not actually Victoria Park but it could be.   Anyway I'm going to the Redfearn to meet Meika.   A drink up there. I though Meika might be there as well.   It was windy but it wasn't cold.

Report 2 Just was thinking about a mushroom omelette(cos me and Charlotte are always talking about having a mushroom omelette when we get our own house next year).   I'm not thinking about the omelette I was thinking about where we'd put it.   I wasn't thinking about the size of the omelette I was just thinking about big omelette.   She said how do you get over one big omelette round a plate.   I can't remember it.   There was

something before that. Meika fancied tomatoes with it as well. Standing round a table. The tables were there but it was a tall table on a pedestal and we were there. You can hear everybody else's lines but it is not such a know all level. It's just in the background that we were all there. There was somebody eating a cheese sandwich. It was Sheila.

Report 3 Was in this pub down town...not anyone in particular I don't think. Somebody said Ros was there so we'd all gone upstairs. Rachel, Patrick and the lot were with me. Walked up the stairs and there was this grotty room and nobody there. Everywhere else looked really good. We just sat down in this grotty room.

Report 4 It weren't very interesting. Not much. It wasn't at home. Either down in the pit, Redfearn or in Leicester somewhere. Just sitting round a table with people from here from University. They were talking to me, I wasn't talking to them. I was happy in the dream. I was smiling in all my dreams.

(Question: Was anything going on before?)...Sure I was on my bike.

Subject 6

Age 21 years.   Sex Male

NIGHT ONE   Sleep Onset 2.06 a.m

NIGHT TWO   Sleep Onset 1.06 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	2.45 a.m	5 mins 37 secs	N
2.	3.53 a.m	7 mins 30 secs	Y
3.	5.01 a.m	8 mins 40 secs	Y
4.	6.30 a.m	5 mins 52 secs (S.A)	N
5.	6.59 a.m	8 mins 20 secs	N

DREAM REPORTS(March 3rd 1983)

Report 1 Something about washing powder. It's something was claimed or was gonna be claimed when the cookery was done. The batter with a prize or something. It was more thought but certain components of it were slightly visual.

(Question: Was there any other people in it?)...Yes but not people that I can. It was Joe Bloggs you know. Just generally doing normal things. I think it was in a home environment but can't say exactly where. A gang, I don't know there was other people involved. They seemed to involve two people, me and someone else.

Report 2 I was in a car with some other people and we were discussing of all things women going into labour and I was being told by someone else about and although he was telling me I could visualise it in the dream,

merges a bit but when I think he was a doctor of some

sort or if not a doctor a close friend so he could find

out how this woman was, but this woman worked at, I'm

not sure if it was a hotel or something and she's gone

into premature labour and in the end he just came down

after seeing her and that's it.

Subject 2

Age 19 years. Sex Female

NIGHT ONE Sleep Onset data missed

NIGHT TWO Sleep Onset 1.43 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	3.50 a.m	5 mins 44 secs	Y
2.	4.45 a.m	7 mins 12 secs	N
3.	5.47 a.m	7 mins 53 secs	Y
4.	6.53 a.m	10 mins 40 secs	Y
5.	7.50 a.m	11 mins	Y

DREAM REPORTS(March 9th 1983)

Report 1 Doing Ph.D's on psychology and recording

people's dreams. Sort of half connected with this, not

exactly significant, wasn't a story as such. It was

more something happening really. An idea, lot of

thinking going on.

Report 2 Continuation of before. Well it's not you,

don't know who it is. Somebody I know but I can't

think. Somebody to do with dreaming experiments.

Something to do with this friend who do the waking up

asks him which stage of sleep have you just came out of,
and you sort of all connected with this. It was in more
like a lecture theatre type thing, lots of big wires
potted around like the thing you get in operating
theatres. Benches black and white.

Report 3 Holiday school trips beginning with Germany,
Austria, so many people in it, it was almost like
something that had occurred earlier. So many piles of
people around I didn't manage to get to sleep til two in
the morning and I went to the kitchen. I went away just
to get away from it. They were talking about the food.
People aren't what they thought, sort of embryo sort of
thing in the dream.

(Question: Which other people were in it?)...Couple of
people from hall, couple from school, school back home.
These comments about there's one girl Charlotte going on
about, Charlotte was sort of very secluded and didn't
want to join in. Just the sort of comments that people
make about them generally.

Report 4 Weird dream. Some people all in one room
getting drunk, sick all over the place, sort   of
recalling other occasions when this happened.

(Question: Was anybody else with you?)...No when you've
got a dream within a dream and you're talking about
something.

(Question: Where you in any particular place?)...My

house except my bedroom wasn't the same. It's more like
my room above here. Sort of a mixture of the two. Some
things the same some slightly different.

Report 5 Someone broke their leg. They had the key
operated. They were on the toilet trying to get into
art college. They were trying to get into art college
and talking about people that got drawing. The right
leg's opposed, sort of the left leg's opposed to the
right. Cos I'm left handed the right arm's getting in
the way(It's a bit hard cos it's one of those things
that's difficult to explain to somebody else). There's
this girl wondering if she could draw the foot for them,
going over their foot to draw sketches to see if it was
the same thing. There were perspectives in it and there
was one bit where I was sitting talking to him in one
room and they were lying down and one of them sez:
"You're the same time as other people in the room".
He's sort of in two places at once. Sitting in that
place we were earlier before, got all these phone boxes
suddenly appeared and then we were looking at these
telephone boxes. Was talking to this friend and this
stuff all starts phoning up.

Subject 8

Age 19 years.   Sex Male

NIGHT ONE   Sleep Onset 1.05 a.m

NIGHT TWO   Sleep Onset 1.20 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	2.25 a.m	1 mins 20 secs	N.A.M
2.	3.28 a.m	8 mins 33 secs	Y
3.	4.45 a.m	7 mins 40 secs	Y
4.	6.03 a.m	8 mins 10 secs	Y
5.	7.13 a.m	10 mins 28 secs	Y
6.	8.25 a.m	10 mins 14 secs	Y

DREAM REPORTS(March 12th 1983)

Report 1 I was flying about on a horse, incredible like pegasus sort of thing flying around on a horse. Circling round over all these buildings laid down in order, ordered sort of fashion. Sort of caravans set down with trees sort of outlined in the area.

Report 2 I thought I was at the University walking away looking all day but the people were walking around with their heads moving. This little prawn coming out of the top of the body and everything else is normal and the only man whose still got a head as I see it and I was only other thing down there. It was pretty strange you know the way everyone walks around in the middle minding their own business. I can remember thinking something different, something unrelated.

Report 3 Drinking Vodka and it was breakfast with a sort of beaker of milk. It was actuallt in hall, the place where we eat. I had vodka first time. Strange room. We'd all been to Oadby that's that bit. It's the same sort of people I sit with in the morning at table. We were discussing what we'd done the night before and that's how I knew we'd sort of been to Oadby.

Report 4 It was a bit strange. It was walking in the city. This American city and changed into a bird O.K and fly off down the street and then up and then right up and then go straight back down again and then knock, a dive, a straight dive and into a pit. That's that quite funny actually. There's a little sort of don't know how to describe it, like a bulb sort of thing. There's all thee swings and there's this sphere flying in the middle unsupported.

Report 5 I was thinking about a race. Lots of people running a race and the people were getting all tired sort of tiring and falling around and then they just get jabbed. I seemed to think I was getting older as well. I was running round which was strange, no just wearing athletes gear running round a track. Seemed a bit pointless.

Age 19 years.   Sex Female

NIGHT ONE   Sleep Onset 1.33 a.m

NIGHT TWO   Sleep Onset 1.42 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	3.51 a.m	6 mins 20 secs	Y
2.	5.17 a.m	8 mins 40 secs	Y
3.	6.22 a.m	7 mins 20 secs	Y
4.	7.30 a.m	9 mins 10 secs	Y
5.	8.40 a.m	10 mins 20 secs	Y

DREAM REPORTS(March 15th 1983)

Report 1 It was something with food I think.   Sitting

round a table that's all.   About three other people.

(Question: Did you recognise where you were at all?)...I

think proabably at home in Bath.   We were all just about

to sit down. Lots of things been happening. From time

to time been thinking about something else.   Feeling

very sort of light.

Report 2 I was dreaming about moving house.   I was with

the person I'm living with at the moment, moving our

stuff from Evington drive to where we really think we

want in Granby Street in a car.   We were getting

everything sorted out and organised, putting into the

car and things like that, but we hadn't no we hadn't

started the car yet. It was just getting everything

ready before that you know popping in and out of the

cars and falling over each other and things like that.
Only unusual in the fact that distances and
possibilities aren't happen that can't happen in real
life. Like one minute you might be sort of at the top
of the house and then the next minute right down at the
bottom talking to someone.

(Question: Did that happen once, twice?)...Yeah a few
times.

Report 3 I was with Doug and Pauline and we were, don't
know where we but I was in the car and we were talking
about having things stolen and we tried. Is started the
car. It was gonna to go off and drove near to the wall.
Then I stopped the car and then these two other friends
came along and while I got out he wanted to try and they
wanted to try and they wanted to start it and things
because I've had yes, some sort of previous travel. One
bloke tried to do it by opening opened the door
continually and it just didn't seem strange.

Report 4 I was doing a friend's bedroom in a flat in
London and we were generally talking. She had some
posters and things like that. We were deciding where
they how to go you know. Which on looks better where
and why and talking at the same time. I can remember
her she wasn't fat. While we were talking about our
different experiences, me down here in Leicester and her
up in London. I was just about to tell her about doing

this I think.

Report 5 I was thinking particularly beehives for some
reason. I was going over the shapes in my mind.
Hexagon, hexagonal shapes you know. Go take up the
overall shape of the beehive. Just going round and
round that in my mind tracing it(which I think maybe it
could have been because they've got that shape on the
cafe ceiling of the National Gallery). I remember
thinking basically how interesting that was.

Subject 10

Age 23 years.   Sex Female

NIGHT ONE   Sleep Onset 1.25 a.m

NIGHT TWO   Sleep Onset 1.35 a.m

REM PERIOD	ONSET TIME	HOW LONG BEFORE WAKING	REPORT
1.	2.41 a.m	5 mins 20 secs	N
2.	4.13 a.m	8 mins 30 secs	N
3.	5.28 a.m	8 mins 14 secs	N
4.	6.53 a.m	9 mins 51 secs(S.A)	Y
5.	7.33 a.m	7 mins 09 secs(S.A)	Y

DREAM REPORTS(March 17th 1983)

Report 1 I was trying to open. I went to go spending
my days around my summer at dairy. I went there cos I
sometimes have to visit some people and they show me
around and there was me and some of my contempories from
the course and they went off some place and I was
talking quite sort of responsible to the foreman that I

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knew there. They were pumpioing in the milk and pumping
it out again and there seemed to be a pail for some
reason. I remember red pipes that were pumping the milk
out and then pumping it back into this factory bowl. At
the same time there was this, these stamps can't
remember if it was my mum or someone asking me about the
stamps and all the time I was talking to someone "I've
got the stamps it's O.K now there", sort of falling down
over the floor and I kept colecting it and and picking
them up and pulling them back and they were just sort of
these co-op stamps and plus normal stamps.

APPENDIX FIVE

REM Dream Reports Recorded in the Laboratory from a

Single Subject over Four Nights(Experiment Four)

The Dream Reports

Comments included inside brackets do not constitute part

of the dream report proper.

NIGHT ONE

DREAM 1(REM length=4 mins 49 secs)

There were four tents in a row and I was in the tent

with my dad, think it was my dad. We were talking about

Spain. Sounded like there was bad news about Spain.   I

was saying there was bad news about Spain and he said

'yes' and we were by a river on a pebbly kind of beach

and that's where it was, four tents in a row.   I was

aware of something, some people outside.

DREAM 2(REM length=6 mins)

It was night and something was about to happen to me

again(It was like watching some sort of t.v series cos)

there flashed up some words on the screen, like the

thought it was a printed page with a quotation.."don't

be afraid of the rainbow fish", and I was afraid of some

sort of devil. Some demons or something were running

around and I was wasn't going to let them get me.

I was in the river I think. I was in a tree and I

was saying some kind of chant, sort of about being

scared of the rainbow fish.

DREAM 3(REM length=5 mins 11 secs)

For some reason we were in a car driving along I
don't know Welford Road, cos someone had rung us up. A
girl had rung my friend up. She said she was parked on
Welford Road. She was extremely rich and we were
driving along, then we parked the car and we were
looking at this really big exaggerated eh 1930's all
time American car. Someone was talking about on the car
radio and we were @arked with our backs to the National
West serviceti1.

Then for some reason we had to go to the doctors. I
was in a hospital in hospital in Green Street down there
for examination, and the bloke behind was complaining
about the fact that doctors always treat you like
children or something accentuating their words and
making you deaf or sound deaf or stupid, and another
side to eh taking my shirt off to be examined cos that
was kind of superimposed on the action of what was going
on.

There was something else in that one as well. There
was something sinister. Something to do with this car.
This American car because this girl said something it
was definetly connected with this telephone call
beforehand, cos she said she either had a flat tyre.
There ws something about this girl being extremely rich
and saying about the car. There was a connection but I

don't know what it was.

DREAM 4(REM length=5 mins 40 secs)

I was talking to Nigel, the bloke I live with next door to me about an old friend I had at school. We were just talking about what he was like. I was at his this week. He used to have quite a nice garden and I, but I was walking up my auntie's garden in She lives in Newbury a really flash house with a really big garden. So I was walking up her garden talking about her garden as though it was his garden. So everything I was relating about me and him when we used to be kids cos he used to live near me in fact might have been related to this garden. It was a boiling hot summer's day and we were walking up the thing and everything was in delapidation in the garden and all the greenhouse and everything was all dirty broken down and things that weren't there. We were just about to get to the top of the garden when you woke me.

DREAM 5(REM length=6 mins 25 secs)

I was trying to get the car started, me and my dad and it seems pretty ludicrous but we couldn't think of the fact that we were reversing it and it was started. Then there was a next lot.. the same..The father of the bloke who lived across the road from me. He was trying to fix his car going trying to jump lead it down the road. For some reason we had his jump leads attached to

our car. Then we reversed away really faster and
bricked the wall. Then we were going up and down the
road trying to start the car in reverse.(It was already
started cos we were driving)

NIGHT TWO

DREAM 1(REM length=3 mins 48 secs)

I was in I was kinda in Freeman's Common car park,
and there was this big hand throwing bowls of, cans of
soup around but they were really big ones cos they were
people in 'em. They were swerving around all over.
Someone was shouting don't spill the cans of soup.
There's this part of something else that built up to
that but it's got cut off. I'm sure there was an
explanation.

DREAM 2(REM length=3 mins 37 secs)

I was dreaming about Dover. I was dreaming about
what it was like watching a film promoting it, showing
the problems of Dover docks. This aerial view and
everything, it covered in perspex to protect it from the
rain or something. It was in some kind of strange
German accent. Someone was talking over talking
over(sic) it was closing up and following this new Jag
X, XJ 12 on a route into the docks from the M1, and you
were following it. It was just like a film cutting into
it as it was driving along the different roads to get
into the docks. Just as you woke me up he was

explaining the difficulties of accidents and traffic jams.

DREAM 3(REM length=9 mins)

There was something about rooms. Now you know the layout of the self catering places. It's four rooms on the ground floor. It's something about that. That led into this thing about the dream. You remember these dreams like I'm doing the action then all of a sudden it's like someone's on a screen doing something else. Someone was saying something I was looking at a kind erm diary and although it was about me again someone was turning it over. While it was being flicked over and there was some girl with denim jacket on and something about jeans, em saying I wasn't old enough. She was saying you're not old enough. There was something about the time. She was showing me her watch. I was holding her wrist and looking at her watch.

DREAM 4(REM length=11 mins 6 secs)

I was in my brother's 'O' level physics set at school and we were trying to do something in pressure cookers and my pressure cooker wouldn't work cos it didn't have a pressure valve and my mum was teaching the class. So when she came round to us, I said "I can't do it cos I haven't got enough safety valves so it won't have any equal relationships".

"Allright then, how on earth you, got no idea about

experiments you'll still have to write it up". She said
"that's o.k then" and then passed me two record cards to
write your name in and I didn't bother writing my name
in. My brother was on one side and this friend was on
the other side and they were writing it in and that's
when they got this book out, and we're reading it, and
it was you know like read and fill in. You read a bit
of text and someone asks you questions. I was running
my finger down a page reading.

NIGHT THREE

DREAM 1(REM length=2 mins)

   This girl I know was in the dream. She's a real
feminist. She was er shouting some of her doctrine at
me about something. I was in a pretty general place.
It seemed like some terraces or I think I was in a tree.
I was climbing up a tree. She was shouting something at
me just as you woke me up.

DREAM 2(REM length=6 mins 25 secs)

   I was talking to a girl who was eh a friend, a
girlfriend of the bloke I used to be at school with.
Well she said she was. I mean I don't know. She was
talking about some bloke and I said "Oh I used to be at
school with him" and then me trying to work out the
date.

   We were at some terraced street, and before that she
was telling us it in the street and there were these two

little kids there and she was saying it to me and we were talking above their heads and something had happened, oh the door had jammed or something(the front door of the terraced house) and he was going off down the road to get a hammer. While she was away I was explaining, Oh I don't actually remember seeing the girl(so maybe it was just going on in my head), and it was talk, quibbling about the date or whatever, talking about 1961 or 2(which obviously is completely wrong cos I wasn't even born then). I can't remember what was happening before. I'm sure I was walking down the street to get to get to this party.

DREAM 3(REM length=11 mins)

I was watching this trailer off, for new t.v serial. These four Pakistanis were in this ford escort in the middle of Hyde park lake(I don't know how it got there). I think it was to the Thames to start off with and they crashed into it. They started to drown and this bloke in a boat went up to them, told them to get out, so they all looked at him and got out and then this boat wasn't anywhere to be found and they had started swimming. Then they were getting themselves away some big eel was rubbing, wrapping itself round the boat and I could feel this eel doing it to me so that's when I became part of the thing. Then I was just about to get to the shore, this thing wrapping itself around me(god it felt real,

never had an eel wrapping itself around me) Oh the slime. It was wrapping itself around my stomach. I was thinking don't struggle or it'll pull you under or something.(It was like a real serial someone over dubbing) someone was saying it(like a B.B.C trailer) "This is the story off..." I don't know what his name was.

DREAM 4(REM length=7 mins)

I'm in a hilly, coastal country on a bicycle, with my girlfriend. We're cycling out ahead(we're with a group by the way). Just as were about to cross over the brow the group shouted to us and we pulled into a white cafe atthe top of the hill with some big white cars parked outside.

DREAM 5(REM length=9 mins 12 secs)

I was dreaming I was a five eh footballer. Scored a couple of goals. It was inside, so that's what makes me think it was five-aside. I had a yellow shirt. I hit one of the goals past from a corner though it was an accident, and I thought one of the other defenders missed it. I think I was dreaming that it was a dream cos I was in bed just before it.

NIGHT FOUR

DREAM 1(REM length=3 mins 17 secs)

Nigel, the bloke, well the bloke I live with(whose living around you last year), living, living next to me

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in Freemans again with his girlfriend(whose around all the time) and bloke in our house called Mark. We were in our house in Nigel's room at the end of the evening, and we were thinking about something to eat. I was talking about omelettes and saying something about Nigel was gong to be sick. They were having sausage sandwiches(This is just like what happened the other night actually, although it's not really, just a general discussion of what we actually said).

DREAM 2(REM length=10 mins 13 secs)

I was talking to someone(a bloke) or they were talking to me. We were both sitting down quite close to each other. Whoever was talking to me was being quite emphatic and waving their hands alot. I'm not sure I can't pin down who it was.

DREAM 3(REM length=11 mins 40 secs)

I was driving a car full of people with a girl sitting in it. We were trying to get, I was trying to manoeuvre out up a step or something, like trying to get the car through a very small gap with lots of people in it. My brother was there and some girl. I can remember trying to manoeuvre it out, and this multi-storey car park and there was a big lorry coming along the road so we had to try and get out and dodge this lorry at the same time.

I was in my house watching the tele. I was on my own

while I was on outside in the hall on the phone so I could hear my talking and the front door bell rang and so I went to answer the door and were four pieces of chocolate on the floor. So I picked them up. I answered the door and it was my brother on his bike, and he was saying turn the tele off cos someone might ring the doorbell. I said "What?" and he said "Turn the tele off cos someone might ring the out, ring the doorbell", and I said "You are ringing the doorbell". He said Yeah, that's why you've got to turn the tele off". "Well", I said, "I was watching it", and that's when he kept saying "John turn the tele off, John turn the tele off".

Before I was watching the tele I was round at my friends house who lives across the road. That's where I got the chocolate from I think. I was watching tele in his house. (I obviously want to go home).

DREAM 4 (REM length=21 mins 12 secs)

I was at this big house on the roof, well on the kind of conservatory roof watching this big garden with grass tennis courts on it. These girls playing tennis. We were round there. We were watching them. I was sitting round some other blokes. The other blokes were in work. Before we'd gone there we'd come back on a coach from somewhere. Big white coach. We'd been up somewhere. Some great big hill like a wall with ferns all covered

over in fern. You could see grass. Then we came back
and we went round watching it.

The house was like my girlfriend's house. It was
big. This sunken, she has got a sunken garden. That
sunken garden has these grass tennis courts on it.
They were playing doubles. Then just as you woke me up
they were all changed. They came trouping back out.

Relation between Report Length and REM Sleep Time

A correlation was computed between the duration of
the REM periods prior to wakening and the lengths of the
corresponding narratives.

rho=0.507, p<0.05(2 tailed).

This value is similar to that obtained by the five
subjects in Dement and Klietman's(1957) experiment, and
likewise demonstrates that there are determinants to the
lengths of the dream reports other than the lengths of
the preceding period of REM sleep from which they were
obtained.

APPENDIX SIX

Computer Program for Simulation of Recurrence of

Elements in Dream Series.

PART ONE

The program was written in Commodore V2 extended

Basic to run on a CBM 64. The output is therefore

intended for a screen size of 40x25. The structured

nature of the program means that it should be relatively

easy to convert to other machines. Chr$ codes for

graphics functions peculiar to the CBM 64 are given

below. This will enable easier reading of the program.

Code   Function.

    5   cursor appears white.

   18   prints characters in reverse field.

   19   returns cursor to home position.

   28   cursor appears in red.

   30   cursor appears in green.

   31   cursor appears in blue.

  146   reverse field off.

  147   clears screen.

  156   cursor appears in purple.

  158   cursor appears in yellow.

Graphics symbols which appear in the program are

'Q'(print one line down) and] which indicates print one

space to the right.

The part of the program dealing with the recycling of

dream elements is contained between lines 700-760. The structure of this is given overleaf followed by a complete listing. Instructions for using it are contained within it. In part two of the appendix details are given of the application of the program to the data obtained in experiment four.

PROC DREAM

EXEC NEW DATA

checks if there is new data which is of a higher priority for processing than that currently in circulation.

EXEC BUFFER

Routine for transferring any items needing further processing into buffer. Will reappear in manifest dream as soon as high priority new data is dealt with.

EXEC M TO LTD STORE

Routine for transferring items just processed in dream into first available positions in limited store.

EXEC BUFFER TO M

Routine for transferring any items stored in overnight buffer.

EXEC LTD STORE TO M

Routine for transferring items from limited store into manifest dream.

END PROC

```
12  rem    dream simulation prog(R.A.Roberts 1985)

13  open   129,3,7

15  exec   instruct 1

20  exec   start parameters

30  loop

40  :    exec instructions

50  :    exec dream

60  :    exec clear

70  end loop

80  end

90  rem

100 proc start parameters

110 print chr$(147):rem screen clear

120 a=0:b=0

130 local a,b

140 dim lcs$(6),mn$(6),bu$(6),el$(6)

145 printchr$(156);:printchr$(147)

150 print"Limited Capacity Store"

160 print"--------------------"

170 repeat:a=a+1

180 :  print"address no.";a;"=";:input lcs$(a)

190 until a=6

200 printchr$(31)

210 print"Initial dream elements"

220 print"--------------------"

230 input"no of elements";n
```

```
240 print

250 repeat:b=b+1

260 :   print"element";b;"=";:input el$

270 :   mn$(b)=el$

280 until b=n

290 print chr$(156):printchr$(147)

300 b=0:c=0:printchr$(31);

310 printchr$(19);:print"dream no";1;"                  "

320 printchr$(156);:printat(12,5)"manifest"

330 printat(12,6)"elements":printchr$(31)

340 repeat

350 :   d=d+1

360 :   printat(14+d,8)mn$(d)

370 until d=n

380 print at(0,5)"processing"

390 print at(0,6)"  buffer   "

400 repeat

410 :   b=b+1

420 :   print at(22,5)"limited capacity"

430 :   print at(25,6)"store"

440 :   print at(34,8+b)" ":print at(36,8+b)" "

450 :   print at(35,8+b) lcs$(b)

460 until b=6

470 printchr$(156):print at(0,14)"INSTRUCTIONS"

480 end proc
```

```
490 proc instructions 2

500 :   if c=0 then call transition

510 :   if c>0  then   print"end  of  transition   between

dreams  "

520 :   if c>0 then print at(0,23)"hit 't'   to   terminate

'c' to continue"

530 :        loop

540 :          get a$

550 :            exit if a$="c"

560 :            exit if a$="t"

570 :        end loop

580 :   if a$="t" then end

590 proc transition

600 printat(0,23)"

"

605 printat(0,22)"

"

610 c=c+1:printchr$(19);:print"dream

no.                     ":print"Q]]]]]]]]";c

620 print at(0,23)"hit any key to continue"

630 loop

640 : get a$

650 : exit if a$<>""

660 end loop

670 printat(0,23)"                        "

680 printat(0,23)"transition between dreams";c;"and";c+1
```

```
690 :end proc

700 proc dream

710 :    exec new data

720 :    exec buffer

730 :    exec m to ltd store

740 :    exec buffer to m

750 :    exec ltd store to m

760 end proc

770 rem

780 rem

790 proc new data

800 printchr$(18);:print at(0,2)"check for new data of
    higher priority":pause 2

805 printchr$(146)

810 printat(0,2)"                                  "

820 :  exec m.empty check

830 :    nd=0:

840 :    printat(0,18)"New Data(y/n)";:input nd$:nd$=lef
t$(nd$,1)

850 if nd$="n" andx=6 then printat(12,8)"          ":end
proc

860 :    printat(0,18)"
         "

870 :    nd=1

880 :    if nd=1 and x=6 then printat(12,8)"New Data":en
d proc
```

```
890 :     if left$(nd$,1)="n"then nd=0

900 end proc

910 proc buffer

920 printchr$(18);:printat(0,2)"proc for transfer to buf
fer":printchr$(146):pause2

930 :     ifx=6then end proc

940 :     ifnd=1then r$="y":ne=6-x:call trans 1

950 :     printat(0,16)"manifest elements to buffer(y/n)
":input r$

960 ifr$="n"then end proc:else

970 printat(0,17)"
"

980 :     printat(0,17)"how many element(s)";:input ne

990 proc trans 1

1000 : if nd=1 then exec auto trans

1010 k=0

1020 repeat

1030 : k=k+1

1040 : printat(0,17)"
"

1050 : ifnd=0thenprintat(0,17)"input element";k;"for
transfer  ";:input el$(k)

1060 : el$(k)=left$(el$(k),1)

1070 : printat(0,17)"
"

1080 : count=0
```

```
1090 :    repeat

1100 :     count=count+1

1110 :     if el$(k)<>mn$(count) then ep=ep+1

1120 :    until count=6

1130 :    l=0:tn=0

1140 :    loop

1150 :      l=1+1

1160 :      if ep<>6andmn$(l)=el$(k)then tn=1

1170 :      if tn=1 then printat(14+1,8)" ":mn$(l)="";

1180 :      exit if tn=1

1190 :      exit if l=6

1200 :    end loop

1210 :    loop

1220 :      lo=lo+1

1230 if tn=1and bu$(lo)=""then bu$(lo)=el$(k):printat(2+

lo,8)el$(k):bf=1

1240 :      exit if bf=1

1250 :      exit if lo=6

1260 :    end loop

1270 tn=0:bf=0:ep=0:count=0:l=0:lo=0

1280 until k=ne

1290 k=0:bc=0

1300 if nd=1 then printat(12,8)"New Data"

1310 end proc
```

```
1320 proc m to ltd store

1330 printchr$(18)j:printat(0,2)"proc transfer to ltd st

ore":printchr$(146):pause2

1340 exec m.empty check

1350 if x=6 then end proc

1360 :    printat(0,17)"manifest elements to ltd store(y

/n)"j:input r$

1370 :    if r$="n" then end proc

1380 printat(0,18)"how many element(s)"j:input ne$:ne=va

l(ne$)

1390 repeat

1400 : k=k+1

1410 : printat(0,18)"

   "

1420 : printat(0,18)"input element";kj"for transfer  "j:

input el$

1430 : el$=left$(el$,1)

1440 : printat(0,18)"

   "

1450 :    repeat

1460 :     count=count+1

1470 :     if el$<>mn$(count) then ep=ep+1

1480 :    until count=6

1490 : if ep=6 then printat(0,18)"element

"jel$j" not present":pause1:else

1500 loop
```

```
1510 :  c1=c1+1:if mn$(c1)=el$ then printat(14+c1,8)" ":m
n$(c1)="":sw=1

1520 :  exit if sw=1

1530 :  exit if c1=6

1540 end loop

1550 :   c1=0:no=0:sw=0

1560 :   loop

1570 :    no=no+1

1580 :    if ep<>6 and lcs$(no)="" then
lcs$(no)=el$:tr=1:printat(35,8+no)el$

1590 :    exit if no=6

1600 :    exit if tr=1

1610 :   end loop

1620 :   ep=0:count=0:no=0:tr=0

1630 until k=ne

1640 end proc

1650 proc buffer to m

1660 printchr$(18);:printat(0,2)"proc transfer from buff
er":printchr$(146):pause2

1670 printat(0,2)"check if new data of high priority":pa
use2

1680 printat(0,2)"
"

1690 :    if nd=1 then end proc

1700 :    bn=0:nb=0

1710 :    loop
```

```
1720 :         bn=bn+1

1730 :         exit if bu$(bn)=""

1740 :         nb=nb+1

1750 :         exit if bn=6

1760 :     end loop

1770 :     if nb=0 then end proc

1780 :     ct=0:tr=0

1790 :     loop

1800 :       ct=ct+1

1810 :       cv=0

1820 :       loop

1830 :         cv=cv+1

1840 :         if mn$(cv)="" and bu$(ct)<>""then mn$(cv)=
bu$(ct):bu$(ct)="":tr=1

1850 :         if tr=1 then printat(2+ct,8)"  ";printat(1
4+cv,8)mn$(cv)

1860 :         exit if tr=1

1870 :         exit if cv=6

1880 :       end loop

1890 :       tr=0

1900 :     exit if ct=nb

1910 :     end loop

1920 end proc
```
·

```
1930 rem

1940 proc ltd store to m

1950 printchr$(18);:printat(0,2)"proc for transfer   from
ltd store":printchr$(146):pause2

1960 :   if lcs$(1)=""thenprintat(0,2)"ltd store is empty
":end proc

1970 printat(0,2)"check if new data of higher priority":
printchr$(146):pause2

1980 :     printat(0,2)"
           "

1990 :     if nd=1 then end proc

2000 :     printat(0,18)"ltd store to manifest elements(y
/n)";:input r$

2010 :     if left$(r$,1)="n" then end proc

2020 :     printat(0,19)"
           "

2030 :cs=0:sp=0

2040 :  repeat

2050 :    cs=cs+1

2060 :    if lc$(cs)=""then sp=sp+1

2070 :  until cs=6

2080 :  proc transfer

2090 :  printat(0,19)"element(s) for transfer:max=";6-sp
;:input nt

2100 :    if nt>6-sp then call transfer

2110 :  t=0
```

```
2120 :   repeat
2130 :     t=t+1
2140 :     printat(35,8+t)" "
2150 :     ms=0:tc=0
2160 :     loop
2170 :       ms=ms+1
2180 :   ifmn$(ms)=""thenmn$(ms)=lcs$(t):lcs$(t)="":print
at(14+ms,8)mn$(ms):tc=1
2190 :       exit if tc=1
2200 :       exit if ms=5
2210 :     end loop
2220 :   until t=nt
2230 :   proc swap address
2240 :   v=0:s=0
2250 :   repeat:v=v+1
2260 :   if lcs$(v)=""and lcs$(v+1)<>""then lcs$(v)=lcs$(
v+1):lcs$(v+1)="":s=1
2270 :   if s=1 then printat(35,8+v)lcs$(v):printat(35,8+
v+1)" ":s=0:m=1
2280 : until v=5
2290 if m=1 then m=0:call swap address
2300 end proc
```

```
2310 proc clear

2320 :  for cr=16 to 21

2330 :  printat(0,cr)"

    "

2340 :  next

2350 end proc



2360 proc m.empty check

2370 printchr$(18):printat(0,2)"checking if manifest rou

tine empty":printchr$(146):pause2

2380 :  x=0:e=0

2390 :  loop

2400 :    e=e+1

2410 :    if mn$(e)=""then x=x+1

2420 :    exit if x=6

2430 :    exit if e=6

2440 :  end loop

2450 printat(0,2)"

"

2460 end proc



2470 proc auto trans

2480 :    ac=0

2490 :  loop
```

```
2500 :    ac=ac+1

2510 :    el$(ac)=mn$(ac)

2520 :    exit if ac=ne

2530 :    exit if ac=6

2540 : end loop

2550 end proc

2600 proc instruct 1

2610 print chr$(147);:rem clear screen

2615 colour 0,0:print chr$(158);

2620 print"Dream Simulation":print:printchr$(30)

2630 print"This program  simulates the   mechanisms"

2635 print"whereby  images and themes are recycled"

2640 print"throughout a series of REM dreams  from"

2645 print"a limited capacity store in which  they"

2650 print"are  stored.   To   use   the   program   one
must":print

2660 print"1. Specify the contents of the store by"

2665 print"by means of a letter  to represent each"

2670 print"element stored."

2671 print"Press the   return  key if you wish to"

2672 print"leave the prompted level empty." :print

2675 print"2. Specify  the number of elements that"

2680 print"are initially present  in the  manifest"

2685 print"dream up to a maximum of six.":print

2690 print"3. Specify  the  manifest elements also"

2695 print"by means of a unique letter."
```

```
2700 print:printchr$(5);:print"Hit       any       key       to

continue":printchr$(30)

2710 get c$:if c$=""then 2710

2715 print chr$(147)

2810 print"The user must  select at  each  of  the"

2820 print"appropriate stages which elements are"

2825 print"to be transferred where."

2830 print"In  this manner  one can  experiment to"

2835 print"produce the  best fit  to  the observed"

2840 print"sequence of a set of recurring elements"

2845 print"in a dream series.":print:print chr$(31)

2846 print"The  number of  operations in the model"

2847 print"taking place between  successive dreams"

2848 print"can be subsequently compared with dream"

2849 print"report length  to provide a test of the"

2850 print"model generated":printchr$(159)

2852 print"View Instructions again(y/n)":printchr$(30)

2855 get c$:if c$=""then 2855

2860 if c$="y"then exec instruct 1

2865 end proc
```

PART TWO

There are a number of assumptions which this program
embodies about the process of recycling dream elements.

1. Elements are held in a serially accessible limited
capacity store of some kind from which they may be
recycled until deemed to be sufficiently processed.

2. The observed continuities both across nights and on
those occasions where the same element(s) are present in
successive dreams, are explicable within the model by
postulating a buffer system where elements
insufficiently processed during a dream may be held,
pending further processing'.

3. The information held in the buffer has to compete
with new incoming information for processing; whichever
is deemed to be of the highest priority gains access to
the manifest dream processing routines. This makes
explicable the existence of dreams in the series in
which there are no recurring elements.

The computer model requires that one specify the
following;

(i) The manifest contents of the first dream. (ii) The
initial contents of the limited capacity store at the
time of dream one. (iii) All operations of addition and
subtraction from the specified memory stores be
indicated numerically. These will be signified by a '+'
or '-' followed by the number of such operations

occurring. In those cases where items are both added to and subtracted from a memory store prior to a dream, then those of addition will always take precedent. This will lend an air of consistency to the model.(iv) The number of recurring elements present in each dream should always agree with what was actually observed.

If one follows the details below it can be seen that in the transition from dream 1(manifest elements 'cd' occurring) to dream 2(elements 'bcd' manifest), elements 'c' and 'd' are transferred to a buffer(+2 operations) and later retrieved for inclusion in the next manifest dream(-2 operations). Furthermore element 'b' is retrieved from location 1 of the limited capacity store for manifest processing(-1 operations). As an item is removed from this store the contents of the addresses below them move up to the highest location(denoted by a low address number). Thus overall prior to dream 2 there are(+2 and -2 and -1) 5 operations in all. The details below present the best available fit with the data obtained in experiment four.

NIGHT ONE

Dream No.	Buffer Contents	Buffer Operations	Manifest Elements	Ltd Store Operations	Ltd Store Address 123456
1.			cd		bfea
		+2			bfea
	cd	-2		-1	bfea
2.			bcd		fea
		+2			fea
	bc	-2		+1	fea
					fead
3.			ebcf		ad
		+1			ad
	e	-1		+3	ad
4.			e		adbcf
				+1	adbcf
				-1	adbcfe
5.			a		dbcfe
		+1			dbcfe
	a				dbcfe

NIGHT TWO

Dream No.	Buffer Contents	Buffer Operations	Manifest Elements	Ltd Store Operations	Ltd Store Address 123456
	a	-1		-1	dbcfe
6.			ad		bcfe
		+1		+1	bcfe
	a	-1		-2	bcfed
7.			bca		fed
				+3	fed
				-1	fedbca
8.			f		edbca
		+1			edbca
	f				edbca
9.	f		New Processing		edbca

NIGHT THREE

Dream No.	Buffer Contents	Buffer Operations	Manifest Elements	Ltd Store Operations	Ltd Store Address 123456
	f	-1		-1	edbca
10.			fe		dbca
		+1		+1	dbca
	f	-1		-1	dbcae
11.			fd		bcae
		+1		+1	bcae
	d	-1		-2	bcaef
12.			bcd		aef
				+3	aef
				-1	aefbcd
13.			a		efbcd
		+1			efbcd
14.	a		New Processing		efbcd

NIGHT FOUR

Dream No.	Buffer Contents	Buffer Operations	Manifest Elements	Ltd Store Operations	Ltd Store Address 123456
15.	a		New Processing		efbcd
16.	a		New processing		efbcd
	a	-1		-2	efbcd
17.			aef		bcd
		+2		+1	bcd
	ae	-2			bcdf
18.			ae		bcdf

The manifest elements of the model exhibit a high degree of agreement with the observed data in experiment four. Excluding dreams 9 and 14-16 where new processing is assumed to be taking place; there is exact agreement on twelve of the fourteen dreams(=85.7%). If the degree of accuracy is counted in terms of the number of correct elements then the figure rises to 90%. It could well be argued that the procedure of indicating the number of operations involved in transferring the elements is arbitrary and that by virtue of this there is no

psychological reality to the model. However the number
of such operations postulated to occur prior to each
dream correlated significantly with the lengths of the
obtained dream reports.

$r_{cd}=0.55$, n=17, p<0.05 (log transformed data).

The size of this correlation is similar to that obtained
with the mathematical model proposed in experiment four.
In fact the operations proposed in this computational
model are almost perfectly related to the value of 'I'
in the set theory model ($r_{ci}=0.986$) n=17, p<0.0002.

APPENDIX SEVEN

Instructions for Raters(Experiment Five)

Could you please rate of the dream reports on the given constructs in the manner indicated below.

These constructs were elicited from the person whose dream reports you have been given, in order to discriminate amongst them. Your task is to apply them to these dreams as you think they may hav done.

A.   Give a score of 1-3 if you think the description on the left is the most suitable.

B.   Give a score of 5-7 if you think the description on the right is the most suitable.

C.   If you are unable to decide between the descriptions or if you think that neither is applicable give a score of 4.

D.   Please rate all dreams on each construct before proceeding to the next construct.

Thank you for your help.

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