KEYWORDS: ***Doodle – Palaeoart – Drawing – Scratching – Cognition – Entoptic***

OODLES OF DOODLES? DOODLINGBEHAVIOURANDITSIMPLICATIONS FOR UNDERSTANDING PALAEOARTS

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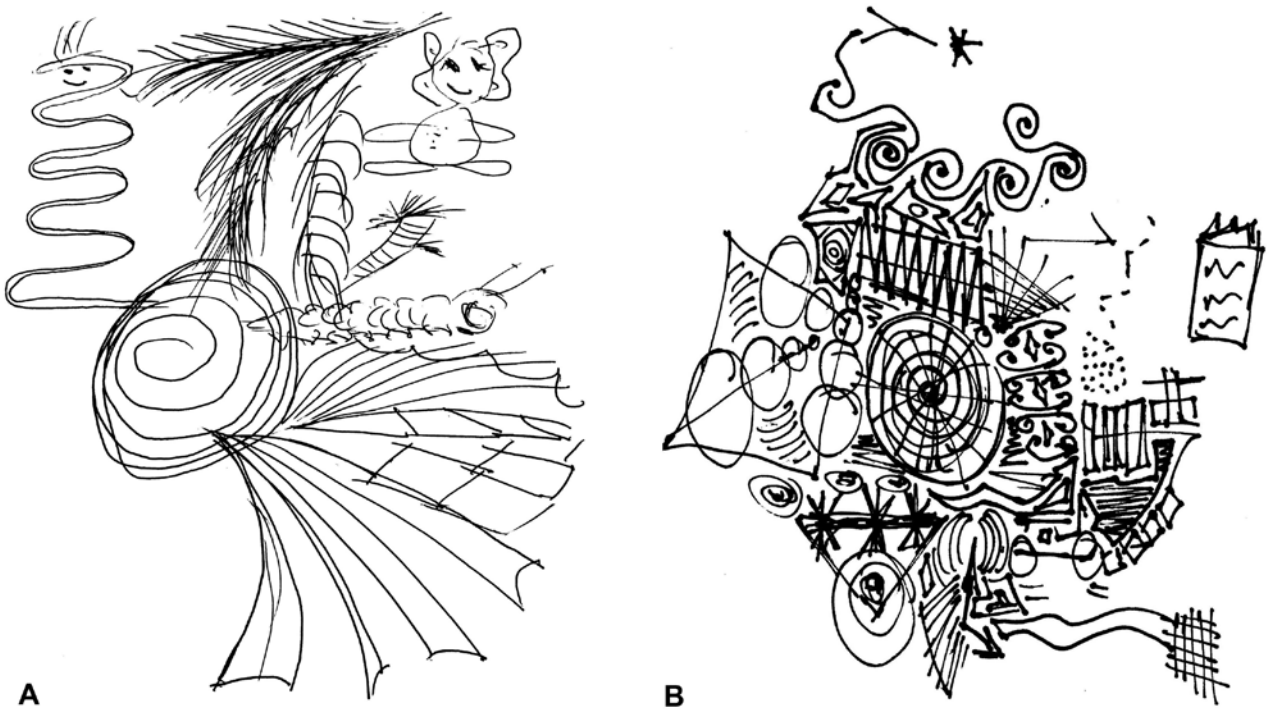
Abstract. This article considers doodling behaviour in modern adults as a lead towards understanding palaeoarts. The comparison might lead to understanding particular characteristics of palaeoart content (such as the relative recurrence of basic forms and the common responses by rock artists to existing markings and geological formations), as well as certain techniques used in its production (such as drawing and scratching). It also provides a sound alternative to theories that imageries arose in altered states of consciousness and/or shamanistic trance.

The idea that rock art is a result of doodling behaviour has appeared in the literature since the late 19th-early 20th century. Breuil (1915, 1952), for example, influentially argued for the evolutionary development of art from a basis in the doodle-like parietal finger flutings of south-western Europe to more complex and sophisticated figures and formal art. The notion continues to have a certain resonance, particularly in non-academia, but somewhat surprisingly the concept remains a largely unexplored hypothesis in palaeoart studies. The notion is generally given only brief passing mentions in rock art literature, usually stating its reputation as a null hypothesis (e.g. Deetz 1964: 506; Hodgson 2006c: 55, 2007: 25–6; Lewis-Williams 1986: 174; Smith 1982: 9). More attention has been devoted to disparaging the theory than seriously exploring its implications in any great detail. Considering the prevalence of doodling today, it is very likely that the behaviour was encountered in the past within those societies that had the means to produce it (i.e. in all those societies that produced graphic 'art'). This article explores the possibility that some palaeoart forms are a result of doodling behaviour, and argues that there is indeed value in the interpretation. Doodles may have a perfectly valid role in the production of palaeoarts. A competent and testable theory of doodling, especially a tenable explanation of its neurological or behavioural origins and functions, might provide a means for understanding particular characteristics of palaeoart content, as well as certain techniques used in its production. It also might provide a sound alternative to theory concerning the depiction of subjective abstract/geometric imageries arising in altered states of consciousness and shamanistic trance (e.g. Lewis-Williams 2002; Lewis-Williams and Dowson 1988).

Bednarik (1990/91: 73, 1994a: 159) has proposed that if the underlying principles responsible for the production of doodles were recognised in large contemporary samples, a comparison could be made to determine whether the same patterns are present in palaeoart. The following article also follows this idea in presenting a large sample of doodles created by contemporary adults and comparing these with the graphic content of palaeoarts. Given good reason to believe they were obtained at relevant times, places, and in relevant circumstances, the underlying principles of doodling behaviour in modern humans, if understood, might explain several characteristics of palaeoarts, including the relative recurrence of basic forms, the nature of drawing and scratching techniques, and the common responses by rock artists to existing rock markings and geological formations.

The nature of doodles

Doodles are the scribbled drawings or markings that are spontaneously produced absent-mindedly, when one's mind is preoccupied with something else rather than concerned solely with the process of drawing itself. The Oxford Dictionary defines doodling simply as 'to scribble or draw, especially



Figures 1A to 1D. *Examples of doodles produced by modern-day adults.*

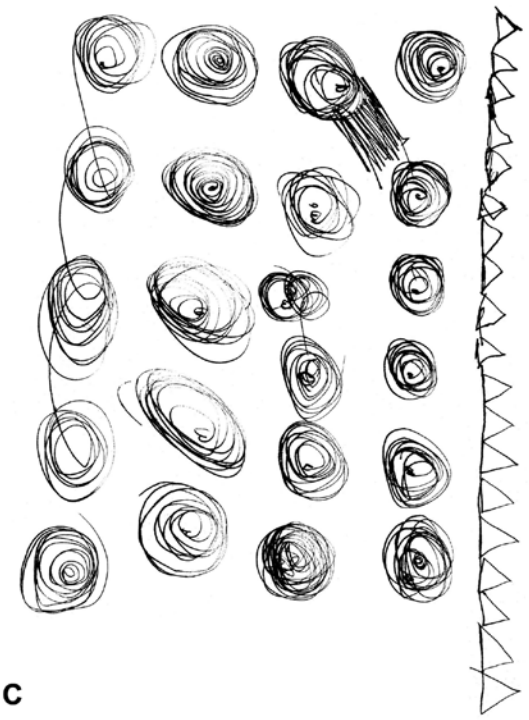
absent-mindedly'. The process of doodling is thus only a partially conscious activity, or at least one that involves varying levels of conscious intent. For the purposes of this study, doodles are understood as a subjective phenomenon involving the subconscious. As such, it may be feasible to explain the behaviour as a result of underlying cognitive universals (Bednarik 1990/91: 73, 1994a: 159). Doodles may be understood as uncensored by the conscious mind, in that they seem to contain 'unconscious' ideas and images comparable to the structured effects produced unconsciously by children in the course of 'automatic, spontaneous, and natural scribbling' (Kellogg 1955: 36).

Today, people create doodles in various situations. For example, during extended telephone conversations, while listening to a lecture, attending a meeting, writing a list, making notes, or on a napkin/serviette during conversation at the end of a meal. They are produced during any moderately engaging mental activity when the means to create markings is available. Doodles take on a variety of forms, from the filling of given spaces on a printed page with simple patterns to more complex drawings and designs. Many people enjoy mindlessly doodling away. There are a number of reasons for the behaviour: it may often be done simply out of boredom; the need for engagement in some form of productive activity while otherwise partially engaged; occupying and working with the hands and eyes as a form of productive fidgeting when forced to sit still and inactive for a period of time; or as an outlet of artistic expression.

Comparable to doodling, the tendency to produce ornamentation is a pan-cultural phenomenon, and the urge to ornament things by humans may also be considered a universal feature of art. The impulse to draw, paint and/or engrave reflects motivations and actions common to all humans. Despite differences in medium, graphic doodling and ornamentation can be seen throughout history, including pre-Historic contexts (e.g. Young 1969) and is a behaviour that is remarkably constant over time (Battles 2004: 107).

Collection of a contemporary sample

A sample of 50 doodles was collected for the purposes of this study (see Fig. 1). Volunteers were individually asked to draw doodles on a blank sheet of A4 paper with pen or pencil for five to 10 minutes while engaged in some form of distracting activity such as a telephone conversation or watching television. Volunteers were selected on the basis of age only, ranging between 18 and 70 years old. This was taken into account because extensive studies concerned with the doodlings of young children and their graphic universals have been conducted in the past (e.g. Kellogg 1955, 1969, 1979; Kellogg et al. 1965; van Sommers 1984). These studies show that the scribbles of children have not yet developed from a basic repertoire, and are produced before a culture-specific style develops. In Western society, children 'learn' and establish a typical set of formal symbols including basic geometric shapes, and objects such as the human face, house, sun, moon and so forth. If the tendency for drawing stops at this stage of development, the range of doodles produced is largely limited to repetitive geometric forms and



basic symbols. A preoccupation with drawing will undoubtedly see the development of more involved patterns and complex symbolism, intricate doodles and complete drawings.

The sample of doodles was analysed in terms of the recurrence of a range of simple abstract and geometric shapes, motifs, designs or patterns, as well as iconic (figurative) elements that are known to exist recurrently in palaeoarts throughout the world (Table 1). These elements include arcs, circles and concentric circles, dot or fleck arrangements, cross-hatching/lattices, multiple straight (parallel) lines, zigzag lines, radial figures, meandering lines, multiple 'waves', combined figures, 'amoebae', spirals, 'fingers'/'fans', anthropomorphous (human or human-like) figures, zoomorphic (animal or animal-like) figures, therianthropic (part human, part animal)/composite figures and organic (plant) forms. The appearance of these elements was counted if appearing on a page of doodles and percentages were then tabulated, so that they could be compared to a sample from palaeoarts. A number of the same or very similar motifs, patterns and themes are found to recur in the graphics created by doodling despite idiosyncratic variation and socio-cultural background. The recurrence of similar motifs is of particular interest and may in turn shed light on the nature and production of non-figurative forms of palaeoart created by humans in the past, where limited or no ethnographic information is available to explain them. In terms of abstract/geometric elements, 70 per cent of the sample was found to contain multiple straight parallel lines, and 68 per cent contained circles or concentric circles. Over 50 per cent contained arcs. Combined figures, meandering lines, radial figures and zigzag lines all appeared in over 35 per cent of the sample. Anthropomorphous forms occurred in 36 per cent of the sample. Perhaps surprisingly, the number of zoomorphic figures was relatively low, as were dot arrangements and other motifs that appear frequently in palaeoarts, which may distinguish these in terms of other means or motivations behind their recurrence.

Motif type	**Percentage of sample**
Multiple straight (parallel) lines	70
Circles and concentric circles	68
Arcs	54
Combined figures	40
Meandering lines	38
Anthropomorphous figures	36
Radial figures	36
Zigzag lines	36
'Fingers'/'fans'	32
Multiple 'waves'	30
Organic (plant) forms	30
Spirals	26
Cross-hatching/lattice	20
'Amoebae'	20
Dot or fleck arrangements	16
Zoomorphic figures	16
Therianthropic/composite figures	4

Table 1. *Results of preliminary analysis of motif occurrence in sample of contemporary doodles.*

Doodling and palaeoarts

Ethnographic data indicate that in some instances, rock art *was* produced as a direct result of doodling behaviour. For example, some rock art of the Helanshan ranges, Ningxia, Inner Mongolia, is reported to have resulted from doodling by individuals who were simply bored (Dematte 2004: 19, 21). Some instances of rock art in Africa are also understood as doodles (Ucko and Rosenfeld 1967: 161). It is likely that doodling behaviour extends into remote antiquity in various forms of palaeoart. It has in fact been suggested that because of the strong resemblance with modern doodling, the phenomena may have their roots in the mark-making abilities of Lower and Middle Palaeolithic hominids (Bednarik 1995: 614).

There are, however, a number of arguments against the hypothesis. Hodgson (2006c: 55, 2007: 25–26) argues that due to the 'precise geometric patterns and obvious symmetry' of early marks, they are not a result of doodling and 'derive from somewhat more than an absent-minded preoccupation'. Similarly, Harrod (2007: 318) argues that the occurrence of repeated shapes and a distinct and limited number of motifs suggest that early markings are more than merely doodles.

In response to these views it is important to note that the generation of a high proportion of a specific range of geometric shapes and patterns is precisely what does result from the production of doodles by a majority of people engaged in another activity with only partial conscious attention directed towards their creation. This is demonstrated by the occurrence of a high percentage of specific geometric forms in the sample collected.

Hodgson (2006c: 55, 2007: 25) further notes that it is important to recognise the fact that a vast majority of early palaeoart was produced by engraving relatively hard surfaces such as rock, bone and ochre, which 'suggests the need for controlled and considered hand-eye coordination, which is not a typical characteristic of doodling'. There are a number of points to consider in response to this argument. Doodling may act as a source of inspiration for some artists, and an unconscious sub-structure may be understood as underlying and activated during creative processes. As Ehrenzweig (1962: 1009) writes, although an artistic composition may usually be produced through a process of deliberate planning and the formulation of a preconceived end result,

> important components of the composition may emerge without any premeditation and even run against the artist's explicit intentions. Yet the artist, if he is inspired, will accept them as integral parts of the artistic structure. Such form elements must be conceded roots in the unconscious mind.

Accidents in artwork that may be used or built on may occur as part of the process of creativity (Maitland 1976: 398) for which unconscious processes, as in doodling, may account.

Rather than produced from a mental template or preconceived idea, doodles may occur spontaneously and unpredictably to the point that their producers 'can almost be likened to spectators of the cumulative effects of their own actions' (van Sommers 1984: 246).

The process of doodling appears to give rise to spontaneous and intuitive forms. Because the mind may be only partially occupied by the process of doodling, resulting marks develop almost automatically. As demonstrated by the sample collected, this does not detract from their similarity in the recurrence of forms and range of motifs produced. The majority of marks created in the process of doodling clearly demonstrate a limited graphic vocabulary and appear to obey some form of discipline in their creation, comparable to the rules of composition that are strongly suggested to be common to humans and other primates (e.g. Clegg 1983). Some are surely dependent on several factors that govern the production of subconscious imageries, including the structuring and functioning of the visual system, and the physical requirements and actions involved in their production. These points are important in the consideration of clearly premeditated artistic production in palaeoarts, which undoubtedly require more time, effort and planning than doodling on a piece of paper.

Returning to Hodgson's argument more directly, the light or superficial marking of hard surfaces such as stone and bone is in fact relatively easy with a sharp implement (enough to create clearly visible markings), and is a process comparable to doodling with a pen or pencil on paper. Light engravings that required little energy and 'skill' were clearly made in habitation contexts in Upper Palaeolithic Europe (Ucko and Rosenfeld 1976: 171). Although engravings on small stone plaquettes are often deep and well-defined, they are also often very lightly engraved, so much so that the markings may be almost invisible except when viewed under the right lighting. Such engraved plaquettes are also often characterised by a mass of lines strongly reminiscent of scribbles or doodles.

Many petroglyphs were also initially scratched or drawn on the rock surface before being executed. It is known, for example, that before producing larger petroglyphs at Parker Point, Dampier, Western Australia, the maker would first draw an outline in chalk or ochre before pecking the design with a sharp stone (Gunn 2007: 39). Superficial markings may have served as an initial activity and template from which a response to create more prominent markings resulted. Although the process of planning a design is generally regarded as sketching (a very conscious and purposeful act), doodles today are known to influence or provide a basis for more developed works of art (Maitland 1976: 402; Menzel 1968; ten Berge 2002). Modern art may include elaborate

instances of doodles, although this is not conveyed in the highly complex and detailed executions of Upper Palaeolithic sites such as Altamira or Lascaux, but only in the Upper Palaeolithic sites that do contain elaborate instances of doodles. The interpretation also does not apply, for example, to instances where a combination of techniques (such as painting and engraving) was employed. Engravings on early portable art objects also commonly exhibit repeated markings (apparently repeated attempts to mark the same lines or approaching an unfound ideal, i.e. 'sketchy'), which may have resulted either from the attempt to define a preconceived idea or from which the final markings may have actually derived. Many palaeoart objects, such as the early engraved ochre piece from Blombos Cave, South Africa, exhibit multiple and repeated markings, only some of which are well defined (Henshilwood et al. 2002). Indeed, it has been suggested by Clottes that the markings on this object may be the result of doodling (see Balter 2002). Though certainly not the case for all portable art objects, considering the relatively small size of this particular artefact and others like it, it is probable that the execution of engravings required a considerable degree of accuracy and hand-eye co-ordination. Apart from engraved portable art objects, however, this sketchy nature is also often found in drawings (and doodles?), including those from the European Palaeolithic and Australia, where secondary marks are made in place of an original (although it may be difficult to distinguish these from emphasis or depiction of movement).

Scratching and dry-pigment drawing techniques (the latter involving the use of relatively soft dry pigment to make marks, distinct from the art that includes pen-and-wash drawings) are both common techniques used in rock art throughout Australia and elsewhere (Gunn 2007). Scratchings, particularly, are found in rockshelters of Australia's interior where the technique appears to relate closely to the simple motif types found in drawings. Faintly scratched petroglyphs occur in larger concentrations at Parker Point, Dampier. Significantly, both scratchings and drawings include 'scribble areas', geometric motifs and irregular sets of lines. Because of the comparable nature of the two techniques, Gunn (2007: 47) has suggested that scratchings are a form of pigment-less drawing: '[s]cratching and dry-pigment drawing are both similar in their application, one with a pointed pigment "crayon", and the other with a pointed implement (either natural or modified)'. More importantly, both techniques have a comparable range of characteristics strongly suggestive of doodling: resultant markings include 'narrow linear elements (either as single-stroke "lines" or areas of multiple-linear "scribble")'; like most petroglyphs and paintings, they are generally produced within a single frame of vision; and they are produced rapidly, suggesting spontaneity in their production compared with other, more time-consuming techniques (Gunn 2007: 48). The evident spontaneity in their production particularly suggests that, rather than 'translated from a mental image' (Gunn 2007: 39), the designs may have been produced 'subconsciously' in the same way as modern-day doodles, i.e. with little conscious effort or attention. Gunn (2007: 47–8) further suggests that the combination of their characteristics suggests that scratching and drawing techniques were employed in a 'more personal art form intended principally for the benefit of the artist or a very limited but immediate audience', and 'provided an outlet for the individual'. The basic assumption for most rock art was that it was produced for a specific purpose, although this may become less acceptable in those cases where it is produced using simple techniques and designs that are generally indistinguishable from modern doodles. Even if it is assumed that all palaeoart was produced for any one reason, it does not preclude occasional works, such as doodling, by individuals who did not concern themselves with a more general art complex (Ucko and Rosenfeld 1967: 170).

That drawings and scratchings 'appear to be complete in themselves' (Gunn 2007: 48) may in fact suggest that, rather than comparable to the sketches of Western art and a basis for more developed designs or formal ceremonial art, doodling behaviour may account solely for their production. Although many sketches are thought to be complete in themselves (particularly a *modello*, produced as a proposal for a larger work and more elaborate than an ordinary sketch), in contrast to doodles, sketches are generally identified as unfinished drawings and are usually depictive, provoking visual experience resembling physical objects represented (Chilvers et al. 1988). This is distinct from a 'study', where representation of a detail is used in a composition and may be highly finished (Chilvers et al. 1988). A majority of doodles are found to contain abstract/geometric motifs and patterning, although there are evidently certain difficulties in distinguishing sketches from doodles by their figurative content.

In terms of engraving or other reduction techniques, it is also clear that the materials employed for the making of markings during the Palaeolithic that remain in the archaeological record are those that have withstood taphonomic processes, and that other more perishable, and more importantly *softer* materials than stone (clay, wood, animal skins etc.), as well as the use of less permanent substances for creating marks (e.g. charcoal) were employed, probably in majority (Bednarik 1994b; Hodgson 2006c: 55, 2007: 25). The production of finger flutings and markings with tools on the soft wall surfaces of limestone caves, or even the use of pigments in painting, further indicates a wide range of suitable means by which to utilise the inherent ability or tendency to create doodles. (This is not to suggest,

of course, that all instances of palaeoart are a result of doodling.)

Painting with fingers or brushes may in fact be less likely to allow for doodling behaviour. The same basic structural images that occur in the scribblings of children are evident in finger painting, easel painting and clay work, although the full range of basic scribbles is not made with the easel brush until after the age of three, attributed to the fact that a brush will usually not hold enough paint to apply in an unbroken manner (Kellogg 1955: 22). This undoubtedly applies to paintings on rock, where a comparatively coarser medium than paper restricts the flow of paint. Wet clay or soft *mondmilch* of cave walls, on the other hand, provide ideal mediums. Because the same basic scribble forms occur in the finger painting and clay work of young children, they may be easily identified in finger flutings known to have been created by children of comparable age (see Sharpe and Van Gelder 2006). With this in mind it is also easier to regard comparable flutings made by adults as a result of doodling.

Symbolic aspects of doodles

Breuil's paradigm concerning doodling undoubtedly had an important influence on rock art research and theories of art origins. Breuil (1952) suggested that parts of animals were discerned by palaeoartists amongst the meandering lines made by the fingers in the soft surfaces of cave walls or by application of clay to rock with the fingers. Although this was discussed by Breuil in relation to art origins, the notion is quite feasible in that attention to (subconsciously produced) accidental marks or doodlings may result in the subsequent conscious enhancement of figurative forms that may be discerned in the marks produced. This was in fact observed on at least one occasion during the collection of the sample of doodles for the study in hand. A mass of lines was initially scribbled by one participant, who subsequently assessed the result of his markings, discerned figurative forms and proceeded to enhance and elaborate on these forms to produce fully recognisable subjects. Similarly, finger flutings, such as those at Cosquer Cave, may form a background to images produced on top of them (Clottes and Courtin 1996), or include the integration of representational images into seemingly random markings, such as those at Pech Merle (Lorblanchet 1992). This is again also reminiscent of Upper Palaeolithic stone plaquettes that commonly feature masses of lines from which figurative forms have been extracted by modern analysts.

Although it is difficult to demonstrate, there are undoubtedly complex symbolic aspects to most instances of palaeoart, as there are in many instances of doodles. It is not the case that a semiotic aspect of palaeoart rules out the hypothesis completely. Representational imagery may clearly be produced as a result of doodling (Bradshaw 2000); doodles vary in complexity from the repetition of single motifs to more complex symbolic depictions as the present analysis of doodles and other studies (e.g. van Sommers 1984: 246) have shown. Doodles carry a vast array of symbols, many of which have specific culturally acquired meaning (for example, any form of religious symbolism), and these may either occur unintentionally in the process of doodling, or may indicate knowledge concerning the specific socio-cultural context to which they belong. Apart from the basic repertoire of simple motifs that may be alternatively interpreted, the contents of doodles do not appear to include the intentional production of symbols that are not known and used within the cultural context in which the doodles are created (Marshack 1979: 274). That *some* palaeoart may have been produced for its own sake (Halverson 1987), or simply as a form of recreation to partake in on a rainy day (Mulvaney 1996), does not mean to suggest that it did not contain complex symbolic meanings for the makers, or bypass the many and varied motivations for rock art production. The fact that graphics are created by doodling does not deny meaningfulness of the imagery, and this differs from the art for art's sake interpretation in that they may acquire or contain meaning even though they may be created purposelessly and absent-mindedly. Like contemporary doodles, simple markings in palaeoarts 'do not initially or necessarily possess but may quickly acquire meanings' (Davis 1986: 197).

A definite relationship often occurs in bodies of rock art between non-figurative and figurative designs and motifs (Anati 1994). These may occur in the same compositions or be used in combination as in patterned-body anthropomorphs, where abstract/geometric patterns have been used to infill the body of human representations (e.g. Sinomis et al. 1994). Similarly, doodles commonly include figurative or non-figurative motifs or combinations of the two (cf. Figs 1a and 1d). This does not provide a strong argument that some forms of rock art were not the result of doodling behaviour, or that this interpretation should not be considered, as some have suggested (e.g. Sharpe et al. 2002: 114–15).

Doodles and the human visual system

Explaining at least some palaeoarts as a result of doodling (or art) provides a compelling alternative interpretation to the popular hypothesis that abstract and geometric forms depict subjective visual imagery or 'entoptic phenomena' (subjective visual imagery generated within the eye) experienced in altered states of consciousness, such as shamanic trance (e.g. Lewis-Williams 2002; Lewis-Williams and Dowson 1988). It is clear from the analysis of recurring forms in the contemporary sample of doodles that comparable elements to those of entoptic form constants occur as a result of doodling behaviour. The basic recurring forms in doodles bear a striking similarity with the

entoptic forms claimed to arise in altered states of consciousness. Straight parallel lines, circles and concentric circles, arcs, radial figures etc., that are characteristic of entoptic phenomena all feature prominently in the sample analysis presented. Elementary geometric forms are therefore found not only in a comparison of entoptic forms with the scribblings of children (cf. Kellogg et al. 1965), but also in comparison with the doodlings of adults.

Coolidge, in an unpublished study (F. Coolidge, pers. comm., October 2007), gathered notebooks from college students from any class from a previous semester. The students were not told of the purpose of the study. Their notebooks were then examined for doodles and any other figures. Coolidge found that the students' doodling behaviour virtually reproduced all levels of entoptic phenomena according to Lewis-Williams (2002), and they also produced human faces and figures, animals, chimera and therianthropic figures. Coolidge concluded that the argument that a particular group of art works in the Upper Palaeolithic were entoptically created by drug-induced altered states of consciousness (e.g. Lewis-Williams 2002) or semi-hallucinatory states of consciousness by means of exercise, starvation or meditation (e.g. Hodgson 2006b) is unnecessarily presumptive and specious. Coolidge proposed that 'mindless' doodling, daydreaming or dream images while asleep were a far more likely source for artistic endeavours of the Upper Palaeolithic as they are cross-cultural, frequent and highly ubiquitous phenomena in virtually all cultures (see also Watson in revision). These findings also strongly support the study in hand in that those who created the doodles were not conscious of the fact they were producing markings for a study, although it cannot be certain whether the marks produced were in fact doodles created during lectures (although it is very likely). They were also subject to the influence of existing marks and produced on variable mediums for which the present study accounted.

Bahn (1988: 217) made the important comment in opposition to the entoptics theory that it would be unlikely that some basic doodle shapes did not appear in Upper Palaeolithic art. It is important to understand in this regard that the graphics produced by doodling may similarly be explained as a result of the human nervous system and the structuring of the visual system. If doodling behaviour is a subjective phenomenon involving the subconscious, then the recurrence of certain forms and basic elements might appear to be the result of underlying universals, if evidence for universality is found. The universality in the form of simple geometric shapes, should it exist, can be explained, for example, by mechanisms common to the primary visual cortex involved in the processing of line and basic motifs (Hodgson 2000a, 2000b: 869, 2006a). The 'neurovisual resonance theory' put forth by Hodgson (2006c), and supported by neuroscientific data, demonstrates the human attraction to certain patterns due to their resonance with the visual system's structuring and the ways perceptual processes operate. It is particularly significant in relation to doodling behaviour that these processes operate at a preconscious level, influencing preferences for certain kinds of markings. Perceptual data concerned with this processing is also incorporated graphically in terms of Gestalt psychology, the principles of which are determined by the visual cortex (Hodgson 2000b: 871). The concept of perceptual grouping, where more strongly emphasised patterns take precedence in perception over weaker ones, is a universal principle of aesthetic experience addressed by neuroaesthetic studies (e.g. Ramachandran and Hirstein 1999). The law of grouping arises from the selected purpose of the visual system in evolution for the detection of signals in noise (such as threatening stimuli in a cluttered scene), or the discovery of interrelated features in the visual field and subsequent binding of those features generally. Vision evolved primarily to defeat camouflage and to detect objects in cluttered scenes, which is essential for survival, and this ability is rewarding in its activation of the limbic system (Ramachandran and Hirstein 1999). The presence of grouping in art or doodles likewise produces an aesthetically pleasing experience by the visual system signalling the limbic system, which gives rise to a pleasant sensation. Latto (1995) and Zeki (1999) have also discussed stimuli such as geometric shapes, blocks of colour, stylised organic forms and patterns of lines, in terms of their ability to excite specialised groups of cells within the visual system, providing aesthetic satisfaction and explaining their intuitive use in art.

Further closely related aspects of human perception account for the appearance of certain forms in doodles and palaeoarts as resulting from underlying psychobiological propensities. This includes the significance of the cross-cultural preference in decorative forms of art for 'variety in unity' or balance between variety in colour, form and organisation. Gombrich (1979) referred to this as 'sense of order', where a manner of regulation exhibits itself in decorative art. This order is achieved by hierarchies of forms, repetition and symmetry. The preference involves the operation of the brain's arousal system (central and autonomic nervous system and reticular arousal system of the lower brain, which creates arousal by processing sensory input), that is also responsible for efficient mental functioning (Berlyne 1960, 1966, 1971). As Smets (1973) has explained, the level of arousal induced is determined by the degree of variety and unity in visual patterns — highly unified patterns with little or no variety result in low levels of arousal, whereas patterns with great variety but little unity result in high levels of arousal. Patterns with moderate degrees of both variety and unity evoke moderate levels of arousal and are found to

be most pleasing to the observer. This is because the moderate level of arousal is where the brain functions and works most efficiently, and where the observer and/or creator 'feels' best. Humans strive for optimal levels of arousal, an important biological trait for survival selected during evolution in helping animals to remain alert and avoid predation (Bednarik 1986a; Hamilton-Smith 1986: 159). Engagement in the activity of doodling produces a pleasurable response and level of arousal that persists with repetition. This explains why some elements are found repeated over and over by the same individual (van Sommers 1984: 245). Repeated lines and geometric shapes are thus particularly appealing to those both creating them and viewing them, because they are an integral feature of the brain (Hodgson 2000b: 4).

As these points stress, abstract forms and motifs are aesthetically pleasing and stimulate the human visual system. They provide an explanation as to why people doodle, why certain forms recur, and why both the activity and results can be enjoyable. Importantly, these concepts also help explain the frequency of motif occurrence found in the sample of doodles collected for this study. Furthermore, the close resemblance of doodles and palaeoarts is fitting with such mark making as an arousal strategy. This does not necessarily suggest a high level of lines and geometric motifs in *all* art (which is clearly not the case for all rock art or other artistic traditions), but that they are more likely to appear unintentionally in the immediacy of doodling behaviour as a result of unconscious processes, as opposed to the various degrees of planning required for the production of formal art. To some extent, the processes underlying doodling behaviour today may thus explain the appearance and recurrence of these forms in palaeoarts.

There are clearly further factors concerning the functioning of the human visual system that account for the recurrence of basic forms both in doodles and palaeoarts (and indeed other artistic traditions) (see, for example, Hodgson 2000a, 2000b, 2003, 2006a, 2006c, 2007). Although doodling can be understood as a subjective, subconscious activity, the extent to which the stimuli or inspiration for doodling is externally derived should also be considered. Doodles may not only reflect an internal state or the structuring of the human visual system, but also an expression of part of a current situation or experience. 'Geometric' motifs that may ultimately derive from the structuring of the visual system may in fact be amalgamated with observations or memories of the natural, physical world, such as natural lines, patterns and forms (Feliks 1998). Doodlings and certain styles of ornamentation often include, for example, organic forms and combinations of geometric and organic forms (ten Berge 2002). The occurrence of stable images in the external world resembling subjective visual imagery would have reinforced these forms of imagery and provided motivation for the imitation of aspects of the physical world (Feliks 1998: 24). Although this applies to all art, the basis of doodling is not found solely in the depiction of external, physical objects as in sketching or representational art produced in this way, but in some instances appears to incorporate external stimuli in combination with eidetic imagery and spontaneous, subjectively derived markings.

Responses to existing marks

Contemporary doodling behaviour is not only observed on previously blank paper, but also as an apparent response to existing marks (such as lines or any printed lettering) on the given medium. This is noted by Bednarik (1990/91: 73, 1994a: 159) as the type of doodles that are most interesting, as they also 'resemble those [strategies] apparent in early art production'. Morris (1962) and Clegg (1983) have also explored the influence of existing marks on the responses of humans and other primates, including experimental observations concerning the placement of markings in relation to existing ones on a given medium. Doodling may be strongly influenced by existing marks, and may include the retracing of letters, filling of spaces with patterns or motifs, or the incorporation of existing marks into a composition. Either a response to lines and/or other printed features on the page or their incorporation into a composition was found in all responses to my request for doodles where blank paper was not used. Similarly in regards to palaeoarts, in addition to the seemingly innate tendency for humans to mark blank surfaces that has been considered as a reason for the appearance of some forms of palaeoart (e.g. Davis 1986: 53; Maynard and Edwards 1971), it is common that a response appears to be evoked by the presence of existing markings, including an impulse to imitate markings made by other animals or natural geomorphological processes (Bednarik 1986b: 44). Apart from finger flutings, the phenomenon is very common in the rock art of the world where 'the images appear to have been prompted by the presence, and cognisance, of such features as particular formations, holes or colour patches' (Bednarik 1986b: 44) or 'fitted to natural rock surfaces of different shapes and sizes and images continuing over edges or around corners or linked to cracks and cavities in different ways' (Bahn 1998: 99). Some of the best-known examples include those in the Upper Palaeolithic art of western Europe in the portrayal of animals — perhaps the most famous being the dotted horses at Pech Merle, where a natural rock feature that closely resembles the head of a horse is used in the animal's portrayal. The response to existing anthropic marks is also seen in the tendency for modern visitors to rock art sites to add their own marks, including additions to existing rock art or new marks of a similar style to those already existing at a site (Meighan 1996: 68; pers. obs.). Similarly, natural features also appear to

have acted as prototypes for many common elements in petroglyphs such as cupules, circles and parallel lines (e.g. Bednarik 1986b: 44–5; Flood 2006).

Davis (1986: 199) notes that '*any* representation anywhere must always accommodate the qualities of its surface' and incorporate irregularities into a representational figure. Seeing marks as 'things' is argued to be an automatic response of the hominin visual system derived from ambiguity or deception in visual perception (Davis 1986, 1987). This was selected during evolution as an unfortunate but necessary correlate to rapid recognition (like our and other beings 'jumping' at unexpected noises or appearances) for its survival value during the Pleistocene in the detection of predators, and thus due to similar visual properties, a significant object (e.g. a potential threat or food source) may be seen where an insignificant one exists (Bednarik 1986a: 202, 2006a; Davis 1986: 201). The same or similar inherent perceptual mechanisms might cause the response to existing marks, explaining its cross-cultural occurrence and appearance in both contemporary doodles and the palaeoarts of the world. A universal principle of aesthetic experience discussed by Ramachandran and Hirstein (1999) is what they have termed 'contrast', defined by the fact that '[c]ells in the retina, lateral geniculate body (a relay station in the brain) and in the visual cortex respond mainly to edges (step changes in luminance) [and other regions of change] but not to homogeneous surface contours' as they are pleasing to the eye. The process is thought to be rewarding in itself because of the allocation of attention: 'Information (in the Shannon sense [that information is everywhere as opposed to the everyday sense, where meaningfulness is the essence of information]) exists mainly in regions of change — e.g. edges — and it makes sense that such regions would, therefore, be more attention grabbing — more 'interesting' — than homogeneous areas' (Ramachandran and Hirstein 1999: 25).

Concluding remarks

Although there are certainly limitations to the theory (there are, for example, very few reports clearly demonstrating ethnographic associations between doodling and rock art), it is feasible to posit that some palaeoart forms occurring in suitable contexts result from doodling behaviour, or that drawing behaviour and doodling behaviour share causes and stimuli, whose investigation may indeed be of value in their investigation and interpretation. Certain aspects of palaeoarts, particularly the recurrence of certain forms and subjects, as well as the nature of particular techniques used in its production (particularly dry pigment drawing and scratching) can be accounted for in light of the hypothesis. The occurrence in doodles of repeated forms that seem to resemble alleged 'entoptics' also provides a sound alternative to theory concerned with the depiction of subjective abstract/geometric imageries arising in altered states of consciousness and shamanistic trance. The underlying principles responsible for the production of doodles and palaeoart are comparable to the extent that the same cognitive/perceptual mechanisms are able to account for the appearance of the same or similar forms in both phenomena. The underlying principles of doodling behaviour in modern humans are thus able to explain several defining characteristics of palaeoarts. Further research may aim at addressing the issues and problems arising from this preliminary investigation and help develop the hypothesis further.

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COMMENTS

Ancient brushstrokes

By JOHN L. BRADSHAW

The central theme of Watson's hypothesis is that much, though probably not all, of palaeoart has its *fons et origo* in a universal human urge to decorate or ornament an encountered *tabula rasa*, or blank surface. The product he identifies as doodling, acknowledging however that this is by no means an entirely novel or original hypothesis. He supports the argument with interesting additional observations, noting also that the hypothesis has perhaps been rather too summarily and prematurely rejected by other scholars.

In general, I find the tenor and main points of his argument convincing, though some aspects I disagree with, and other points might deserve further exploration and expansion.

Few human behaviours are usually amenable to unifactorial explanations. Watson's empirical investi-

gation, moreover, into controlled doodling suffers from a serious flaw – the very act of control itself. Giving someone a writing instrument and sheet of paper, and requesting a doodle to order, is entirely different from the unplanned, spontaneous, free-wheeling actions commonly occurring during some other engaging activity. Indeed, this non-naturalistic procedure clearly negates his previous premise of doodling as an automatic, spontaneous, mindless, unconscious freewheeling. This observation itself leads me to see naturalistic doodling as akin to the neurologists' *utilisation behaviour.* At a clinical level, with bilateral medial-frontal damage, and consequent impairment of the central executive and supervisory system, a patient will experience a compulsive urge (which is quite inappropriate, in terms of a current social context) to take up and use any objects to hand. Thus he or she in the clinical examiner's office may pick up the latter's pen and pad, and start drawing — clearly a contextually inappropriate behaviour (see e.g. Della Sala 2005; Frith et al. 2000).

As so often is the case, when disturbed or preoccupied, a normal healthy individual may exhibit mild subclinical forms of behaviour resembling, in greatly attenuated form, those found in pathology. I see doodling as being a classic example of an otherwise perfectly normal form of utilisation behaviour. I do not see it as necessarily reflecting, in a neo-Freudian fashion, as perhaps suggested by Watson, unconscious ideas, images or urges uncensored by the conscious mind, and somehow providing access to the subconscious. That does not, however, in any way detract from the general thesis that *some* forms of palaeoart were perhaps sometimes occasioned by a form of 'doodling on a rainy day'. Nevertheless, clearly other forms of such art were performed for quite different purposes — sacred, cultural, tribal emblems, mythological ... perhaps even with the emphasis more on the act itself than upon any enduring product (Bradshaw 1997). And differential taphonomic preservation of different materials or processes, in such varying contexts, may bias the latter-day availability of what is left for us nowadays.

I agree with Watson that all such explanatory approaches are greatly to be preferred to the intrinsically implausible accounts in terms of altered states of consciousness and shamanistic trances (Lewis-Williams 2002).

Watson, like many before him, seeks to analyse doodles (of whatever provenance) in terms of certain basic elemental forms or components — contours (linear, curvilinear, wavy meanders, parallel, diverging, intersecting), circles, dot and fleck arrangements, cross-hatching and lattices, zigzags ... . Note however that the same constraints apply in the acts both of producing and of perceiving such material, and indeed also in devising artificial pattern-recognising algorithms. The primate visual system is organised so as to extract areas of high information — typically regions of contrast or transition between other steady-state areas — and thus bounded by real or virtual contours. Such areas of high spatial frequencies are the most informative. Artificial pattern recognisers are similarly configured. It is therefore hardly surprising that non-representational markings should be rich in such 'perceptual primitives', and indeed that many representations themselves can be broken down and characterised in similar fashion. It is nothing to do with altered states of conscious, and the 'utilisation behaviour' of doodling (on paper or ancient rock surfaces) is likely to be particularly rich in such patterns.

As an aside, I remember as a very young child in England standing by the school bus stop, with a coin held between forefinger and thumb, grinding with my friends into the soft sandstone wall. We produced patterns of round, shallow holes indistinguishable from the cupules often hailed as a form of intentional, ritual palaeo-marking. We did it simply because we enjoyed the *action,* not because we liked the end product, or felt it had some particular significance.

I disagree with Hodgson (2006c) that the precise geometric patterns and obvious symmetry of many early marks thereby differentiates them from doodled patterns. Surely much modern doodling is often structured and symmetrical. However, Hodgson's argument, that the relative difficulty of engraving marks in a hard surface suggests deliberate intent (unlike doodles), is less easy to refute. Finally, the incorporation of naturally-occurring features in a surface (a flaw, blemish, irregularity ...) into the rendition is equally possible, even plausible, whether it is a simple doodle, or a sacred or mythological representation.

While William of Occam's principle, *hypotheses non sunt multiplicandae praeter necessitatem,* is generally a good guide to understanding processes, apparently simple human actions may in fact have more than one *fons et origo,* and not necessarily only on different occasions or in different circumstances

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On 'Oodles of doodles' by B. Watson

By J. B. DERĘGOWSKI

This is an interesting paper concerning the significance of doodles, which clearly are *sui generis,* records of human cognitive functioning, and therefore

like all such records worthy of examination, and since doodles may be present in rock art, it is of importance to students of rock art. But doodles are, it would appear, very elusive, indeed so elusive that the concept of a doodle is obscured rather than illuminated by the examples given.

The definition adopted by the author is pellucid: doodles are 'drawings or markings produced spontaneously and absent-mindedly'. Since the definition does not specify the nature of the markings, whether they are representations of objects, geometrical patterns or other devices, the nature of markings on, say, a rock face, cannot be used to decide whether a particular design is or is not a doodle. The difficulty of deciding which markings *are* doodles, and therefore constitute material evidence for discussion of doodles and doodling, is thus formidable.

The author thinks that children's scribblings can be thought of as doodles. This is questionable; children do not appear to scribble absent-mindedly. On the contrary, they appear to pay much attention when engaged in acts of drawing/doodling to the task in hand. Their scribblings are not therefore doodles in terms of the adopted definition.

The same can be said about adult doodles described by the author. Unfortunately, the experimental report presented is very terse, but it would appear that the subjects were *asked to draw*. Their responses were not therefore *spontaneous.* They also, one presumes, had to keep an eye on the time and this questions the absent-mindedness of the performance. Nor does the study by Coolidge, which is quoted, address the problem adequately. It seems almost certain that the notebooks contained some doodles (as defined by the author); it is, however, difficult to conceive how Coolidge could decide which of the scribblings facing him were doodles and which were not.

This absence of clear, unquestionable empirical evidence weakens the theoretical, meticulously documented discussion of various circumstances in which doodles may be found and of the possible origins of doodling.

That doodles do exist few would deny, for general individual experience speaks for them, but their exact role in the realm of drawing cannot be identified if they cannot be identified with certainty. Only once this is done will it be possible to identify their role in cognition and in rock art.

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The intentional object of doodling

By LIVIO DOBREZ

Ben Watson's paper raises two questions: 'how best to define doodling?' and 'did palaeoartists doodle?' With regard to the second question, Watson's claim appears sufficiently modest to incline you not to disagree: *some* palaeoimages are *likely* to be doodles. Watson offers a contemporary doodling sample — which 'looks like' examples of palaeoart. Therefore some palaeoart very likely represents a case of doodling. He also puts forward a neurological/psychological explanation for the images under discussion: they suit brain structures and operations and so constitute their own neuroaesthetic reward. One outcome of this explanation being that, with the help of Occam's Razor, it sidelines the shaman-trance line on palaeoart images.

Let us pass over problems inherent in comparing a defined modern doodle sample with a palaeo-sample which is of necessity vague. The difficulty is not merely a practical one, viz. (assuming an adequate modern sample), that of obtaining a valid palaeo-sample. Rather it has to do with the logical starting point, the definition of doodling. Watson is clear on this definition: it relates to a certain kind of activity in a certain type of situation. Doodling is absent-mindedly marking while you are otherwise engaged and it is done for reasons of boredom, displaced activity and so on. I accept this behavioural/situational definition but wish to rephrase it in philosophical terms. Though Watson does not strike me as inclined to psychoanalysis, his references to unconscious motivation and to Ehrenzweig (1962) certainly call up the ghost of Freud. We can jettison this sort of psychological baggage by using the term 'intention' not in the everyday volitional sense but in the Husserlian phenomenological sense in which we speak of an intentional object as an object of our attention. In this terminology, when we make a mark we normally focus attention on it, i.e. we make it our intentional object. When we doodle, on the other hand, intentionality is only loosely attached to this mark; its focus is elsewhere, on another object. Thus a doodle is not a properly constituted intentional object; it remains fuzzy or indeterminate. So much for doodle content. With regard to doodling activity, we may think of it less in terms of degrees of conscious/unconscious motivation than in terms of acting 'aimlessly' or 'distractedly', i.e. without determinate goal. Of course to say that an act is aimless is not to imply it is without meaning. It may mean any number of things. So far I have no disagreement with Watson. It is just that neutrally descriptive philosophical language may help keep our eye on the essential definition of doodling as inattentive activity. Unconscious motivation is not limited to doodling, which is why Menzel (1968) slips easily from discussion of doodling

to discussion of art. Deeply influenced by Freud, the Surrealists promoted André Breton's idea of 'psychic automatism' — its celebrated example being the automatic writing experiment which resulted in the sentence 'The exquisite corpse will drink new wine'. But automatic composition, verbal or visual, is not doodling, though there is a relationship — as there is with preliminary sketching and also ornamentation. Doodling distinguishes itself from art (however subliminally generated) in that it comes about as a by-product of something else, that something else being the actual intentional object at the time.

While nothing I have said so far contradicts Watson's argument, I think there is a problem with it and that is the fact that it runs together doodling defined as an activity and doodling defined in terms of content, i.e. what is depicted. But the second definition of doodling is untenable because a doodle has no determinate features, that is, it can have *any* features (lines, circles, faces etc.). In short, any content may constitute a doodle. Watson, however, implicitly assumes that there are formal markers for doodles, i.e. that you can tell a doodle from the way it looks. This cannot be the case. In some people's minds Jackson Pollock's *Blue poles* may qualify as a doodle — and in fact it has been said that Pollock painted as it were automatically. Indeed he did so not a little in the spirit of the Surrealists, some of whom had by his day made their way to the United States. But of course he painted rather than doodled because his attention was entirely focused on his action over the canvas (hence 'action painting', 'gestural abstraction' etc.). If the image was not made according to a predetermined template, it was nonetheless not aimless. In short, *Blue poles* may (to some) 'look like' a doodle, but it is not a doodle. In a readily accessible location, palaeo finger markings might indeed be doodles. Identical markings in a high location requiring a makeshift ladder for access (Clottes and Courtin 1996: 61) cannot be doodles, since nobody climbs a ladder in order to doodle. Thus both recent and palaeo-marks which might be judged to 'look like' doodles may or may not be doodles. This is because the proper definition of doodling cannot be in terms of formal content but must be in terms of an activity. In other words, not what the result looks like but the state of mind in which it was done.

Watson knows this, which is why his argument shifts from doodling to art (the sketch, ornamentation) and back again. He knows that, *formally* speaking, what he says about doodling applies equally to art. The argument, at its most modest, stating that 'modern doodles (which we *know* to be doodles) look like palaeo-images which may or may not be doodles'. But then again, he glosses over his knowing it. The formal resemblance argument emphatically hints at less modest conclusions, viz., that some palaeo-images are *likely* candidates for doodles. This is why Watson lays considerable stress on 'abstract' markings. Now leaving aside the question as to whether or not the modern figurative/abstract binary is applicable to palaeoart (where, in any case, our term 'abstract' may indicate no more than 'figure unknown'), the difficulty is that *either* abstract *or* figurative images may be doodles — or not. In Watson's own modern sample, some doodles are figurative, some not. It is a difficulty analogous to the one we encounter in judging what is art and what is doodle. You cannot assume, as Watson does, that an 'abstract' mark is *more* likely to be a doodle.

The issue is concisely put by saying that Watson runs together two separate arguments, viz., (1) that palaeoartists doodled and (2) that some palaeo-images 'look like' doodles. The first proposition may well be true; the second cannot be used to support it because those palaeo-images which 'look like' doodles may or may not be doodles — by Watson's own sound definition of doodling as an activity. Now the neuroexplanation addresses (2), but fails to advance the argument, since it applies to images in general and not to doodles in particular. It does not address (1) at all. The brain may be predisposed towards certain forms and reward itself for generating them. But that mechanism comes into play with attentive as well as inattentive generating of those forms. Presumably it comes into play with 'abstract' as well as 'figurative' versions of them (assuming we allow what is a problematical distinction). Thus even if you show there are neurouniversals, something I am very willing to accept, you cannot term a particular example of modern or palaeo-marking a doodle with any certainty — unless you just happen to know it *is* a doodle. The presence of images which recur — doubtless with good reason — is not sufficient evidence for it. Where palaeoart is concerned, the best you can say is that its makers may sometimes have doodled. Which is all Watson claims — while simultaneously and on false logic attempting to give much stronger force to his claim.

In the end, given that the formal resemblance argument cannot succeed (and that Watson's other argument, the one from technique, comes up against comparable difficulties) we are returned to the question: did our remote ancestors doodle absent-mindedly? Or is doodling a culture-specific activity and at least one of its psychological contexts — boredom — a relatively modern phenomenon? Perusing another of Watson's sources (Young 1969), it strikes me that a readiness to conflate Gordion's graffiti with doodles may be symptomatic of a larger temptation to 'demythologise' ancient images by reading them in modern terms — as, for example, less exclusively religious or less serious than is often supposed, in short as secular or playful or as having their origin in something like art for art's sake. Now secularism is emphatically a recent phenomenon, as is art for its own sake. At the same time there is no evident reason to deny our ancestors aesthetic sensibility or playfulness or a category of cultural

production akin to what the modern Wangkangurru call 'rubbish' songs. But any argument for that has to be kept distinct from the claim for the antiquity of doodles. Watson makes such a claim and I am very open to it, though his case for it is flawed.

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The fine art of doodling

By PAUL FAULSTICH

The strength of Ben Watson's paper lies in its scholarly revisit of a persistent popular perspective on rock art. What I offer in this response are not scientific conclusions, but impressions about the nature and meaning of rock art and doodles.

In contrast to positivist approaches that stress quantification and rationalisation, Watson's interpretive approach utilises intuition and experiential deductions to 'get back' to the meaning of the data of consciousness. Whereas positivism deals with the knowledge of facts, Watson is concerned with the evocation of essences (essence in this case referring to the inherent, unchanging nature of phenomena, as distinguished from their attributes, existence or meaning). Although scientific analyses of the positivist kind have proven keenly fruitful, a qualitative approach can yield complementary insights into the nature of human experience. Compelling symbols direct the perceptive archaeologist to look at the world as constructed by the minds of the makers. Comprehending the symbolic structure of artefacts necessitates re-creation; through creative interpretations we can relive, perhaps, the act of creation, and it is this that I believe Watson is attempting.

Watson's 'testable theory of doodling', however, fails to compare 'like' expressions. Can 21st century urban doodles really be transferred to Palaeolithic expressions? If so, this would suggest that doodle motifs are somehow encoded in human DNA; that is, they are largely biological rather than cultural. Watson's analysis, however, does not shed light on the relationship between biological and cultural factors in the 'underlying principles responsible for the production of doodles'. How much of doodling behaviour is genetically encoded, and how much is culturally informed? The present analysis does not help discern this variation, which seems critical to a cross-cultural theory of doodling behaviour. Hence, even though the same patterns might be evident in both contemporary (Western) doodles and Palaeolithic rock art, the context, motivation and inspiration might be — and probably are — vastly different. Paul Klee's (1879–1940) deceptively simple paintings, for example, should not be compared with Palaeolithic art, but with 20th century American art culture. Likewise, it is problematic to attempt to extract meaning from Palaeolithic art by analysing contemporary doodles in the lecture notebooks of university students. That does not mean, though, that it should not be done. But 'underlying cognitive universals' are not revealed through the doodles presented in Watson's sample, wherein kitty cats, flowerpots and The Star of David are illustrated.

The distinction between doodles (spontaneously produced absent-mindedly, when one's mind is preoccupied with something else rather than concerned solely with the process of drawing itself) and images that emerge out of trance states is at best ambiguous. Doodling, then, cannot be conjured up through the type of experiment conducted wherein participants are asked to doodle and are then (purportedly) distracted. This directive makes the marking process overly conscious and thus unreliable, and doodles produced through this process certainly are censored through the conscious mind. Plus, cultural and ethnic variations are not considered or tested for.

Meanings, as we are used to thinking of them, are culturally specific and develop within historical frameworks. A different and more primary level of meaning also exists, arising directly out of perceptual and cognitive associations. This primary meaning is innate and biological in nature rather than reflective and cultural. Cultural meanings on the other hand, are secondary levels of meaning, which emerge from initial cognitive associations. Our ability to interpret them depends upon our knowledge of the structure and content of the symbolic system of which they are part. At this stage, to search for the cultural meanings of Pleistocene markings would be presumptuous.

Could it be that the relative recurrence of basic doodle forms is biological? It seems plausible to me that doodles may possibly be subconsciously informed by biological — perhaps even entopic — phenomena. Hence, doodles and entopic phenomena are not mutually exclusive, as Watson suggests. Indeed, entopics can be stimulated through the exact 'absent-minded' state that Watson attributes to doodling. Doodles are not independent externalisations, but emerged out of cognitive responses to perceptual (but not necessarily visual) stimuli. Perhaps doodles can be viewed as providing a nexus between what is concrete (the external world) and what is abstract (the human condition). Petroglyphs and pictograms, as I understand them, are artefacts of neither pure art nor pure science. Likewise, to make such a sharp distinction between 'absent-mindedness' and 'altered states of consciousness' may be unduly Cartesian, and a more nuanced distinction might be worth

exploring.

In my estimation, it is a truism that 'some palaeoart forms are a result of doodling behaviour', especially if one considers idle markings in dirt and sand as falling within the realm of art. Contrarily, Watson is very catholic with various suppositions, such as his remark that 'many petroglyphs were also initially scratched or drawn on the rock surface before being executed', followed by one singular example. This is indicative of one of my concerns; most of the theoretical posturings of this paper are insufficiently substantiated.

So, while much rock art may have been *informed* by doodles, their *meanings* may be much more cultural, complex and mediated. When is a doodle not a doodle? Perhaps a motif ceases to be 'merely' a doodle when it takes on specific cultural symbolism. For example, the U-shaped symbols (not doodles) common in Central Desert (Australian) Aboriginal art, both contemporary and pre-settler, is elementary in form but complex in meaning. Symbols place emphasis on the relational qualities of an object, rather than its outward form. Among Warlpiri peoples of central Australia, for example, a U-shaped motif often represents people or mythological ancestors. While this shape does not look like a human (to me), it iconically signifies a person because it resembles the imprint of a person sitting cross-legged on sand. Hence, people are depicted by the mark left where the human form intersects the earth. This is not inconsequential, for it demonstrates the critical ecological — that is relational — thinking that connects people with the land. Through this symbolism, Warlpiri assert that there is no clear separation between who we are and where we are. Ethnographic analogy suggests that the U-shaped motifs common in Central Desert rock art are expressive of this intimacy, which extends a simple form into a meaningful symbol.

Likewise, let us consider the simple doodle-like forms of lines and circles. The visual style of Warlpiri art mimics the narrative style of Warlpiri myth. In myth, Dreaming stories are recounted as the Ancestors' travel through the country. Warlpiri paintings depict these travels and the sites associated with them (I have seen Warlpiri paintings remarkably similar in design — but not intent — to the doodles of Figure 1C). The narrative style is evident in the interrelated circles and lines that are so prevalent in Warlpiri paintings. The circle/line composition is widely used to illustrate the journeys of Ancestral Beings and the places that they create; the sites represented by circles, the paths that connect the sites being represented by lines. This site/path structure is a visual device that graphically maps the Dreaming. In Warlpiri art, circles and connectors are visual models of things in the world. The line motif reflects Warlpiri mobility and the emphasis on movement across the country. It illustrates travels through the landscape in determined and knowledgeable ways, linking sites in distinct paths. Lines, and other less direct connectors, are employed by Warlpiri to depict the tracks of Ancestral Beings. In this sense they are iconic. Conversely, circles are used to depict places. Initially this may seem problematic if we are to think of Warlpiri maps as essentially iconic, for most places do not really *look* like circles. However, major campsites and sacred places are usually associated with water supplies, caves or trees. These objects are basically circular in form at the point where they intersect the earth. It may be through this organic connection that sites came to be represented as circular forms. The circle may have *emerged* as a doodle, evolved to *depict* a waterhole, and *denotes* broader social and mythological aspects of the site.

Experience is the stuff through which symbols emerge. A symbol is a construction of reality, a synthesis that brings experience into a synergistic relationship with our ways of being in the world. Original thought burgeons through the exploration of symbols. Perhaps doodles are the initial construction of phenomena, which allows for the subsequent creation and organisation of meaning. They are more fundamental than culturally-specific symbols, which entail metaphorical constructions. Primary symbols consist not simply of things, but of experiential insights that bring congruence and meaning to existence. Thus, experience may be transformed into symbol.

Homo sapiens are equipped with an acute capacity for pattern recognition and discrimination. This capacity is transferred to artistic behaviour through graphic externalisations. Symboling is a process, not simply of production, but of projection, interpretation and absorption. Symbols consist not just of cultural codes to be deciphered, but of latent perceptions, emotions, and experiences to be discovered. Symbols are rich concepts through which the mind synthesises many particulars into single expressions. They draw us into looking at the world with fresh insight and they succeed when they expand reality with a deeper sense of rightness. Through the interpretation of a symbolic work, new associations are opened up which affect the aesthetic and cognitive realms of the viewer. Doodling may be critical in activating cognitive processes through which new concepts are developed and synthesised, but to suggest that rock arts are a direct manifestation of doodling behaviours remains unsubstantiated (and, in my opinion, unlikely).

Among its other functions, perception acts as a filter, screening out unnecessary 'noise' from the world. As a species, *Homo sapiens* can make sense of the universe only by simplifying its unfathomable expanse and complexity into a finite system of similitudes, thereby altering not so much the environment, but our sense-making capabilities of perception. Symbolic expressions emerge from human cognition and perception, which are keyed to the physical environment. Doodles have preceded these 'symbols

in consciousness'. Meaning — as distinct from intent — may not have existed prior to the act of externalising; it may have emerged through the ensuing reflective process. Through this discursive process, relationships unfold and new meanings are created. Being semiotic, doodles, graphic signs and symbols are mechanisms through which new combinations of conceptual order may be created and reflected upon. Experience moves from sensory and spontaneous (doodling) to rational and reflective (symboling), involving mental activity, which is integral to the process of human knowledge. Between perception and fully abstract concepts (cognition) there is a continuum along which different types of conceptualisations, with varying degrees of abstraction, can be found. In this way, it is worth attending to the doodle, and I commend Watson on diving into this contested terrain.

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From doodles to semiosis

By JAMES HARROD

Watson has made an important contribution of evidence for the hypothesis that neurological 'form constants' provide a basis for the evolution of Palaeolithic marking traditions.

Knoll and Kugler (1959) used temporal stimulation to elicit a 'spectrum of subjective abstract light patterns' for 24 test individuals (50+ depictions). Reviewing this and subsequent studies, including 'phosphenes' produced by hallucinogenic drugs, Kellogg, Knoll and Kugler (1965) group 520 phosphene drawings by 313 subjects into fifteen 'phosphene form groups' and also argue that these correlate to typical children's scribbles ('20 basic scribbles and 6 diagrams') and may also correlate to images in rock art. They provide a table showing frequencies of these fifteen 'form constants' among 806 scribbles of one subject on multiple occasions. Watson has now extended these findings, providing a new data set for adult 'doodles' based on a 'sample of 50 doodles' and suggests there are similarities between these and the Kellogg et al. list of fifteen phosphene motifs as well as similarities to Palaeolithic marking motifs.

The following table (Table 1) summarises the three data sets and suggests matches to Later Acheulian marking motifs (Later Acheulian period, c. 700 000 to 200 000 BP). I derive this eightfold classification of motifs (Harrod 2007, 2004a, and see Feliks 2007 analysis of 'fan' motif) in reviewing current evidence for Later Acheulian marking motifs (top to bottom, Table 1), arcs (Bilzingsleben); CLM or 'fan' (Bilzingsleben, Stránská Skála, inclusion in Swanscombe biface, inclusion in West Tofts biface); meander (Bhimbetka); iterative strokes (twice at Bilzingsleben, Port-Launay en Ecouflant); cupule (Bhimbetka); 'shape of space' (twice at Bilzingsleben, double rectangle and D-shape); lattice ('tree' lattice inclusion in La Grotte de l'Observatoire biface; three examples apparently engraved net-like lattice, Asselt, Beegden NL, Pampau, GR); and aggregate combination of motifs (Bilzingsleben).

Adding in the Watson data set highlights that there are definite similarities between some phosphenes, doodles and Later Acheulian marking motifs, but also some interesting differences that need to be taken into any account. For instance, the Later Acheulian quadrangular 'shape of space' or 'container' motif is very rare in child scribbles and phosphenes and does not appear among the Watson adult doodle categories. Is this a categorisation issue or does it reflect something about the uniqueness of the Later Acheulian motif?

While the radial (star) motif is one of the most frequent phosphenes — second most frequent in Kellogg et al. (1965) and most frequent in Knoll and Kugler (1959) — there is no known example of an incised star radiating from a centre in Later Acheulian marks, unless we count the 'fan' or 'convergent lines motif', although in all known occurrences the source or centre of the radiance is not incised but resides in a kind of imaginal or virtual reality, invisible and at a distance from the incised object itself (see Feliks 2007). In other words, the Later Acheulian marking motif is of a higher order of conscious selectivity and complexity than any doodle or phosphene.

How does the Later Acheulian cupule motif match the list of adult doodles or phosphene drawings? They are neither circles nor mere iterations of dots or small circles. Rather, they seem to be some kind of aggregate or combination of circle and multiple dots motifs, and this indicates a higher order of complexity and conscious reflection, one at least comparable, for example, to the Bilzingsleben engraving that aggregates rhomboid within rhomboid cross cut repetitively by various kinds of stroke marks. Are we to conclude that the simple circle motif, which is the second most frequent in the Watson doodle count and the most frequent in the Knoll and Kugler (1959) phosphene count, does not occur in Later Acheulian marks? If so, are we to conclude that the Later Acheulian marking motifs are of a higher order of conscious selection and manipulation than adult doodles and phosphenes?

Considering the three data sets in our table, the Later Acheulian marking motifs seem more strongly correlated to adult doodles than phosphenes. Is this difference statistically significant? If so, what does this imply?

In order to further our understanding of the

Phosphene Form Groups			Phos	Scrb	Dood	**Later Acheulian Motifs**
1	Arc, crescent		18%	1%	54%	Arc
2	Radial, star		14%	3%	36%	Divergent lines motif
3	Wave (line or multiple)		13%	18%	38% (30%)	Undulating line
4	Lines		11%	4%	70%	Stroke marks
5	Combined figure		10%	2%	40%	Combination of motifs
6	Circle, hexagon		8%	22%	68%	Cupules
7	Multiple fig. (dots, points)		6%	19%	16%	
8	Odd figure		5%	13%	20%	
9	Quadrangle		3%	2%		Shape of space
10	Spiral		3%	8%	26%	
11	'Pole'		3%	>1%		Divergent lines motif
12	Lattice		2%	5%	20%	Lattices
13	Triangle		1%	>1%		
14	Fingers		1%	>1%	32%	
15	'Cherries'		<1%	1%		
Anthropomorph					36%	
Zigzag					36%	
Organic (plant) forms					30%	
Zoomorphic					16%	
Therianthropic composite					4%	

Note 1: Phosphene form groups according to Kellogg et al. (1965). *Note 2*: Phos = adult drawings of phosphenes, % by type, Kellogg et al. (1965). *Note 3*: Scrb = child scribbles, % by type, Kellogg et al. (1965). *Note 4*: Dood = adult doodles, '% of sample' by type, Watson (2007) (percentages not directly comparable to Kellogg et al. since latter determine frequencies from total doodles for all individuals). *Note 5*: Identification of eight basic Later Acheulian marking motifs (Harrod 2007, 2004a). *Note 6*: Knoll and Kugler (1959) present a fifth data set, a table of some 50 drawings of phosphenes by 30 subjects. By my count, this table gives in rank order, star-like, radial forms (15, 30%); circular or hexagonal forms (7, 14%); crescents (~7, 14%) [note that these are 2-D crescent objects, like lunar crescents or half-moons, and not simply linear arcs]; stroke lines (6, 12%); waves or wavy lines (4, 8%); flickering light (4); repetitive dots (2, 4%); unclassifiable (4). I have added (1959) category names to the (1965) category names, where former seem to me to add more clarity.

Table 1.

correlations, both positive and negative, between phosphenes, child scribbles, adult doodles and extent examples of Palaeolithic marking motifs, especially Later Acheulian, it would seem that we need a rigorous statistical analysis of the correlations between the frequency distributions in these data sets, using both power analyses and tests of statistical significance. (Unfortunately, it seems, the method of counting for the new Watson data set frequency distribution is not directly comparable to those for the phosphene and child scribble frequency distributions and it might be helpful to re-analyse the data set to enable such a comparison.)

I think there is a second aspect of the role of phosphenes and doodles in the evolution of semiotic marks that needs more refined examination, namely the relative role of 'nature' versus 'culture' in the phenomena under investigation. For instance, a subject's drawing of phosphenes is a second-order act of representation, and thus not necessarily to be labelled as 'natural', 'unconscious', 'automatic' or even 'archetypal'.

Consider that Bressloff et al. (2002), following Klüver (1966), reduce geometric visual hallucinations into four groups of 'form constants, (1) tunnels and funnels, (2) spirals, (3) lattices, including honeycombs and triangles, and (4) cobwebs, all of which contain repeated geometric structures' (Bressloff et al. 2002: 474). These they demonstrate mathematically represent algorithmic 'shift-twists' in Euclidean symmetry associated with visual cortex area V1. In this light, subjects' depictions of phosphenes in Knoll and Kugler (1959) appear to be selective representations of fragmentary parts of Klüver's four basic V1 form

constants. What degree of conscious or cultural selection is involved in a subject's drawings? To what degree does the sensorimotor gestural system mediate the fragments of Klüver form constants drawn by subjects? To what degree is this the case for Later Acheulian marking motifs? This needs future research.

With respect to this discussion I would like to reiterate a point, which I have made elsewhere (Harrod 2007, 2004a), that a critical factor in the evolution of human symbol-making and the associated conceptual abilities of the human mind is the intentional pairing of marking motifs that have oppositional characteristics, what linguists call 'differential features'. Examples seem first to appear in the Later Acheulian, such as the Bhimbetka meander and cupule, Stránská Skala divergent and convergent lines, and the lattice inclusion in a La Grotte de l'Observatoire biface. Later Acheulian differential features appear to include (1) point versus line; (2) convergence versus divergence; (3) recursive order versus sequential order; and (4) infill versus container. It is because of these differential features that the marking motifs have an inherent capacity to express semantic meaning and we contemporary hominins can attempt to decode them. Later Acheulian markings appear to manipulate and reconfigure precursor doodle and phosphene forms in a quite conscious and selective manner. This technique of 'semiotic' pairings appears to become progressively more frequent in the Middle Palaeolithic and into the Upper Palaeolithic. In the case of the European Upper Palaeolithic geometric signs we witness the innovation of abstract signs that no longer appear in the catalogue of doodles or phosphenes, such as chevron, claviform, tri-line, bi-line, vulva-seed, and split rectangles and triangles, and these, as I have argued (Harrod 2006, 2004b), constitute a sophisticated geometric protolanguage of gesture-movement-forms that represent transformation processes in nature and spirit.

Watson's contribution with respect to adult doodling is a step forward in our understanding of the precursors of early hominin semiotic behaviour and suggests avenues for future refinement.

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Stopping doodles from getting out of hand

By DEREK HODGSON

Doodles are a phenomenon that has long been neglected and Watson's analysis is to be applauded in throwing light on to the subject. The proposition that some of the repetitive marks to be found in palaeoart can be explained by doodling I find, however, less compelling. As I have indicated previously, marks, such as those from Blombos and earlier, were mostly produced on fairly hard surfaces that required the use of both hands and a considerable amount of concentration in order to avoid injury. Moreover, the accuracy and consistency of the Blombos example attests to a measure of fine motor control in order to create the detailed lines and precisely repeated angles. Doodling is more of an untidy business with less attention to the precise location of angles involving much overlap and disregard for the overall gestalt. There may be a few isolated cases of palaeomarks as doodles but it seems that if Watson wishes to bolster his claim he needs to provide concrete evidence and examples with supporting data. His thesis also needs to be argued more cogently against the more probable scenario that palaeomarks were made with due care and attention by their makers. Doodles may well have been more widespread than the archaeological record suggests, as the preferred materials would have been of a more perishable and easily accessible variety that have not survived. However, it is difficult to make any statements about this when the evidence remains unavailable. The point about Ehrenzweig is a non-sequitur, as the fortunate accidents alluded to are, after all, either disregarded or intentionally modified and incorporated into the composition.

Sharpe and Van Gelder's findings that finger flutings in French caves were produced by infants as young as two years of age, rather than suggesting a nonchalant disregard for the marks produced, seems more to suggest that, in such dark and dangerous places where the infants were often lofted up by their parents to quite high walls and ceilings, much attention was given to the activity. In fact, infants seem to take a special interest in drawing repetitive marks, especially contours, line intersections and closed forms because these help to reinforce the neural networks necessary for efficient and effective perception of the world. This is not just to do with the perceptual potency but also because eye-hand co-ordination is facilitated — an activity fundamental to the evolution of *Homo sapiens* as a species.

Notwithstanding these concerns, the analysis of the processes underlying doodles is well argued and valuable in providing insights into the processes and means by which such marks are created. The fact that they seem to be produced with little conscious

effort, i.e. subconsciously defined, suggests they are a function, as Watson emphasises and I have been at pains to demonstrate, of the way the early visual cortex is structured and functions. In fact, the evidence on doodles seems to lend further support to the neurovisual resonance theory that I have put forward and presented copious neuroscientific evidence for during recent years. This theory is based on the idea that palaeo-marks stem from certain preconscious contingencies and have a surreptitious effect on the kinds of marks made. In other words, there is a resonance or positive feedback loop between the visual cortex and the actual marks. They therefore both stimulate and simulate how the early visual cortex functions. This process is hence partially 'subconscious' in that conscious intentions are underwritten by tacit neuro-visual events. I refer interested readers to the references cited by Watson with respect to this theory. The fact that 'entoptic' forms resemble doodles adds further confirmation to the early visual cortex as being the overriding influence on palaeo-marks. Coolidge's findings are significant in this respect, especially with regard to the non-conscious component involved.

Watson's remark pertaining to previously produced marks and particular kinds of natural phenomena providing a stimulus for later marks is particularly apt and dovetails with the neuro-visual resonance theory as it shows how there are various contingencies that can prime the visual cortex leading to the production of palaeomarks. A corresponding factor would have been cut marks made in the defleshing of bones and the making of stone tools that often accidentally look like repetitive lines. Interestingly, some of the earliest palaeo-marks come from Kozarnika cave in Bulgaria — sets of intentionally made parallel lines on a stone tool probably made by *Homo erectus* — that are thought to date back 1.4 million years. As *Homo erectus* seems to have had a proportionally larger early visual cortex compared to the rest of the brain in comparison to the same proportion in modern humans, this part of the cortex would have exerted a much greater influence in *Homo erectus* thus leading to the production of such lines. It is no coincidence, then, that Watson has found similar parallel lines to those of Kozarnika to be the most common doodle motif. The next most common motif, the circle and concentric circle, Watson chooses to consider as one. This is interesting because it has been found that the same set of neurons in early visual cortex respond to both these motifs as a single shape (see Hodgson 2006c). In other words, such neurons are unable to reliably discriminate between them.

I remain somewhat sceptical as to the relevance of dreams and daydreaming as a source of the European cave depictions proposed by Coolidge that I have suggested can be more readily explained by 'hyperimages' (also known as pseudohallucinations — see Hodgson 2006b, cited in Watson's paper). I see the inclusion of natural features into these representations as particularly revealing as to the psycho-visual dynamic involved, i.e. what is perceived as happening in the space between the observer/artist and the actual rock surface. The inclusion of natural features in European cave representations seems, in fact, to have been grossly underestimated with new examples being discovered regularly even in well-known caves (Clottes 2007), though Clottes still holds, mistakenly I believe, to the shamanistic interpretation of these depictions. Watson's citing of Davis is particularly relevant in this regard:

> '*any* representation anywhere must always accommodate the qualities of its surface' and incorporate irregularities into a representational figure.

The use of so many 'sketchy' outlines of animals in European caves, where stronger and more pronounced outlines would have been appropriate in the subdued and unstable light available, suggests that the authors of the depictions were intrigued by how the animals would have seemed to hover between the wall surface itself and the [hyper]image existing in the mind's eye. The seeing of animal forms in a matrix of previously drawn abstract lines may well be another example of this process. Interestingly, the inclusion and association of repetitive marks and patterns with representations is thought by psychologists to add a sense of potency to the objects depicted (Horowitz 1975).

In conclusion, Watson's analysis of doodles is valuable because it presents further empirical data as to the importance of the neurovisual resonance theory for understanding the pervasiveness of graphic primitives in so many different arenas across time. I remain unconvinced, however, as to doodles being a significant factor with reference to palaeo-marks as doodling is premised on there being easily usable materials that do not require much attention to fine-motor control.

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Doodles, rock art and arousal: an alternative to the entoptic explanation

By PAUL S. C. TAÇON

Watson's argument is a welcome breath of fresh air for the debate about the significance of certain forms of palaeoart. In particular, I have always been puzzled by the insistence of some researchers that spirals, arcs, concentric circles, zigzags, dots and many

other geometric marks can all be explained away with shamanism and hallucinations brought on by drugs and/or trance. I was told that phosphenes (an entoptic phenomenon) cause one to see such patterns and that I, too, could see them if I pressed my finger to my closed eyelids. After several attempts to see such things I was left with sore eyes and a sticky finger. Rhythmic drumming by an indigenous North American friend did no better in helping me see in my mind geometric patterns like those of some rock art sites and my recollection of early years at university is that I saw very different things when intoxicated at undergraduate parties. Even if I had seen swirling patterns of geometric designs on any of these occasions, and managed to stay upright, I still could not understand the apparent compulsion to then replicate them on and in hard surfaces. Watson's thesis provides a much more plausible explanation, one that is both parsimonious with observation and supported with contemporary research.

It is important to note that Watson is not stating that all rock art resulted from doodling behaviour. Instead, he suggests that some of it might have come about in this way. Watson notes that 'The impulse to draw, paint and/or engrave reflects motivations and actions common to all humans', but it is probably true that most humans also doodle, whether this be with a finger or stick in sand, pen on paper or in some other form. Certainly it is plausible that some rock art resulted from doodling, perhaps while story telling, recounting adventures of the day or planning for the future. Many sites in Australia, for instance, have recent scratched, drawn or painted designs that appear rough, unskilled and with apparent less meaning than more elaborate nearby imagery. They appear to have been made in an offhand way rather than in a deliberate, methodical manner. They are placed much more randomly than more detailed designs and resemble classic doodles many of us produce on paper. Many appear to date to the European contact period. In much of my work I have argued that at particular sites and certainly within both small and large regions, what we call rock art was made with a multiplicity of meanings and resulted from many motivations. Aboriginal Australians generally agree with this interpretation and do not believe all rock art to be sacred. Certainly it is plausible that some marks we identify at sites resulted from doodling, although this is not to say that they did not subsequently acquire meaning.

I was fascinated to see that Watson noted 4% of designs produced by his doodling subjects were of therianthropic/composite figures. Perhaps coincidently, this is close to the proportion of such creatures found in rock art regions where they are prevalent, whether it is southern Africa, northern Australia or elsewhere (e.g. see Taçon and Chippindale 2001). Of course, I am not suggesting that therianthropic imagery everywhere resulted from doodling but it is an interesting comparative statistic. If nothing else, it helps lessen the sting of a purely shamanistic argument to explain vast bodies of rock art or every incident of composite beings.

It also is worth emphasising something many people have observed, what I express as 'marks attract marks', including doodles. Even chimps add marks to marks when given the opportunity to draw (see Lenain 1997). Perhaps this helps explain why some rock art sites have great masses of marks/designs while other suitable surfaces nearby have little to none (i.e. places with initial/early marks received greater attention over time by subsequent markers). It might also explain the prevalence of doodle-like marks on and next to elaborate designs at some sites, something akin to the accumulation of graffiti at some locations that have elaborate designs superimposed and surrounded by hurried doodle-like graffiti marks. Watson also notes that '[t]he process of doodling appears to give rise to spontaneous and intuitive forms' and notes Maitland's (1976) contention that accidents in artwork may become part of the process of creativity. This reminds me of my grade ten art teacher who always extolled that a good artist never has an accident, they merely incorporate the change into their design. It also reminds me of Inuit soapstone carvers who began the carving process by doodle-carving, stating that eventually the animal within reveals itself so that the artist may release it from the rock (e.g. see Carpenter 1973). As well, it takes me to the Injalak Arts and Crafts Association of contemporary Arnhem Land where budding young artists doodle with paint on tables and floor space while older men paint on paper or bark nearby. Some of these doodles spontaneously turn into rich images before ones eyes, only to be quickly abandoned in favour of some newly enticing distraction. I have been told that this is how some younger men practice and learn; by observing and talking to accomplished artists while doodling (Sally May pers. comm. 2007).

Finally, Watson notes that '[e]ngagement in the activity of doodling produces a pleasurable response and level of arousal that persists with repetition', but this is true of most art and hints more at the adaptive value of any form of art activity than much else (there is a vast literature exploring the adaptive value of art but until now doodles have received marginal attention). Thus when you next observe a colleague doodling when you are presenting your seminar or conference paper do not feel they are bored with a stale presentation. Rather they are increasing their level of arousal so as to be better able to ask curly questions when you have finished! Watson is congratulated on a superb paper that not only provides insight into the past but also the present.

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In praise of doodling

By ROBERT G. BEDNARIK

The neglect of this topic, correctly diagnosed by Watson, is I think closely related to the similar neglect of another aspect of rock art research. Apart from some notable exceptions, my suggestions long ago that there is every indication a large component of European Pleistocene cave art is the work of children or juveniles has been just as unpopular. Although a very persuasive notion, if the rather extensive evidence is fairly considered, this has remained similarly ignored. The reason for these two palaeoart-related issues being shunned in most discussions is almost certainly that the majority of scholars dealing with Palaeolithic art are infatuated with the notion that everything about their object of attention oozes profundity — that it is all connected with ceremonies and deeply held beliefs of the most important members of the societies concerned (older men, naturally). This has been a defining characteristic of this field almost since the archaeological establishment had so carelessly rejected the authenticity of Palaeolithic cave art in Europe. Much of the research in this field over the 20th century seems to have been guided by some subconscious atonement for the mistakes made in the 19th century. European rock art and portable art of very doubtful provenience is often keenly embraced as being Palaeolithic, even in cases where it is of recent centuries or consists only of natural phenomena. In the same sense, most commentators seem to overemphasise the scholarly importance of this palaeoart (while studiously ignoring that most Pleistocene art does not even occur in Europe), and its great significance to understanding aspects of cultural gravity, such as religion, ontology, metaphysics and the origins of art. If a large part of it, perhaps even most of it, had been made by teenagers, even by infants in cases, the carefully crafted constructs of these interpreters of ancient palaeoart would simply fall apart.

A similar impediment applies to the proposition that the study of doodles is of importance to a scientific investigation of palaeoart systems. This is *not* because such art can all be explained as doodles, but because doodling behaviour may have preserved ancient aspects of mark-making behaviour. Similarly, the art of Palaeolithic children is scientifically perhaps more relevant to a *scientific* study of this phenomenon than the art of shamans or other ultra-sophisticates. A preoccupation with profundity reminds me that the discipline's own maturity is perhaps best served by adopting scientific approaches and abandoning its search for 'deeper meanings'.

Watson's arguments against pictograms being doodles are most sensible: it is almost impossible to regard stencils, beeswax figures or finger painting as the result of absent-minded activities, and any application of pigment to rock can be considered a fairly deliberate process, with the sole possible exception of drawing (dry pigment applied by crayon). Conversely, Gunn's points about scratchings are well made and generally valid, but terminologically he is wrong in emphasising the similarity of scratching and dry-pigment drawing. They may look superficially similar, they may be made by similar gestures, but one derives from a reductive process and is therefore a petroglyph (and technically it is a sgraffito), the other is made by an additive process, so it can only be a pictogram. As always the need of determining the CCD of the phenomenon category is paramount.

But Watson's point concerning pictograms applies equally to all Lower and Middle Palaeolithic surface markings I have examined. Not one of them could reasonably be defined as the result of spontaneous and absent-minded activity; all were made carefully, measured and deliberately. In some cases I have reported distinct traces of how the spacings of lines were determined in a fashion demonstrating that there was a clear preconception of the final arrangement (e.g. the Oldisleben 1 object, Bednarik 2006b). This would be wholly incompatible with doodling, in which the end product is not planned or consciously pre-determined. I would also qualify the use of doodles produced on request, as in Watson's experiment. The study of doodles in students' notebooks Coolidge has conducted is in my view of much greater relevance, and his description of alternative explanations as 'unnecessarily presumptive and specious' is, I think, precisely on the mark.

Much-used telephone directories or telephone message pads would be mother lodes of authentic doodles; graffiti, on the other hand, would not qualify, nor, I suspect, would most rock art. The significance of doodles to rock art study lies not in that direction, but in the possibility of studying modern doodles neurologically. If, as I have long suspected, their elementary forms are deeply embedded in our inherited neural structures, it would not be surprising if they had guided the earliest mark making of hominins. As I have noted, the marking strategies one sees on much used telephone book pages seem to be dominated (a) by reactions to various edges and other pre-existing features; (b) by graphic strategies of filling vacant space; and (c) by specific repetitive patterns. The same can be said of the earliest palaeoart, but it does not follow that it consists of doodles; what comes 'subconsciously' and effortlessly to the modern person may have required considerable cognitive and mental effort, *conscious effort*, by *Homo heidelbergensis*. But the genetic preservation of such behaviour patterns, e.g.

in the reticulate arousal system of the lower brain, implies that they had adaptive value. It is in this general context that the study of doodles deserves the full attention of the palaeoart student.

Clottes is therefore mistaken in seeing the Blombos lattice as a doodle. It was made as deliberately and with as much care as any of the significantly older, Lower Palaeolithic engravings (Bilzingsleben, Wyhlen, Sainte Anne I) and linear petroglyphs (Bhimbetka, Daraki-Chattan, possibly Blind River), or any of the countless thousands of Middle Palaeolithic linear markings (there are vast numbers of them in Australia alone). The most interesting aspect of doodling is not the question of its role in palaeoart production — which is probably negligible — but the apparent window it offers us to the past through carefully applied neuroscience, to explain how the engraved patterns of the Lower Palaeolithic ancestors came to be externalised. This is far more important than idle discussion of etic meanings of palaeoart.

Watson seems to be using the term 'entoptic phenomenon' in the sense of 'phosphene motif'. The two terms are not synonymous: the latter is always an entoptic, but most entoptics are not phosphenes, so these words are not interchangeable. Certain writers addressing shamanism in rock art have muddled this issue, perhaps deliberately, by using the two terms as if they were interchangeable. Since Watson seems to refer exclusively to phosphene motifs, it would be preferable to use that term alone, and so avoid confusion. Another minor quibble I have is that Watson lists Lascaux as one of two typical Upper Palaeolithic art sites; it is not very typical at all, and as Bahn (1994, 1995) has long pointed out, its more recent and best-known art is very probably not even of the Pleistocene. In any event, all Lascaux rock art is undated, and dated examples are available to make the point.

Concerning the notion that iconicity emerged from random finger flutings, we need to clarify that there is not a single instance of this among the many hundreds of square metres of surviving Australian finger flutings in caves, and even in the very sparse western European examples it seems clear enough that the artist possessed a perfectly formed concept of iconicity. Conversely, the naive notion that societies who produce only 'geometric' arts are incapable of drawing figuratively has just been refuted by showing that at least one such society can produce highly competent iconic pictures if prompted (Sreenathan et al. 2008). The 'iconocentric' (Montelle 2007) researchers of Palaeolithic art are once again reminded that non-iconic art is the more complex of the two, and that the iconic zoomorphs of the Franco-Cantabrian caves *are conceptually and cognitively more primitive* than the purely non-iconic art of the same period in Asia. Even apes can identify iconicity; the comprehension of non-figurative art is far more complex and only emically accessible.

Watson's reminder that modern doodles may comprise symbols, e.g. religious symbols, seems to offer one interesting explanatory key. If they were created at a subconscious level, it suggests that modern doodles can include 'acquired' or learnt symbolic forms, and the process seems to demonstrate the involuntary production of symbols. Surely religious symbols are not yet genetically encoded in us. Or are they? That, too, seems worthwhile to pursue further.

As editor I have the privilege of seeing all other debate Comments before their publication (generally desisting from responding to them). Here, however, I need to make an exception, to point out that some of Harrod's above notions need to be qualified — in part because I may be responsible for them. This applies in particular when he writes of 'Later Acheulian' markings. He defines the Bhimbetka cupules as Acheulian, and as I am guilty of having done so myself (before I knew better!), I am obliged to point out that this has been clarified with Harrod before (Bednarik et al. 2006: 115): these petroglyphs more probably belong to the lower occupation characterised by chopping tools, as is the case in Daraki-Chattan.

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REPLY

Drawing attention to an inattentive activity

By BEN WATSON

I firstly wish to express my thanks for the generally supportive comments received in response to my study. I am pleased to have enabled the discussion of various aspects of palaeoarts from an alternate viewpoint, as well as providing possible avenues for further study. A number of interesting and important points were raised by the commentators, and I aim to address some of those I believe to be the more pertinent and interesting in this response.

A matter of definition

One of the major points raised by Deręgowski and Dobrez is the problem of accurately defining the phenomenon. As Dobrez makes clear, one of the main difficulties is that doodles are characterised by the indeterminate nature of markings produced. Although

this is the case, it is important to at least attempt to work towards a means by which doodles can be identified. Doodles may indeed have determinant features in terms of content; it is simply the case that this has not been tested for. In opposition to Dobrez — that it cannot be assumed that abstract markings are more likely to be doodles — I note that 38 per cent of the sample collected contained abstract markings only, in contrast to no instances of figurative depiction occurring in isolation. Doodles comprising a combination of figurative and abstract elements made up the remaining 62 per cent of the sample. This observation removes some degree of assumption and may help to further define the formalistic characteristics of doodles. It further helps to distinguish between markings that are *more likely* to have resulted from doodling than others (namely isolated figurative elements). It does remain to be seen, however, whether these statistics are a result of bias in terms of subjects' own notions of what doodles actually are or something more fundamental. The figurative elaboration of abstract forms need also be considered. Although the use of line in graphic representation is very simple and found universally, it is more likely that complex figurative drawings require a greater degree of focal attention and thus appear less frequently in doodles. This is supported by the fact that abstract compositions activate more restricted parts of the brain than narrative and representational or figurative compositions (Zeki 1999).

Distinguishing doodles from marks made in other ways is certainly one of the biggest problems with the hypothesis, and is something that has been noted by others in the past (e.g. Layton 1986). I admit the difficulty (and perhaps impossibility) in differentiating between intentional and comparatively unintentionally (or unconsciously) derived markings, but attempting to work towards a means of identifying doodles is a step in a direction that others have been too quick to shy away from. It is exploring the limitations of the hypothesis that I believe is important.

By using the term 'unconscious', I meant simply to refer to cognitive processes that are not mediated by conscious awareness and thus an independent guide basic to human behaviour, as opposed to discredited psychoanalytic concepts of the mind. In truth, I may have been well advised to avoid psychoanalytic terminology and to speak of intentionality, although the use of 'unconscious' in referring to processes that occur outside ordinary focused consciousness forms part of many recent psychological theories that are in agreement with brain sciences (see, for example, Hassin et al. 2004; Stein et al. 2006).

Dobrez is right to note that unconscious motivation is not limited to doodling, and the discussion of doodling behaviour is relevant in the wider context of art and material culture generally. As Taçon noted, a similar process may also be involved in the production of three-dimensional sculpture, as in the 'doodle-carvings' of the Inuit, and may shed light on the production of sculptured palaeoart objects. Hodgson further points to the role of stone tools, for which a theory of doodling or unfocused activity may also extend. Akerman (1979: 75–76) has in fact suggested that some stone tools may result from a type of doodling, as they may be produced casually and without consciously focused attention in a very short period of time by a bored person occupying the hands with a piece of stone. This may particularly be the case if the person is a specialist in the production of a specific tool type. Although stone tool manufacture may require a certain degree of effort and concentration (and like doodling may involve varying levels of conscious attention or intention), the activity may be inherently satisfying. Furthermore, many characteristics of stone tools are comparable to doodle markings such as the use of symmetry, the regularity of flaking, repetition of serrations, and so on.

Sample collection

Hypotheses based on clearly intentional activities are certainly easier and are more controlled than those concerned with activities such as doodling. Bradshaw, Deręgowski and Faulstich all found issue with the fact that the resulting markings made by subjects were influenced or inhibited by the means through which they were obtained — that by asking subjects to doodle, the results would ultimately differ from those produced 'naturally'. Collecting a sample of 'genuine' or 'authentic' doodles (a potential problem also found in Coolidge's study) is by no means an easy task. By giving subjects instructions in an experiment it may be assumed that by doing so the data will have been influenced by the effects of states of intentionality. But even if doodles produced entirely 'naturally' were analysed, the varying role of intentionality played in the production of the markings must also be admitted.

I must add that I failed to point out that I used a fixed set of instructions explicitly asking subjects to produce doodles *in their own time*. This was to allow for some degree of spontaneity to occur. The time period (between five and 10 minutes) was imposed in an attempt to limit resulting markings to a level of comparable complexity. It may be reasonably assumed that a more reliable motif count will result from markings produced within a limited time frame rather than comparing doodles produced by one subject over an hour or intermittently over a period of days with those of another individual produced in a matter of seconds. I do not see how keeping an eye on the time (if this even occurred) would question the absent-mindedness of the task, as Deręgowski believes — in all likelihood, it would ensure an additional distraction from the task.

For the purposes of collecting a controlled (systematic) and scientific sample, doodling is not something that can easily be documented with

great consistency or accuracy in other contexts or circumstances. It remains of interest to consider alternative contexts and mediums (such as Bednarik's suggestion of telephone directories or message pads) considering the variations in which palaeoarts occur. But there does not appear to me to be a more suitable means of collecting a suitable sample without having to account for a wide range of additional variables and without being sure that the markings are actually doodles. Unfortunately none of the commentators criticising my method suggested a means by which a more authentic sample could be obtained.

In terms of monitoring degrees of conscious intent, the only reliable means of distinguishing between conscious and unconscious thought processes involves neuro-imaging, allowing differences in brain activity to be shown during conscious and unconscious perceptions (del Cul et al. 2007). Again, the problem of requesting the production of doodles by subjects would be unavoidable if such a study of doodling were undertaken.

It is also important to consider that the degree of conscious awareness of the requested task may not be as important as the level of expertise achieved in a skill such as drawing or writing. Once the skill of drawing or writing (as with driving or typing) is achieved (initially by conscious learning and attentive practice), it becomes habitual so that motor skills and perception can operate routinely and automatically. The brain region responsible for this 'habitual controller' is the dorsolateral striatum, influenced by the neurotransmitters dopamine and serotonin (Daw et al. 2005). A degree of 'unconscious' activity may thus be present in all graphic mark-making activity, but more so in the process of doodling due to the directing of attention away from the task. According to this model of the unconscious, various types of implicit and explicit processes work together; the neural basis of doodling (and creativity generally) depends on the integration and alternation of conscious and unconscious processes, i.e. varying levels of conscious intent or focused and unfocused attention (see, for example, Martindale 1977, 1995; Martindale and Hines 1975). It may well be that these processes played a fundamental role in hominid cognitive evolution and ultimately gave rise to tool and mark-making abilities.

Sample comparison

Despite its problems, I am pleased to see the attempt by Harrod towards a comparison of my data with phosphene motifs, children's scribbles and a specific sample of palaeoart. I will take this opportunity to present the motif categories used by Harrod that I omitted to facilitate further comparison. In order of frequency they are as follows: The 'pole' motif occurred in two per cent of the sample; 'cherries' occurred in four per cent; the quadrangular motif occurred in 10 per cent; and triangles occurred in 22 per cent. The initial categorisation I presented was based on those motifs that appear to occur most frequently both as phosphenes and in palaeoarts. For example, both sets occur frequently among the abstract petroglyphs of Australia (see Bednarik 1984). It is probable, however, that other motif types and pairings or combinations of motifs recur in the sample of doodles. 'Differential features' are perhaps less likely to occur due to their greater semiotic importance, and there is much more variation where combinations of motifs appear.

It is no coincidence that phosphene and doodle motifs closely match as both ultimately arise from the underlying structuring and functioning of the visual cortex. Faulstich makes an interesting point in regard to the degree to which absent-mindedness or inattention as a form of altered state of consciousness has the ability to provoke phosphenes, but the mind state in which doodles are produced suggests that it is not necessary to *consciously* experience phosphenes for the same or similar motifs to appear in graphic form. Harrod is correct to note that the drawing of phosphenes is 'a second-order act of representation'. Doodles, on the other hand, are more likely to be informed by the same neural structuring that gives rise to phosphenes in the immediacy of the activity as opposed to phosphenes themselves.

Religious symbolism and cultural considerations

I am compelled to briefly comment on Bednarik's question concerning the biological origins of religious symbolism. Primarily responsible for human emotion and including the neural networks responsible for 'religious feeling', the limbic system (particularly the amygdalae and hippocampus) is essential for the experience and attribution of religious significance to certain geometric motifs (Joseph 2003: 343). In addition to the existence of certain neurons that selectively respond to geometric stimuli such as the cross or circle, it is understandable that a combination of perceptual and emotional salience may give rise to the religious significance attributed to these and other basic motifs.

The involuntary production of symbols may also be created at a pre-conscious level due to the influence of subliminal perception. Marginally perceptible visual stimuli that are detected and processed prior to being brought to conscious awareness are found to influence subsequent behaviours including drawing. Experiments demonstrate that following exposure to subliminal images, traces of the images emerge in the drawings of the observers (Fisher 1959). Interestingly, the subliminal stimulus of animals may result in compulsively drawn combinations of animals (Shevrin 2001: 17–18) — something that is much more likely to occur in societies that have an intimate relationship and coexistence with animals. Considering also the intimate relationship humans have with their conspecifics, this may provide a

further means of understanding the appearance of therianthropes and composite creatures in palaeoarts.

The interpretations I have given do not, of course, deny that in some ethnographically informed contexts, seemingly random doodle-like drawings and scratchings in rock art may have complex religious and ritual associations (see, for example, Keyser and Taylor 2006; Ross 2007). Although the basis of simple motifs may be genetically encoded, they are also undoubtedly mediated by culture. Harrod and Faulstich both note the importance of considering cultural factors that may affect the selection and use of motifs in their graphic representation. Although simple abstract motifs arising on a pre-conscious level are susceptible to the attribution of complex symbolic or religious meaning, considering the reduction of conscious attention in the production of doodles it may be more likely that, at least in their initial generation, the higher areas of the brain responsible for the interpretation and attribution of meaning to the markings assume a lesser role.

Arbitrarily depicted subject matter clearly does not represent specific recurrent motifs and themes that may be explained by underlying universals. More complex religious symbols (such as the Star of David) undoubtedly arise in doodles as a result of cultural conditioning or at least guided by some level of conscious recognition. Accounting for possible cross-cultural variations is important and something that remains to be tested, though I suspect that if a sample were collected from individuals of different cultural origin, similar findings to those I have presented would result. Even if differences may be attributed to cultural and other factors, understanding reasons for the dominance of certain motifs in doodling from the perspective of brain sciences brings us one step closer to understanding the recurrence of basic content in palaeoarts throughout time and space.

The topic of doodling is an important one in furthering our understanding of human mark-making behaviour in the past. Although several issues remain, there is great potential for future study and I hope that this is the beginning of an ongoing dialogue on the subject rather than the end.

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