



Known and Unknown Stone: Papuan Petrology and Reciprocity

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ABSTRACT

What is knowable about stone tool users' knowledge? The people of the New Guinea Highlands were among the last to use stone implements routinely in their daily lives. These comprised both lithic flake tools and polished stone axes. Their classification of these objects challenges our notion of taxonomic knowledge, which involves agreement over defined classes, whereas they evidence considerable disagreement with unclear categories. It is necessary to situate stone within the egalitarian acephalous cultures where reciprocity features centrally to appreciate the ontological status of stone.

Résumé de recherche: Que peut-on savoir quant aux connaissances des utilisateurs d'outils en pierre ? Les peuples des montagnes de Nouvelle-Guinée furent parmi les derniers à utiliser régulièrement des instruments de pierre dans leur vie quotidienne. Ceux-ci comportaient des outils de pierre sur éclat et des haches de pierre polie. Leur classification de ces objets remet en cause notre notion du savoir taxinomique, lequel implique un accord quant à des classes définies, alors qu'elles mettent en évidence des désaccords considérables avec des catégories imprécises. Il est nécessaire de situer la pierre au sein des cultures acéphales égalitaires où la réciprocité est mise en exergue de manière centrale pour apprécier le statut ontologique de la pierre.

Resumen: ¿Qué se puede saber sobre el conocimiento de los usuarios de herramientas de piedra? La gente de las Tierras Altas de Nueva Guinea estaba entre los últimos en utilizar instrumentos de piedra de forma rutinaria en su vida diaria. Se trataba de herramientas de escamas líticas y hachas de piedra pulida. Su clasificación de estos objetos desafía nuestra noción de conocimiento taxonómico, que implica un acuerdo sobre clases definidas, mientras que ellos evidencian un desacuerdo considerable con

categorías poco claras. Es necesario situar la piedra dentro de las culturas acéfalas igualitarias donde la reciprocidad ocupa un lugar central para apreciar el estatus ontológico de la piedra.

KEY WORD

New Guinea stone implements

Introduction

What is knowable about what people who depend on stone tools know? In striving to understand others, as the postmodern and more recent ontological turns stress, we have to scrutinise closely our own culturally framed preconceptions and remain open, so far as possible, not only to recognising the unfamiliar but also allowing it to challenge our heretofore acculturated experience (Ellen 2006; Kohn 2015; Pickering 2017; Willerslev 2016). Even with objects such as stone tools, the danger is an “ethnocentric, one-sided attitude” that “fails to capture the complexity of different cultures”, being overly “informed by the values of our own western societies” (Pétrequin and Pétrequin 2011:335).

People living in the Highlands of New Guinea still used stone implements when the outside world intruded into their valleys in the twentieth century, albeit their ancestors were among the first to cultivate crops some 10,000 years B.P. (Denham et al. 2017). Today Wola speakers, who occupy valleys in the Southern Highlands, continue to cultivate likewise (Sillitoe 2010). Reciprocal transactions are central to their social lives. People exchange valuable things at important social events such as marriage, birth, and death, and to settle disputes. Previously, stone axes, together with sea-shells and cosmetic oil—among other transactables including pigs, which continue to feature today with cash—circulated interminably within regions (Sillitoe 1979a:144–157).

A preliminary stage in any ontological discussion is to classify the things of interest. This concerns collective socio-cultural schemes that people are socialised into, which arrange what they know and experience in ways that guide thought and action. Categories represent what is significant to them in discriminating between things. Still, these are not necessarily easy to grasp—even for stone objects “out there”—because people may use quite different criteria. Even if we perceive these, we may modify them to deal with the variation as we see it and address issues, we think pertinent. It is

paradoxical to find peoples' categories inadequate, when the aim is to promote understanding of their view of the world, and it is a challenge to assess the extent of "distortion".

The Wola speakers in the Was Valley relied on stone axes until the mid-twentieth century and used flake tools until the late twentieth century. The ethnographic data from the Highlands discussed in this paper date from the 1960s and 1973 for the Was Valley. In addition to discussions with persons who had previously relied on stone axes, I observed their use in the clearance and cultivation of gardens (Sillitoe et al. 2002), in the manufacture of a range of artefacts (Sillitoe 1988), and in the construction of houses (Sillitoe 2017); similarly, I observed and documented the use of chert tools in the manufacture of a range of artefacts (Sillitoe 1988) and also in an archaeologically framed analysis of use-wear (Hardy and Sillitoe 2003). This work has resulted in large museum collections of stone axes and flake tools, available for further research. The Wola identify between these two broad categories of stone implements: *aeray* "knapped flakes" and *kwiw* "ground axes".

Chert Flaked Implements

Among Wola, there is no terminological distinction between flake tools and chert raw material; both are represented by the term *aeray* (Figure 1). People say that colour indicates quality, preferring *bombray* "black" stone that gives the more durable and sharpest-edged tools. However, individuals often settle for the first nodule they find, even if lighter *hundbiy* "brown to grey" (Sillitoe 1988:58). These distinctions are not formally named categories. A powdery carbonate accretion, the *shongol* "skin", often coats nodules, and to determine their quality men heft them, the heavier the better, and if fit break them open. They used the irregularly shaped flakes as struck off a nodule without further retouch (Figure 2). These have sharp *nay* "cutting edges", selected according to size and shape for the job in hand. There are *onda* "large" pieces that they can hold firmly (to pare wood for a bow or axe haft, etc.) and *g^{en}nk* "small" flakes for finer work, sometimes mounted in a *haebuwk* "handle" (to engrave bamboo or shave rattan strands, etc.) while those with a *wil* "point" can bore holes (drilling through bone, etc.). These are generic descriptive, not categorical, distinctions: known knowns.

These implements have a wide range of uses, such as cutting, gouging, scraping, smoothing, and decorticating a range of materials such as wood, bark, bamboo, bone, and seashell, and butchering animals, notably pigs. The Wola use them in making tools, weapons, utensils, musical instruments, and some clothing and ornaments; 86 of the 150 objects they



Figure 1. Aeray “chert” flakes

owned featured flake tools in their manufacture (Sillitoe 1988). There is wide variation in the shape and size of tools used for various tasks, with different flakes not comprising “single-functional types” (White and Thomas 1972:278). The Wola have a contrasting wide functional vocabulary for these various activities—for example, there are six different phrases for cutting various raw materials, the aim in cutting them and the way they use the flake. The focus is on their use, rather than the tools themselves (Hampton 1999:77–82; Strathern 1970; White 1967; White and Thomas 1972). When presented with a selection of flakes and asked to categorise them, my friends would comment on their possible uses—paring an axe handle, bow shaft, digging stick, or some such thing. They distinguish functionally, not categorically, between flakes according to size and edge profile. In short, all flakes are simply *aeray* with no further tool focussed classification.



Figure 2. Knapping flakes off a nodule

Ground Stone Axes

While flakes are an integral part of the Wola toolset, they are not as eye-catching as their polished stone axes (Sillitoe 1988:43–50, 457–462). Wola distinguish between two classes of axe: the *kwi shomael* “work axe” and the *kwi shong* “show axe” (common distinctions in the highlands—Strathern 1965:185; Vial 1940:158). The *shomael* “work axe” is a stout, usually quadrangular blade of shiny stone with a flat poll (butt-end), used in clearing vegetation, constructing fences around cultivations, making various artefacts, and collecting firewood. According to Bulmer (1964:248–249), blades are “‘quadrangular’ in contrast to... ‘oval-’ or ‘lenticular’ -sectioned... blades exhibiting this feature [flat-sidedness] will sometimes be referred to as ‘planilateral’”. The *kwi shong* “show axe” is a large delicate blade of similar stone and is a decorative object used by men in dances and exchanged as a transactable valuable, as were larger *shomael* “work axes”.



Figure 3. An *aiben* polished axe

According to the Wola, both axes comprise the same stone. They distinguish three classes. Again, colour features. Firstly, there is the *aiben*, *haelboi*, or *mumung* axe of glossy dark stone (Figure 3), varying from black through to various dark blues and greens, sometimes mottled together (petrologically a thermally metamorphosed greywacke or basalt—Chappell 1966:104–109; Sullivan et al. 2017). Secondly, the *paym* axe of grey stone (Figure 4), varying in hue and sometimes mottled (a low-grade metamorphosed fine-grained chert). And thirdly, the *haez* axe, a residual category of dull pale to dark stone (a glaucophane schist). Again, these are known knowns.

The hardness and durability of stone are significant factors. The glossier and darker, the better the quality but these are not fool proof guides, and to assess a blade's quality men put it on their palm and inspect the moisture that condenses on its surface: the wetter, the better. The local terminology also suggests the properties of axes. *Aiben* means “across”, alluding to the speedy felling of trees “across” an area. *Haelboi* means “deaf”, hinting at the din of falling trees, and *mumung* means “round”, the symmetrical profile of superior axes. *Paym* is a large wild pandanus, the derivation of which is unclear, while *haez* means “white”, referring to the axe's inferior lustreless appearance. In addition to these terms, men named their axes, one called his Agimuwla, after the locale Agim, where he cleared a

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◀Figure 4. A *paym* polished axe**Table 1** *Shomael* “work axe” dimensions (sample = 115 axe blades collected in the Was Valley and deposited with the National Museum and Art Gallery of Papua New Guinea in Port Moresby)

Axe blade size	Length (cm)	Width (cm)
Average blade	9.1	5.6
Smallest blade	5	3.9
Shortest blade	4.8	
Narrowest blade		3.6
Longest blade	21.9	5
Widest blade	16.2	9.3

garden quickly, plus *uwla* the onomatopoeic for the crashing sound of falling trees. His son called his axe, Attombiyap, after the locale At, where the axe *tombiyay* “dug” holes rapidly in the trunks of felled trees.

The Wola also distinguish between blades by size, again as *onda* “large” and *g^{nk}* “small”; terms qualified further as *ora* “very” large or small. The *shomael* “work axes” varied considerably in size (Table 1). The Wola region is distant from the sources of axe stone and their supply was limited. The restricted availability of axe stone led to the use of surprisingly small blades, similar to other communities far from quarries, such as the Wiru (Strathern 1970) and the Duna (White and Modjeska 1978:284). Strathern’s (1970:326) comparison showed that quarry-adjacent Melpa axes were larger than distant Wiru axes “in the region of 5–6 inches instead of 2–3 inches”. The wide variation in the size and shape of axes again had no functional basis; all were used for the same tasks across the central New Guinea cordillera (Pétrequin and Pétrequin 2020:249). A specialised range was unfeasible with some men sharing axes (for example, 83% of stone axe users had shared them with their fathers and 15% continued to share with a brother on inheritance). While all axes might be used for the same purposes, some were obviously better suited to specific tasks than others—for example, a larger axe for felling trees, and a smaller one for delicate artefact work. Relatives sometimes lent axes to one another, although men did so hesitantly, and only to individuals they trusted to use them prudently, again as elsewhere (see Glasse 1968/69:573 and Godelier and Garanger 1973:197 regarding Huli and Baruya speakers).

Owners not only worried about physical damage through carelessness but also borrowers’ relations with women weakening axes, which extended to 2 or 3 days after coitus. I discovered this by chance—as with much ethnographic knowledge—when the friend who collected my firewood was

angry with me for lending our (steel) axe (the taboo transferred to steel tools) to a neighbour, who asked to borrow it briefly to chop his own firewood; he patiently explained why he was cross, remembering my naive ignorance of many (to him blindingly obvious) things. Women were not even allowed to handle axes. The Wola believe that they would blunt them irreparably, particularly if they touched them at certain times of the month, which accords with men's fear of menstruating females, believing that contact with them can cause serious illness, even death (Sillitoe 1979b). When asked why axes become blunt, people gave their standard response to such awkward questions: it's *ninau shumbaen bismiyuwp* "our ancestors' ways"; it was a known unknown.

Stone Sources

While the Wola realise, of course, that stone for axes occurs somewhere, they were unaware of where. It was an unknown known. Similar to others living away from the quarry regions, where "few men had any idea of the identity of the quarry owners", they made do with "what came their way" (Burton 1989:268). The axes arrived readymade. When asked the direction, the Wola indicate northwards round to eastwards. Several quarries are located in those directions (Burton 1984a,b; Sullivan et al. 2017). The majority of their axes originated from quarries in Jiwaka and adjacent Provinces to the north-east (Chappell 1966), with a few coming from riverbed sources in the Enga Province to the north. The Wiru, who live to the east of the Wola and nearer to quarry sources, are likewise "very vague as to the origin of axes", although they can point out the "directions from which the axes reached them" (Strathern 1970:326).

It is the opposite with chert tools. The source of—*aeray hul* "chert bone"—nodules is well known in neighbourhoods. Nodules are fairly common, occurring eroded in the banks and beds of streams; or in heaps cleared from stony soil during cultivation; or as stashed partially used cores near homesteads, even an early missionary visitor to the region noted their "abundance" (Bartlett 1964:670). Persons are free to collect chert from anywhere, it has no transactable value, and no one claims exclusive rights to sources; collecting a nodule demands little time and effort.

The classificatory schemes of those living near stone quarries for axes are predictably more complex than the Wola tripartite scheme. The Melpa have sixteen terms, which "refer to the 'origin' of the stone", that is, the "place where the stone was quarried" (Strathern 1965:187). The terms also refer to the appearance of different rocks. When identifying a previously unseen axe, men would "classify the blade according to colour and general texture (*king* "skin"), the veining (*ka:n* "rope") and other markings (*mon*

“writing”) in the stone” associated with a quarry (Strathern 1965:186). They would also “feel it, and lick the stone (to see how the graining looked when it was freshly flaked)” and in naming it they might compare it with “flecks on possums’ fur or the colour and sheen of feathers” that are specific to one of the sixteen classes; for instance, “axes called *Mbukl* may also be called *nambroi*”, after the “reddishness of a tree” of that name, or “*maemb*, if it has a rough surface” like a hammerstone, or “*nunt*, if its surface” suggests the “prickly leaves” of a bush (Strathern 1965:186). Likewise in West Papua, terms refer to source locales of axe stone (Hampton 1999:60–68; Stout 2002:704; Pétrequin and Pétrequin 2020:4).

When told about these detailed classifications, a perceptive Wola friend commented that they reflect location, with those living nearer to sources more familiar with stone. This neighbourhood knowledge of subtle differences in the appearance of stone is lost by the time axes reach Wololand, having passed between many people on the way, some speaking different languages. A survey of axe heads across the Papua New Guinea highlands shows that the “number of names offered decreased noticeably away from the factories” with different types of stone “gradually grouped together without discrimination” (Hughes 1977:183—see Table 14 for a list of terms for axe blade stone by source, colour, and axe type for 21 places/peoples across the Papua New Guinea highlands).

Disagreements Over Axe Stone Identification

While those living in quarrying regions distinguish more kinds of stone, there are noteworthy discrepancies in their identifications, which are significant regarding individual versus collective knowledge. A comparison of local terms with petrological identifications indicate that men are “not entirely consistent in their attribution of specific terms to rock classes” (Chappell 1966:105). Melpa speakers’ identification of toolstone were the “same... in 65.1 percent... of 66 cases” and those of Maring were the “same... as the petrologist for 68.8 percent... of 183 specimens” (Chappell 1966:114). Possible reasons for these “discrepancies in identifications” are “lack of expertise or knowledge ... for geographical reasons” and “nearly thirty years since stone axes were in regular use” (Chappell 1966:115). Additionally, men identified “axes of ambiguous appearance” and sometimes named them, with “little apparent logic” so as “not to lose” prestige (Chappell 1966:116). The men had a “tendency to judge on the superficial appearance of the rock”, while from a geological perspective, it is inadequate “naming tools without taking all obvious petrographic features into account” (Chappell 1966:115). But these differences with petrological identifications likely reflect use of “non-petrographic criteria (shape or size of

artifact; knowledge or assumptions concerning provenance, irrespective of appearance)” and “alternative modes of classification which they did not or could not explain” (Chappell 1966:116).

The quarry-neighbouring Melpa, for instance, also deploy a simple two-fold classification “into “white” (*kund*) or “black” (*pombora*)” axes that cross-cut the foregoing sixteen types distinguishing “lighter or darker specimens of a particular stone” and in addition, they refer to “quality, whether they are good (*kae*), strong (*rondokl*)... or bad (*kit*), soft (*rimbrimb*)” and so on (Strathern 1965:186–187) resulting in criss-crossing identifications. The quarry criterion even further obfuscates classification because a “single quarry site may produce two or more named categories of stone” and in other cases persons may apply “two locality names”, one of a “stream and the other a hill” at the place (Strathern 1965:187–188). And individuals unfamiliar with a “source may attribute the different categories to different quarries” even leading to a “multiplication of site-names” for stone sources (Strathern 1965:187). In summary, in only a “few cases were individual blades consistently classified” (Strathern 1965:189).

The disagreements occur among the stone quarriers along the Wahgi Valley, who distinguish several different kinds of rock, although they disagree over applying the names to rock strata in situ (Burton 1984a:237–238, Table 2, 1984b, Table 3.1), with “each exposure” subject to “several different “readings”, such that “no two informants gave the axe varieties in exactly the same order” and there was “much variation” (Burton 1984b:60). The terms were often figurative, likening rocks to various kinds of leaves and fungi, and while the quarrymen “willingly classified museum specimens by these names”, they were “too inconsistent in their identifications for the basis of the classifications to be clear” and they were also “inconsistent in attributing axe blades to... quarries” (Burton 1984b:61). Similarly in West Papua, when “three experienced” Langda men were asked to “name a random assortment of flaked pieces independently, they agreed in only 2 cases out of 11”, a “total lack of agreement” (Stout 2002:704). There is a proliferation of confusing unknown knowns.

Disagreements over Axe and Flaked Tool Morphology

Disagreements over axe stone identification did not bother the Wola; if someone differed from another that was his right. Attitudes to blade orientation further indicate a tolerance of divergence. This came to my attention observing men hafting axes and maintaining rattan bindings (Figure 5). While they mounted blades with cutting edges nominally vertical, the socket often twisted around in the binding or the split in it was not true,



Figure 5. Binding a *kwi* *shomael* “work axe”

moving the head out of alignment. The same occurred among the neighbouring Huli, the “blade... always at an angle” ranging from “60 to... 85 degrees” (Glasse 1968/69:572) and likewise in West Papua “socket angles... varied from 50° to 85°” (Hampton 1999:53). When I enquired into the matter, my friends thought my concern somewhat comical; verticality was

Table 2 Condition of *shomael* “work axes” (n = 115 axe blades)

Axe blade condition	%
Undamaged	30
Usable but edge not perfectly ground	12
Usable with some damage to cutting edge	30
Damaged too badly to be usable	28

These statistics may not represent the situation in stone axe using times with the owners of some of the badly damaged blades casting these aside as steel axes became increasingly available

relative not absolute for them, and an overly precise interest in blade angles misplaced.

The view that morphology alone—the size, shape, and other physical characteristics of objects—is the key to classifications and relates to native typology and use is questionable. Any typology of Wola axes founded on symmetry, size, and so on would order them in a manner that gainsays that of users, for whom they all fall into the two *kwiŷ shomael* “work axe” and *kwiŷ shong* “show axe” categories. Stone scarcity conditions their attitudes. The limited number of blades reaching their region from distant quarries governs their views. While men used stone axes prudently, they nevertheless occasionally damaged them (Vial 1940:162). The need for regrinding ranged from axes becoming *hibiyninj bay* “blunt” with use, to them suffering a *korob pokay* “serious chip” (Sillitoe 1988:50–52). Sometimes, it was only a nick that required some grinding, others a sizeable chip that demanded both knapping and honing to render the blade usable (Table 2).

Whatever the damage, men were anxious to grind away the least stone necessary to repair the edge. The result was somewhat lop-sided and unsymmetrical blades, their faces and edges skewed to maximise on the stone that remained after suffering a chip. Similarly, among the Wiru the “blade edge” was “markedly skewed” (Strathern 1970:326), something seen among the Una too with “resharpening and grinding... resulting in very oblique cutting edges” (Pétrequin and Pétrequin 2020:168). It also prompted the use, as noted, of improbably small blades by the Wola, with them becoming barely usable below a certain size and weight. The wish to conserve axe heads was not men’s only concern, they also sought to keep grinding to a minimum because it was arduous monotonous work. Grinding a blade that had suffered considerable damage took over 56 h and one with a small chip over 17 h (Sillitoe 1988:51, Table 4). These times compare with those of Burton (1984b:119–120, Table 6.1), who found that it took nearly 37 h to grind an axe blank until usable. All that men needed was a sharp and usable edge, the shape was unimportant within certain

limits: be it bevelled, hollow-ground, or bi-convex, whether symmetrical, lop-sided or whatever, they were all the same so long as serviceable. Likewise, the Melpa are “not interested in the particular form, its bevelling or such features” (Strathern 1965:186). In short, the variation in size and shape related to axe undersupply and did not comply with any morphologically framed classificatory scheme.

The hardness of the rock clearly has implications for the use life of an axe (see Hampton 1999:61–62). While no one knew the lifespan of a work axe—predictably as disrupted when steel axes arrived and the Wola had no calendar to measure extended time periods anyway (Sillitoe 2010:336–341)—men’s dependence on inheritance as a source of *shomael* ‘work axes’ suggests many decades, and *shong* ‘show axes’ passed down the generations.

The careful curation of axes contrasts with attitudes to chert implements. The use life of flakes is usually brief. These casual attitudes contrast with some populations elsewhere, such as the Gamo of Ethiopia for whom knapped tools are living things (see Arthur 2018). While Wola flaked tools have sharp edges when freshly knapped, these soon become dull and users readily discard them without seeking to rework the cutting edge, with chert plentiful another implement could soon be knapped. When they have finished with chert tools men carefully dispose of them, and debitage flakes, in places where people are unlikely to step on them; not only to avoid injuries but also to find unused flakes and larger core-like pieces again; thus blurring the storage and discard distinction of archaeologists (Torrence 1986) and gainsaying their “expedient” and “curated” categories (Binford 1977:29–33; Parry and Kelly 1987). Occasionally men carry sharp flakes (12 out of 76 men surveyed had such flakes on them), although they usually knap new ones as and when needed. With their short lifespan, they were normally used for one task only and sometimes men require several flakes to complete a piece of work.

Unknown Challenges for Archaeologists

The classification of flake tools is particularly challenging with “assemblages... notorious for being informal and undiagnostic” (Torrence 2011:29). It is understandable that archaeologists seek to classify such objects in interpreting them, as illustrated by a study of chert tools excavated in the Eastern Highlands, which compares a “standard typology... employed by archaeologists” with a computerised “attribute analysis of worked edges”, although formal types “remained fugitive” (White 1969:21, 22, 41). Subsequent work with Duna speaking contemporary tool users, which used multivariate analysis to sort a collection of flakes, confirmed

indigenous distinctions—similar to those of the Wola—between large flakes and fine hafted ones. The findings, which “appear to prove the obvious” in validating the local classification, warn that the “concepts of a “type specimen” and a “type site” are “misleading when applied to ethnographic data” (White and Thomas 1972:304). Nonetheless there are attempts at formal descriptions such as one among Eastern Highlanders that characterises flakes as “unifacially chipped scrapers, low-angled in cross section, with several edge configurations” both “concave and convex”, although “terms such as end- or side-scraper are irrelevant” (Watson 1995:91). The Wola make no attempt, as noted, to standardise *aeray* “flake” tools, using different shaped and sized flakes in the same tasks, the whereabouts of the sharp edge is of no consequence.

Archaeologists noted some time ago that the “highlanders of New Guinea by no means adhered to the model perfected by prehistorians”, with axe “blades hafted strictly” vertically being in the “minority” (Clark 1965:20). But etic classifications are unavoidable in archaeological contexts, with no actors to give the emic view. For instance, in an analysis of prehistoric “ground stone axe blades” excavated in New Britain, they “were classified into two... groups” initially by the “presence or absence of a waist”, and sorted further into “oval, elongated oval, square to rectangular and triangular” shapes (Pengilley et al. 2019:205). Some apply such classificatory logic to contemporary ethnographic collections; for instance, classifying New Guinea axes according to variations in their shape and form, such as by cross-section profile, whether lenticular, oval, round, or quadrangular-sectioned (Blackwood 1950:13–20; Bulmer and Bulmer 1964:53–67; Bulmer 1977; Dosedla 1975:106–109; Steensberg 1980:40–52). Some authors go so far as to devise formal measured classifications of axe heads, which are clearly foreign to any local non-mensural scheme (Godelier and Garanger 1973:192–197; Hampton 1999:60–68; Hughes 1977:151–168).

The wider implications for archaeology are intriguing, with stone technologies of considerable interest and prehistoric periods formulated after them (e.g. Clactonian, Mousterian, Neolithic, and so on). Archaeologists have long puzzled over the status of such periods; such as Lippert (1886–1887:163–169) who cited the continued use of earlier-period flaked tools together with later-period ground stone axes. It appears that polished axe traditions correlate with a simplification in flake technology (Parry and Kelly 1987; Torrence 1986:58), with a decrease in retouch over time (White and Thomas 1972) and decline in tool size (Holdaway 1995). It is arguable that versatile ground axes reduced the need for many specialised flake tools; their durability and longer use life favouring them too. The use of flake tools may also decline where people have access to such substitutes as bamboo for razor-sharp implements, and animal bones, tusks and claws (Binford 1989:466). The variable availability of stone axes in New Guinea

lends credence to these ideas. The Melpa speakers, adjacent to quarries, used axes as “more of an all-purpose tool” and flake tools less than the more distant Wiru people (Strathern 1970:319); although Highlanders continue unexpectedly to use chert tools after obtaining superior steel axes. And these populations have similar subsistence regimes, which runs counter to archaeologists’ use of “stone tools... to track changes in land use and subsistence patterns” (Torrence 2011:30). In short, the differences between New Guinea Highlander approaches to the identification of stone implements and those of archaeologists and museum curators independent of users intimate a profound disconnect in perceptions.

The Individual Known and Collective Unknown

The aforementioned disagreement between persons in identifying stone axes indicates another typological challenge, namely that individuals from the same culture may classify things in different ways, having unique views of the world (Ellen 1993:126–148). An experiment among the Duna, where men were “asked to re-sort” flake tools “classified by” others, shows the extent of the divergence with many of the classifications “drastically reorganized” (White and Thomas 1972:276, 286). Participants agreed on the identity of only a few tools—arguably their shared notion of “ideal type” (White et al. 1977:383). When individuals knapped tools, these likewise varied considerably in size, weight, and edge-angle, reflecting the men’s different notions of a suitable tool. Some consistently produced flakes of similar dimensions, while others were more random, likely reflecting differences in skill (the higher skilled rejecting more flakes as duff) and quality of chert worked on (those with poorer chert tolerating more inferior implements). What they usually use flakes for—heavy work or fine tasks—could also explain some of the variation. Even bodily size could play a part, larger and stronger men with big hands selecting bigger flakes (White et al. 1977:387–390). Whatever, the Duna say that they all make the same tools, although they are aware of variations, using “several descriptive terms for various groups of stones” but with scant “evidence that they form any *system* of classification” (White et al. 1977:381).

This variation pertains to unique experience informing individual comprehension, interpreted according to the collective knowledge of the cultural tradition into which they are socialized (Ellen 2006:1–29). While it is trite to observe persons differ over exactly how to make and use things, over their understanding of why they do it their way, and the extent to which it is proper to innovate, and so on, the implications are profound in aspiring to further understanding of entire cultures—that is, seeking to encompass the variable knowledge and understanding of all. Variations in

the behaviour of individuals abound in all spheres of life, and actors are often unaware of them; or at least will not, or cannot, talk about them. When we write blandly of normative behaviour and cultural expectations, we are distorting reality—indeed we are not even sure what these are, different actors having varying conceptions of them. Furthermore, when the sum of variations between persons reaches a certain indeterminate point, we talk about different communities. But what is the nature of the boundary where one passes into another?

The boundary issue concerns the classifying of things with the challenge of justifying the allocation of objects that fall on the boundaries between classes to one or another. All hand-made objects differ somewhat; no two axe heads are identical. A century ago, maverick ethnologist Leo Frobenius observed, “all cultural objects... elude by their variability any attempt at a truly exact... classification” (Haberland 1973:5). Consequently, it is feasible to extend identification down to individual axes, with no sharp boundaries according to size, shape, or whatever. The aforementioned naming of individual axes by their Wola owners suggests this practice; with relatively few axes between them, a community of kinsfolk knew each other’s axes by their names. The boundary conundrum relates to some profound epistemological issues, with the world effectively unbounded and like objects flowing into one another. The problems parallel those of natural scientists, who wrestle continually to justify their imposition of discontinuous classes upon the continuous products of nature. The boundary-defining issue recurs across Wola life, for instance in their fluid notion of land rights that confounds map representation of group boundaries (Sillitoe 1999). It is necessary to divide and classify phenomena, informed by some collectively acknowledged scheme, to understand something about them. The drawing of boundaries between classes, definition of their content, and the criteria that determine inclusion or exclusion are critical. In some regards, these conditions concern what we think we know, structuring our quest for knowledge by introducing some order into the connected confusion of reality.

Reciprocity and Authority

While disagreements over the identification of things are usual among humans, their pervasiveness among Highlanders voids the sort of consensus we might assume necessary for a system of classification to exist at all, as a culturally sanctioned arrangement of phenomena, into which social interaction habituates individuals and they collectively agree on. Why such levels of disagreement? The freethinking discord relates to wider cultural arrangements. The anarchic status of Wola typologies reflects the fractious

nature of socio-political relations; such disagreements are an inevitable aspect of their egalitarian order; they show it in action. The discrepant use of categories is not confined to the tools discussed here but is a widespread feature of Wola life, as I have documented in detail for crop plants (Sillitoe 1980) and animals (Sillitoe 2002). The extent of individual freedom of action is difficult for those living in centrally governed states to appreciate. Autonomy and equity are isomorphic. The degree of sovereignty and equality individuals expect, within agreed cultural limits—encompassed by universally recognised exchange obligations—seemingly pose problems for social order. Violence is a feature of everyday life as people readily defend their individual rights and kin usually support one another in disputes, which sometimes erupt into armed confrontations and conflicts that feature payback revenge. Reciprocal exchange institutions are central to the constitution of this fiercely democratic stateless society (Sillitoe 1979a). The interminable series of socio-political transactions are pivotal to the accommodation of the ardent egalitarian values and the ordering of their sometimes-aggressive social life, moderating social interaction.

While reciprocal transactions have a competitive edge and some individuals excel in them and achieve renown locally, they secure no authority to direct the actions of others nor to determine what they know. The transactional rivalry is an aspect of the feisty equitable ethic, men constantly endeavouring to sustain their standing within a community of equals. Those who outshine others may occasionally enjoy a marginal degree of influence, but they cannot translate it into power and exert control over others (Sillitoe 2010). The sexual division of labour, epitomised in axe handling taboos, features here, thwarting any such domination of others (Sillitoe 2010:445–453). Although some commentators think the arrangements exploit women (Josephides 1985; Modjeska 1982, 1995; Strathern 1988), which would controvert egalitarianism. It accords with autarkic familial arrangements and ordering of wider society. In a way, multi-purpose axes “symbolize these egalitarian societies in which everyone... can assimilate and reproduce all the technical facts” (Pétrequin and Pétrequin 2020:249) appropriate to their gender.

A stateless order such as that of the Wola differs fundamentally from a state in demanding the obfuscation, not concentration, of power. By definition, there are no authorities to determine the correct identification of some rock or any other thing—or arbitrate in serious disputes over an accusation of theft, adultery, or some other wrongdoing—where power is dispersed equally among all households and not vested differentially in authoritative offices. There are no acknowledged experts, such as university and museum geologists—or police and judicial officers—who others recognise as qualified to settle any disagreements. Wola individuals might argue

over differences of identification and reach an agreement or not. In a sense, the identification of things such as stone axes and chert flakes is potentially subject to constant negotiation, which thwarts attempts to capture such an oral system in written text that inevitably seeks to arrest it in a formal classificatory scheme, stripping it of its ever-negotiated spontaneity.

Knowns and Unknowns

While socio-political context accounts for the fractious attitude of New Guinea highlanders to typology, it remains to reconcile our authorised ordering of knowledge with their anarchic approach. The fuzzily defined conceptual categories suggest challenges with unavoidable conundrums that complicate the understanding of their worldview. Indeed, the amount of disagreement threatens to overwhelm our notion of classification, as an agreed arrangement of phenomena, and prompts reflection on the extent to which such people, socialised into a radically different cultural tradition, are doing something analogous to classifying in Western thinking when they discuss things, such as stone implements. We have to foster, so far as possible, different conceptions and think more flexibly with fluid categories to comprehend the constitution of such knowledge. The use of concepts familiar to us may be prejudicial in interpreting such cultures, for our intellectual tradition seeks to define firm categories to further understanding of phenomena to fit our explanation of the world.

The New Guinea ethnography puts the phenomenological critique of knowledge in an interesting acephalous context, where people expect to disagree over their subjective understanding of objective phenomena “out there”. It accords with the current processual approach to social life, never finalised in a structure, and the associated crisis in representation, where all knowledge is contested. While the cultural norms and historical heritage of society inform understanding of the world, these do not dictate what is known but are subject to never-ending modification with life’s experiences. Nonetheless, there must be a considerable level of agreement between members of the same culture, who speak the same language, about the content of the words they use or they will be unable to communicate and interact socially. The Wola suggest a wide margin of tolerance, even the limits to the approach to social life as a negotiated process because some agreement is inevitable about understanding and interacting in the world. It is necessary to explore the extent, and assess the significance, of variation rigorously, and investigating the classification of artefacts such as stone tools may contribute to grasping the epistemo-

logical implications, offering a concrete domain to explore the knowns and unknowns.

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