

## THE ELOUERA INDUSTRY OF SINGLETON, HUNTER RIVER, NEW SOUTH WALES.

By FREDERICK D. MCCARTHY,  
The Australian Museum.

AND  
F. A. DAVIDSON.

(Figures 1-135.)

In 1941, one of us (F.A.D.) discovered a workshop and camp-site at Gowrie, three miles west of Singleton, on the northern bank of the Hunter River, and in the territory of the Wonarua horde of the Kamilaroi tribe. Since that date he has visited the site regularly, and this paper is an analysis of the specimens that he has collected, and of those gathered by both of us during a week spent in the area in June, 1943. The collection, totalling 2,451 specimens, has been presented to the Australian Museum. This study is the third of a series analysing New South Wales industries.

The implements occur on a terrace about two hundred feet above the river and adjacent alluvial flats. They are embedded in the top six-inch layer, which consists of a fine silt and is lying upon a coarse gritty clay of great depth; at the base of the terrace is a thick layer of water-worn pebbles. On the northern side of the valley the implements are particularly abundant on a tongue of land enclosed by a bend of the river at Gowrie, and their occurrence was traced for about ten miles along the terrace and is probably more extensive. Visits have been made to two parts of the terrace on the southern side of the valley, one six and the other six and a half miles east of Singleton, and to another section opposite Gowrie, about four miles across the valley, and in each locality the implements were found.

Mitchell (1838, II, 14) described the Hunter valley as being thinly wooded and bearing in most parts a good crop of grass. This description still applies to the terrace, but it has been cleared of trees where necessary for the grazing of cattle. It is eroded by numerous natural drainage gullies running from its highest points to the flats and river, and its margin consists of rounded hills and creek beds, plateaus round which the river flows, and high alluvial cliffs into which the river is cutting in the great bends, as at Gowrie.

### Materials.

The predominant material is chert of all shades of colour from cream to red, grey being scarce. Other materials commonly used are jasper, quartzite, porphyry, and conglomerate. Igneous rocks occur among the river gravels at the base of the terrace, and this deposit formed the source of the materials.

### Technique.

The use of fine-grained stones such as those mentioned above did not cause the makers of these implements to diverge from their traditional types, as might be expected from a comparison of their excellent materials with the poor quality, refractory rocks used on the south coast of New South Wales (McCarthy, 1943, 129-30). Although the techniques appear to have been the same in both areas, they are more specialized and are more clearly demonstrated by the artefacts at Singleton, where prismatic cores bearing convergent flaking predominate and flakes and blades with faceted butts are commonly found. It might be mentioned that the faceted butt technique was employed mainly for the production of blades, and it appears frequently among the *bondi* points

and blades used as scrapers and knives; it is rarely seen on blocks. Squat and stout flakes with plain butts are well represented at Singleton.

On the cores the striking-platforms are formed by the usual methods, embracing the removal of one or more flakes, the use of the cleavage face on block cores, and the use of the flat crust on some of the pebbles. Multi-platform cores are also formed by the use of one or more knapping faces as striking-platforms, and several cores of this type have been worked progressively, that is to say, the end of the knapping face has served as a second striking-platform when it was found by the knapper that it was not possible to strike a narrow blade the full length of the original face owing to a fault in the stone (Fig. 74). The napping face is at an angle varying from 70° to 85° to the striking-platform.

The industry is a mixture of symmetrical flakes and blades, and of squat and stout flakes. Slender symmetrical blades trimmed back to the central ridge or to the first ridge from the margin, and asymmetrical blades, were struck off for the making of *bondi* points. Blades of both types were utilized for *elouera*. The inner platform angle on the normal flake and blade implements varies from 95° to 135°, and mostly between 110° and 120°. Trimming and retouch on the various implements are the same as on South Coast stations.

Although suitable pebbles are abundant in the river pebble layer at the base of the terrace, they were not used as hammerstones as commonly as one would expect, and only one broken pebble hammerstone was found. Signs of percussive use are common on trimmed coroids, blocks and uniface pebble implements. Flake fabricators are poorly represented, only eleven specimens being collected, and no bone or shell implements occurred.

When collecting we sometimes came across a core and set of flakes left by a knapper, among which were trimmed flakes and up to as many as fifteen geometrical microliths. Similarly, up to six *bondi* points were found in a group. Both the microliths and points appear to be unused. At one station, one of us (F.A.D.) recorded finding forty-three geometrical microliths and eighteen *bondi* points, but as a general rule the latter are more abundant than the former, and both types are scarce in some sections where cores and flakes are abundant.

### Artefacts.

The 2,451 implements comprise 257 cores, 58 cores used as implements, 89 uniface pebble implements, 112 blocks, 15 *worimi*, 8 cleavers, 788 normal flake and blade implements (including 89 *elouera*), 524 *bondi* points, 245 geometrical microliths, and one edge-ground axe blade. Attention should be drawn to the abundance of *bondi* points and geometrical microliths, and to the scarcity of *elouera*, *worimi*, and cleavers, and in these respects the analysis supports impressions gained on the stations when collecting. The composition of the industry at Singleton, in regard to the trimmed coroid and knapped implements, agrees closely with that at north Cronulla (Boat Harbour and Quibray Bay) on the south coast of New South Wales (McCarthy, 1943, 131-33).

I. Coroids		end and lateral	7
Cores (257)		bilateral	2
one striking-platform	99	uniface	4
two striking-platforms at opposite ends	50	split-pebble	8
two or more striking-platforms at angles to one another	95		
conical	8	II. Blocks (127)	
discoid	5	Crown	
Core implements (58)		straight to convex edges	23
straight to convex edges	28	concave	21
concave	17	nosed	12
nosed	5	Keel	
binate	3	straight to convex edges	18
biface discoids	5	concave	23
Uniface pebble implements (89)		nosed	15
end	36	<i>worimi</i>	16
lateral	32	III. Cleavers (8)	
		IV. Normal Flake and Blade implements (788)	

<i>Eloocera</i>		Butt	
type 1	28	plain	129
type 2	32	faceted	58
type 3	28	trimmed	327
		Thin margin trimming	
Scrapers		knife	32
side	120	scraper	29
side and end	12	point only	12
double side	35	VI. Microolithic (245)	
double side and end	20	Geometrical	
distal-end	67	trapezoid	118
butt-end	19	segment	29
double-end	6	equilateral	11
concave		isosceles	14
lateral, lateral and end	115	scalene	56
distal-end	37	right-angled	4
butt-end	7	special pieces	3
nosed	126	oblique trimmed blades	(22)
Utilized	10	Normal flake and blades (173)	
Piercers	17	abrupt trimmed blades and side	40
Burinate		side and end	3
spalled	10	double side	6
scaled	2	double side and end	3
utilized	6	distal end	22
Knives	52	butt end	5
Serrated	27	double end	5
Fabricators	11	concave	25
V. <i>Bondi</i> points (524)		nosed	25
Conformation		piercers	2
left	324	knives and serrated	7
right	200	utilized	—
Trimmed on single edge		burinate	1
(a) distal end and plain butt	105	fabricators	2
(b) distal end and butt	6	<i>eloocera</i>	27
(c) distal end and faceted butt	55	VII. Glass and crockery (232)	
(d) completely	159	Scrapers and knives	190
Trimmed on two edges		Scrapers	
(e) distal end and plain butt	24	end	20
(f) distal end and butt	3	concave	84
(g) distal end and faceted butt	3	nosed	17
(h) completely	169	piercers	11

## I. Coroids.

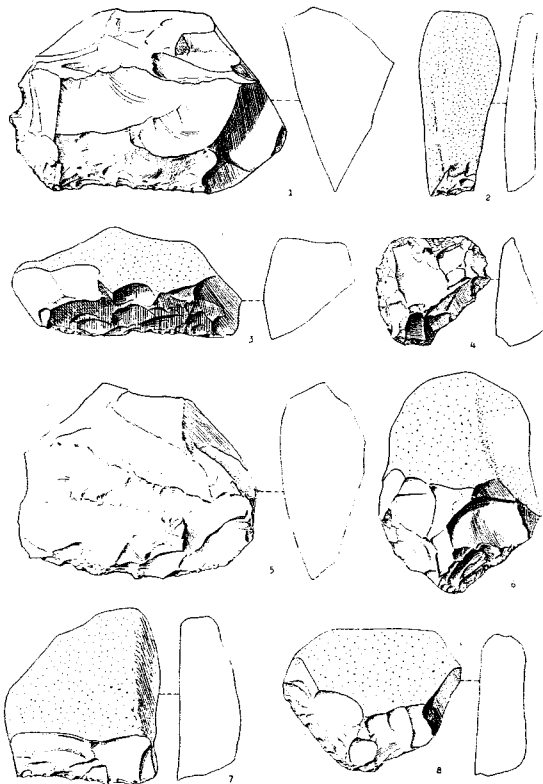
## Cores.

A splendid series of cores ranging from small nuclei 2 cm. long to large lumps 11 cm. long from which a few flakes only have been knapped. Those with one striking-platform are in the majority, followed by the multi-platform group, while those with two opposed platforms (Fig. 73) are in the minority. There are numerous nuclei in the multi-platform group. The 81 prismatic cores (Figs. 71-72) are from 2.5 to 6 cm. long; many are pyramidal in shape, tapering from the striking-platform to a sharp edged or pointed distal end, or to another platform, and some have a crust surface opposite the knapping face. It might be noted that most of the prismatic cores fall within the range of sizes of the *bondi* points and, as they bear long narrow flake scars, are probably point cores. There are two cores with semi-discoidal and two with discoidal margins knapped from upper and lower surfaces, and they are from 3 to 5 cm. in greatest diameter. The eight conical cores (Fig. 12) have a cleavage face as their striking-platform, and they are from 6-9 cm. in greatest diameter; several of them are similar in many respects to the *horse-hoof* type (Tindale, 1937, 52, fig. 15) of the interior of Australia. Globular cores are not represented, apparently because the homogeneous materials permitted the knappers to prepare with ease a prismatic or other variety of core with the knapping face at a suitable angle to the striking-platform. Tortoise cores are also absent. There are two pebble cores knapped at one end, each with one striking-platform (McCarthy, 1943, 135).

*Cores used as implements.*—The majority are small nuclei from 2.5-7 cm. long, which have been utilized on various parts of their margins. One is shoe-shaped, 12 cm.

long, and bears step-chipping in a shallow notched style on both lateral margins and one end. Three have straight trimmed margins at one end. The concaves are 1-4 cm. wide and several are worked back under the edge; one has a concave on each lateral margin. There are five rounded noses and one triangular nose. One keeled specimen is a rolled and heavily patinated elongate piece of chert 8 cm. long, bearing a sharply trimmed nose between two concaves at one end, but the chipped area is not patinated.

A series of what appear to be thin discoid biface implements (Fig. 77) are in reality core nuclei which have been skilfully knapped on both sides. They are from 3-4 cm. long, and have from two to four striking-platforms, those on one surface being at a different angle from those on the other; alternate flaking is shown by the flake scars where there is a platform at each end of one surface. Most of them bear secondary trimming on various parts of their margins.



Figs. 1-8.—1, *Worimi*. 2-4, 6-8, Uniface pebble implements. 5, Split pebble implement. (One-third natural size.)

*Nucleiform burinates*.—Two specimens, of which one is narrow and one is broad, are 3 cm. long, and a third one (Fig. 70) is 8 cm. long. The burinate edge is formed by one spall on two, and two spalls on the other one. The two short specimens bear trimmed scraper edges on their margins. They conform to the group classified by Noone (1934, S4, fig. 2, f) as A—spalled, VI—vertical spalls from margin and face, with horizontal platform.

#### *Uniface pebble implements.*

This forms an important group in the industry, and the series includes all varieties hitherto described in New South Wales. They are made of chert or quartzite, and show finer flaking and trimming than those from coastal sites where coarse materials were used in their manufacture; the steeply sloped working face is often heavily worked with long spall-scars and fine retouch, and the edge may be serrated or notched in outline when viewed from the lower surface. In shape they are round, oval, rectangular, and triangular, often flat on the lower surface and convex on the upper surface. Some are broad and long but comparatively thin, others are short, thick and squat, and some are as small as  $4 \times 4 \times 1$  cm. In thickness they range from 1 to 6 cm. Most of them are flat on both surfaces, and a few are keeled, thus retaining the original form of the chert pebbles. It is not possible to distinguish a crudely flaked from a carefully trimmed series because they all belong to the latter category. The end and lateral varieties predominate, and the other varieties are scarce. Remarks on the specimens, classified according to the working edges, are as follow:

*One lateral margin*.—The working edge is from straight to convex on twenty-three, and concave (Fig. 3) on six. One (Fig. 8) bears a broad nose, 3.5 cm. wide, with wide concaves on each side, in the middle of its trimmed margin, and one, triangular in shape, has a small rounded nose. 6–12 cm. long.

*End* (Figs. 2, 7).—The working edge, 2–10 cm. wide is from straight to convex on eight, concave or notched on six. Three have a well trimmed nose and a piercer-like projection. Six are triangular in shape. One (Fig. 6) has a keeled lower surface, and both margins of the V-shaped end are trimmed. 5–12 cm. long.

*One end and one or both lateral margins*.—Four are unilateral and end, one of which is a thick high-crowned lump with its trimmed margins at right angles to one another and is similar to a specimen from Port Kembla figured by McCarthy (1943, 136, Fig. 8a). Three are bilateral and end, and two are bilateral. Two bear concaves and a nose on the same margin. One is triangular in shape. 6–11 cm. long.

*Uniface*.—Two discoids (Fig. 4) trimmed all over one surface, 6 cm. in diameter, and made of chert. There is one *hache-courte*, or one end of a larger implement, which shows the characteristic technique of the *sumatra*-type; it is made of a grey igneous rock and is 7 cm. wide.

*Split-pebbles trimmed on edge of cleavage face* (Fig. 5).—Four are unilateral, three bilateral, and one lateral and end trimmed, and all have convex working edges. 10–14 cm. long.

## II. Blocks.

*Crown*.—Among those with from straight to convex (Fig. 76) working edges, eight are 3–6 cm., ten are 7–11 cm., and four, which have well trimmed semi-discoidal (Fig. 11) and discoidal edges, are 8–10 cm. long. One of the latter is rectangular, and is trimmed on adjoining margins. One (Fig. 22) is tongue-shaped, high-crowned, and trimmed along both lateral margins and distal end, with a plain butt-platform. Two are pieces struck from prismatic cores, one of which has a steep-faced working edge at one end, and the other has a trimmed oblique edge.

Those with concaves, which are 1–3 cm. wide, range from 4 to 15 cm. long, and form an irregular series. The concaves occur on semi-discoidal edges on several specimens. One tongue-shaped example has a long sloping face, and is trimmed all round its margins excepting the butt, and at the distal end there is additional trimming on the edge of the cleavage surface, thus forming a biface margin. The largest specimen,

15 cm. long, is oval and domed in shape, and has two step-chipped concaves, one 6.5 cm. wide and 3.5 cm. deep, the other 3 cm. wide and 1 cm. deep. Another domed specimen 7 cm. long has a shallow concave 3.5 cm. long.

The nosed series bear from one to three noses 0.5–3 cm. wide. One is of particular interest; it is a bean-shaped block, bearing at one end a sharp peaked nose, 0.5 cm. long, between two concaves each 1 cm. wide, and an additional nose forms the corner round which the trimming leads to the lateral margin. One (Fig. 75) is 5 cm. long, and has a narrow prominent nose 1.25 cm. long set between two deep concaves on its lateral margin. 5–10 cm. long.

*Keeled*.—The majority are longer than wide, but they do not conform to any particular or uniform shape.

Among those with straight to convex working edges seven are 3–7 cm., and seven 8–13 cm. long. Eight have semi-discoidal trimmed margins, two of which are oval and domed with two trimmed lateral margins, and are 7.5 and 12 cm. long. One (Fig. 10) is tongue-shaped, has a median keel and a plain butt, and is trimmed along both lateral margins and the distal end.

The concave series comprises eleven small blocks 4–7 cm., and eleven heavier lumps 7–15 cm. long. The concaves are 1–5 cm. wide, and extend the full length of the margin on some specimens; they occur mostly on lateral margins, but five are on end margins, while straight to convex trimmed edges occur on other parts of the margins. One narrow piece, 10 cm. long, has a concave 3 cm. wide worked into the distal end of its outer crust surface.

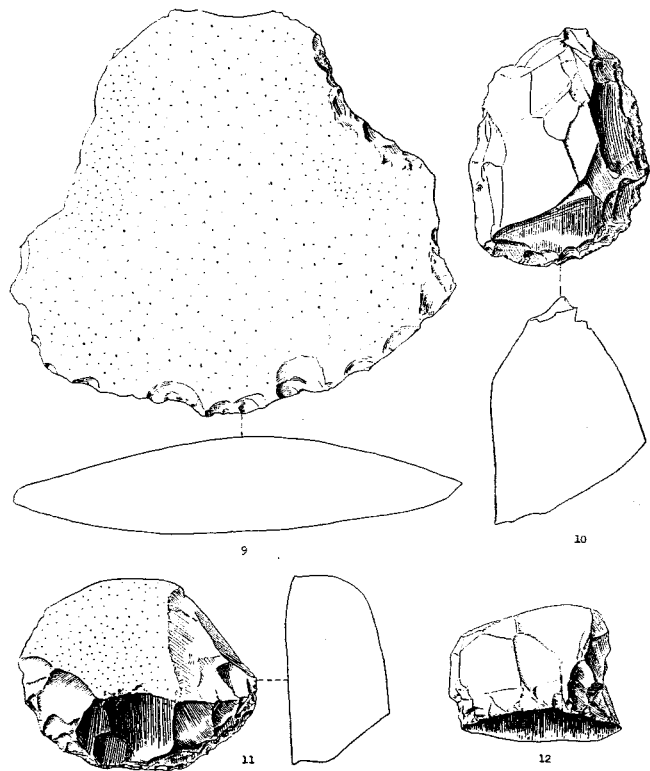
In the nosed series, from one to three noses are present, and they are either flattened, ridged or steeply convex on the trimmed surface. One, 7 cm. long, has a broad rounded nose on one end of its butt-platform. One is triangular, with two long trimmed margins leading to the nose and is of the borer type. The largest specimen is rectangular, has a median keel, its trimmed end and lateral margins form a right angle, and it bears two ridged noses on two corners. One has the trimming extended across the edge of the butt-platform to form a broad concave edge leading to a rounded nose 2 cm. wide. 4–8 cm. long.

*Worimi*.—Eight are normal blocks 7–11 cm. long, with the chord or thin margin trimmed from the cleavage surface along one lateral margin and end on six specimens, and on two lateral margins and end on the other two. One has ridged peaks on three corners which appear to have been used for graving, and several concaves. On three (Fig. 1), 8–13 cm. long, which have been quartered off large pebbles, there is an outer crust and an inner cleavage surface, and they are trimmed from the former; they are similar to the example from Crescent Head figured by McCarthy (1941, 24, pl. vi, fig. 11). Two have long slightly concave edges, and one has a broad concave beside an equally wide nose, each 3 cm. wide. One, which is 10 cm. square, has a deep concave 4 cm. wide, a trimmed nose 1.5 cm. wide, and another concave 2 cm. wide in that order on the same margin. One, which is 7.5 cm. long, has a notched edge of three noses and four concaves on its lateral margin and a trimmed convex edge on the adjoining end.

It might be mentioned that the *worimi* is a chopper of triangular section, usually made from a block. Its relationship to the lateral-edged uniface pebble implement has been discussed by McCarthy (1943, 138–9). Some specimens bear a superficial resemblance to the *elouera*, and it is not possible to distinguish the two groups by minimum and maximum dimensions; the essential difference is that the *worimi* is a chopper and its principal working edge is the chord or thin margin, whereas the *elouera* is a scraper-knife tool with the most pronounced trimming on one or both edges of its thick margin.

## III. Cleavers.

There are several interesting pieces in this series of large slices knapped from pebbles. Two have evenly trimmed convex edges, one is serrated and concave, and one is notched, in a group 8–10 cm. long. A large oval specimen 14 cm. long has a flaked and trimmed convex distal end, one of the same size has two concaves on its lateral margin.



Figs. 9-12.—9, Tanged cleaver. 10, Keeled block, double side and end trimmed. 11, Crown block, semi-discoidal edge. 12, Conical core. (One-half natural size.)

and one 11 cm. long is a discoid cleaver. One has the outer edge of its butt-platform trimmed, and a concave on the adjoining margin.

The most interesting specimen (Fig. 9) is tanged in shape, 15 cm. long and 3 cm. thick; the trimming extends round the broad concaves on each side of the tang, which is 8 cm. wide, and across the convex blade end, which is 17 cm. wide. The trimming is done from the inner or cleavage surface on one margin of the tang, and from the outer or crust surface on the other margin; the same reversal of trimming occurs on the blade end. It weighs 1 lb. 6 oz. Although in outline this specimen resembles the tanged implements described by Casey (1934), it does not belong to this group, which are all coroids and much heavier. They are, in addition, finished off by hammer-dressing and polishing, and it is obvious that this specimen was not intended to be treated so carefully.

#### IV. Normal Flake and Blade Implements.

The chert and jasperoid rocks predominate among the materials used in this group.

##### Scraping and Cutting edges.

*Elouera*.—The three varieties defined by McCarthy (1943, 139-40, figs. 17-19) are evenly represented in the series. Scraper trimming is present on the chord (Fig. 19), which is often slightly concave, on forty-five specimens, a relatively high proportion, of which there are fifteen in each variety. Knife and saw edges are present on this margin on the majority of the remainder. Secondary uses are limited to concave and nosed edges. Remarks on the varieties are as follow:

(1) One of chert, 7 cm. long, is heavily retouched along both edges of the thick margin. Three have concaves on the edge of the thick margin. Ten are less than 3 cm., the balance up to 7 cm. long.

(2) Five have concaves on the thick margin and one on its distal end. Several (Fig. 16) have scraper trimming limited to the distal end, but show knife use on the chord. The largest *elouera* (Fig. 13) of the collection is in this group; it is 8.5 cm. long, of equilateral triangular section 3 cm. wide, notched and scraper trimmed on the chord with a concave in the middle, and the butt is rounded but not trimmed. Another specimen has three notches on the chord. Seven are less than 3 cm., the balance up to 8.5 cm. long.

(3) On six specimens is a narrow, rounded edge formed by long narrow spall-scars at the distal end, which could have served as a nosed graver. One has a concave on the outer edge, and one on the inner edge, of the butt-platform. One (Fig. 15) has a trimmed nose and concave at the distal end. One has a concave on the distal end. One is hat-shaped in outline. One (Fig. 14) has concaves on both margins. Ten are less than 3 cm., the balance up to 7 cm. long.

*Utilized*.—The flakes and blades in this group exhibit scraper and knife use on various parts of their margins. Six are blades. The largest example is oval and has an outer crust surface. One is like a broad, flat *elouera* and has a long knife margin, with serrated trimming on the opposite and thicker margin. One is a blade 4 cm. long with one knife and one scraper margin. None has a faceted butt. There is a concave on one thin blade, 4-9.5 cm. long.

##### Scraping edge.

*Side*.—A mixed series of blades and scrappy flakes, some of which are thick, and many are well used and carefully retouched. Seven (Fig. S3) are abrupt trimmed blades 3-5 cm. long. One (Fig. 17) is a segment with a crust back. Only four have faceted butts. Forty are less than 3 cm., the balance up to 7 cm. long.

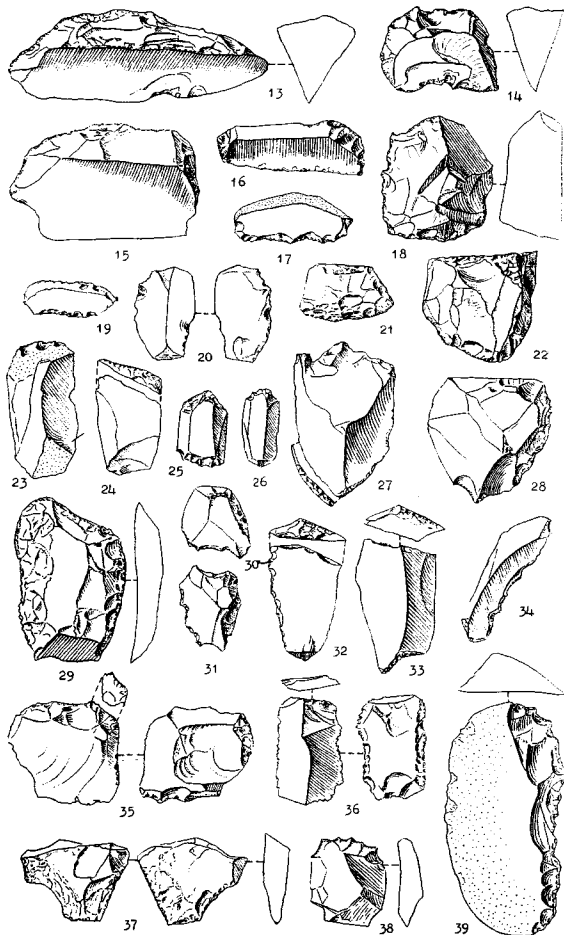
*Side and end*.—Nondescript flakes have been utilized in this group. One keeled specimen (Fig. 18) has a nose-like corner. One has a faceted butt. This group is well represented among the concave and nosed scrapers. Three are less than 3 cm., the balance up to 7 cm. long.

*Double side*.—Nineteen have both lateral margins trimmed from the inner face, and four of these are pointed flakes. Six (Fig. 20) are trimmed on one margin from the inner face and on the other margin from the outer face. One is a plunged flake trimmed from the outer face. None has a faceted butt. Six are less than 3 cm., the balance up to 5.5 cm. long.

*Double side and end*.—Eleven are tongue-shaped, three semi-discoid, two trapezoid, and four irregular flakes. The majority are thus carinate scrapers. One has one concave lateral margin and end worked from the inner face, and the other lateral margin is worked from the outer face. Several bear tiny noses. Two have faceted butts. Three are less than 3 cm., the balance up to 8 cm. long.

*Distal end*.—In the straight-edged series the trimmed margin is transverse (Fig. 23) on the majority, and oblique (Figs. 24, 78-81) on twenty-six specimens, the latter forming a well marked variety. Five are less than 3 cm., the balance up to 6 cm. long.

In the convex-edged series (Fig. 28) three are duckbills 2-5.5 cm. long, and seven (Figs. 25-26) are microlithic thumbnail scrapers. One (Fig. 21) is a semi-discoidal *tulu* type, 3 cm. wide, and it has a steep-faced, step-chipped working edge wider than the



Figs. 13-39.—13-16, 19, *Elovera*. 17, Side scraper. 18, Side and end scraper. 20, Double-side scraper. 21, *Tulu*. 22, Side and end trimmed block. 23-28, Distal end scrapers. 29-32, Butt end scrapers. 33, 35, Double end scrapers. 34, 36, 39, Serrated blades. (Two-thirds natural size.)

butt-platform. One ogival-shaped example (Fig. 27) is worked from the inner face half-way to the middle of the end, and from the outer face along the other half of the margin. A series of specimens with faceted butts includes five elongate narrow blades; the trimmed distal end is straight on two, oblique on two, convex on two, and concave on two. Eighteen are less than 3 cm., the balance up to 7 cm. long.

**Butt end.**—Eight are trimmed, two obliquely (Fig. 32) on the inner edge of the butt-platform. Thirteen are trimmed on the outer edge (Fig. 30), and although some of them have faceted butts, they appear to bear additional retouch and signs of use. One has the trimming at the upper edge of the scar-face adjoining the butt-platform, and the edge is concave. One (Fig. 29) is beautifully trimmed along both lateral margins, which are straight, and on the inner, slightly concave edge of the butt-platform; it is 5 cm. long. Five are less than 3 cm., the balance up to 8 cm. long.

**Concave.**—Only four have faceted butts. Some are segments with a crust back. The variation in the widths and depths of the concaves indicates a wide range of uses, and the various kinds are shown in Figures 40-48. Remarks on the varieties are as follow:

(a) **Lateral margin.**—Thirteen have the concave on a thin margin, but on the majority of these it is worked back to form a thick, strong edge. Several concaves are on delicate flakes. Seven have the concave adjoining the butt-platform (Fig. 41). The concaves range from 0.5 to 3 cm. wide, and up to 0.75 cm. deep. Some are on blades, but the majority are on nondescript flakes. Many bear additional trimmed convex and straight working edges. Ten have two concaves on the same or on opposite margins (Figs. 40, 46-47). One has a long trimmed convex edge between two concaves. Ten are side and end scrapers in addition to their concaves. Eleven (Fig. 45) are less than 3 cm., the balance up to 7 cm. long.

(b) **Distal end.**—Twelve blades (Figs. 42, 44) have narrow concaves from 0.5 to 1 cm. wide, with peaks on both sides, occupying the whole of the end margin, and on one of these the concave is 2 cm. wide. Fifteen have concaves up to 2 cm. wide on a longer end margin, five of which are broad blades; one of the latter is a rhomboid, with a narrow concave in the middle of the distal end. Four are side and end scrapers in addition to their concaves. One large flake, with crust outer surface, 9 cm. long, has a concave 2 cm. wide. Several are blades with a faceted butt and distal end concave. Nine are less than 3 cm., the balance up to 4 cm. long.

(c) **Lateral margin and distal end.**—Most of the concaves are about 1 cm. wide, but two are 2.75 cm. One (Fig. 43) is a narrow blade, with a concave 2 cm. wide across the distal end, and it has another one of the same width on its lateral margin. One has three concaves on one lateral margin, and one on the distal end. One has a concave on each of three of its four margins. The twelve examples are mostly irregular flakes. Five bear three or more concaves scattered round their margins. Six are less than 3 cm., the balance up to 5 cm. long.

(d) **Butt end.**—Six (Fig. 30) have the concave on the inner edge, and one on the outer edge, of the butt-platform. The concaves range from 1 to 1.5 cm. wide. Three have trimmed straight or convex edges at the distal end. Three are less than 3 cm., the balance up to 4.5 cm. long.

(e) **Double end.**—Five specimens of small size, 2-3.5 cm. long. One (Fig. 33) has a concave on the distal end and an oblique straight edge on the outer edge of the butt-platform. Two have a concave on the inner edge of the butt-platform, one of which has a trimmed straight edge, and the other a concave with two small noses, at the distal end. One has a concave on the outer edge of the butt-platform and a trimmed straight edge at the distal end, and it is wider than long. One has a concave at each end, but it is a poorly shaped rounded flake.

An exceptionally interesting specimen (Fig. 35) is almost square in shape, and 3 cm. long. The butt is 1 cm. thick, and is formed by two converging and faceted edges of scar-faces, one of which is heavily trimmed from the outer face, and the impact spot is opposite their junction. One lateral margin is a knife edge, and the other lateral margin and distal end are scraper-edges trimmed from the inner face.

*Nosed.*—The nose is triangular on thirty-four specimens and is rounded on the balance. The types of noses are shown in Figures 33, 49–56. Sixty-two have one nose, and the remainder two or more. Only twelve are blades, the others being irregular flakes. On two the trimmed margin is almost completely discoidal, and on ten it is semi-discoidal (Fig. 33). Three are thick flakes with a rounded nose forming their distal ends (Figs. 49–50). One (Fig. 52) is a carinate scraper with two noses. Two (Fig. 51) have long narrow noses projecting from the lateral margin and are of the borer type. One has noses, bounded by pairs of concaves, at each end of a trimmed straight margin, and two more noses separated by a concave at the opposite end. One resembles a specimen from Lake Illawarra (McCarthy, 1943, 143, Fig. 30); it is an elongate tapering blade, with a nose at the apex, and two small flakes have been removed at the base of the nose, the latter being 0.75 cm. wide and long and suitable for boring use. The nose projects up to 0.75 cm. from the margin, but on the majority up to 0.5 cm. only. Some bear untrimmed sharply-pointed projections in addition to the nose. Twenty-five are less than 3 cm., the balance up to 10 cm. long.

A distinctive variety has a straight-edged rectangular nose (Figs. 55–56) projecting sharply from the margin, with the usual concaves on each side; the working edge is straight, 0.25–1 cm. wide. There are nine examples of this variety, and five are on blades. The type also occurs on the south coast of New South Wales (McCarthy, 1943, 143, fig. 35).

It might be mentioned that projections from the margins of implements are utilized for noses by simple trimming, but where they are not available it is necessary for the workman to form a nose by making two concaves and trimming the projection between them. If the nose was used for engraving, the concaves would enable it to penetrate more deeply into the wood. The large numbers of concave and nosed tools suggest that the industry was the product of a people who used wooden weapons, utensils, and other articles.

#### *Piercers.*

One is a ridged thumbnail scraper with a tiny point on a semi-discoid edge. One (Fig. 60) has a point at one end between two oblique concaves, and an oblique concave at the other end with a piercer point on the corner. One is of *elouera* shape, has a piercer point on one corner, two concaves with a sharp nose between them, and a rounded nose on the other corner; its lateral margin is trimmed. The finest example has a long narrow piercer in the middle of its convex lateral margin (Fig. 59). Ten are short, triangular points similar to the nose but definitely of the piercer type, and apart from one blade are irregular flakes. Two (Figs. 57–58) are elongate pointed blades trimmed on both oblique margins leading to the distal end; one of these is roughly serrated, and has a concave on one margin. One is an oblique trimmed blade, 3.5 cm. long, with a concave serrated thin margin, and the trimming on both lateral margins meets at the distal end to form the piercer point. Six are less than 3 cm., the balance up to 5.5 cm. long.

#### *Burinates.*

The range of types is similar to that from the south coast of New South Wales (McCarthy, 1943, 143–4, figs. 96–103), but there are none among the *bondi* points. The classification followed is that of Noone (1934).

##### *A. Spalled.*

(1) *Central (bec-de-flute)* (Fig. 61):—A perfect example on which two oblique spalls, one on each side, form the working edge. 4 cm. long.

(5) *Concave*:—Concave spall opposed to concave spall. Three examples are on narrow blades, and the burinate edge is formed by one spall. One (Fig. 62) is a double, and has the burinate edge at one end formed against a flat surface. 4.5–6 cm. long.

##### *B. Scaled.*

(1) *Bevel-scaled*:—Oblique line of scales opposed to vertical spall. One (Fig. 63), 3 cm. long, is formed by one spall. The other one (Fig. 64), 4 cm. long, is formed by

one spall also, and is a double, with several shortened spalls forming the edge at the other end.

(5) *Concave-scaled*:—Concave line of scales opposed to vertical spall (Fig. 65). A series of seven specimens 3–5 cm. long. Six are formed by one, and one by two spalls. The spall runs the full length of the face on two, and ends in a jag-like ledge on the other five. The concaves are shallow on the majority and are 1–1.5 cm. wide. Two are nuclei utilized for burinate purposes.

(6) *Rostrate-scaled*:—Vertical line of scales opposed to convex spall. The only specimen (Fig. 69) is a particularly fine example 4 cm. long. It has a shallow concave 1 cm. wide against which the spall has been knapped.

(8) *Counter-scaled*:—Scale opposed to scale. One (Fig. 68), 3 cm. long, is trimmed on its lateral and end margins, and the burinate edge is formed on the corner between them. The other one (Fig. 67) is 6.5 cm. long, and on one surface two spalls have been removed in addition to the counter-scaling.

There are in addition four utilized burinates, two spalled and two scaled, 2–4.5 cm. long.

#### *Cutting edge.*

There is a small number of knives from Singleton in comparison with south coast stations (McCarthy, 1943, 144), but the cutting edges on the *elouera bondi* points, and other implements are to be noted.

Among the knives, eighteen are blades, and twelve are pointed. Nine have faceted butts, and five are asymmetrical segments with crust backs. Sixteen are less than 3 cm., the balance up to 9 cm. long.

Among those with a serrated edge (Fig. 34), nineteen are lateral, with their longest margins serrated, seven are end, one side and end, and three double side and end. One of the latter is pointed, and another (Fig. 36), which is rectangular, is very finely and carefully toothed right round its periphery, the trimming being done from the outer face. On five the serrated edge is saw-like, and tiny squills have been removed from both facets of the edge. One (Fig. 39) is an elongate-oval blade, 8 cm. long, with a crust outer surface, and a steep-faced concave serrated edge. Another one, 6 cm. long, has a notched serrated lateral margin, steeply worked. Four have faceted butts, and five are asymmetrical segments with crust backs.

#### *Fabricators.*

Only eleven specimens were collected, even though a careful search was made for them, and it is difficult to understand why they are so scarce in this industry. It is apparent that they were used for a purpose of greater importance, or of a commoner nature, on the south coast of New South Wales where they occur in comparatively large numbers (McCarthy, 1943, 132, 145), than in the Singleton district. Four bear one trimmed lateral margin, and one of these has a rounded nose on a corner, in addition to the fabricator edge. Two have faceted butts. Five are of the punch variety. One, with a faceted butt, has a gouge-shaped fabricator edge at the distal end. One is made of quartz. One (Fig. 37) has two concave fabricator edges separated by a short straight edge of the same type.

An unusual specimen is a large crescentic flake of chert with a faceted butt. Heavy trimming, more in the nature of fabricator use, extends around one edge of the curved lateral margin for one-third of its length, and along the balance of this margin along the other edge. The chord is partly serrated. 9 cm. long.

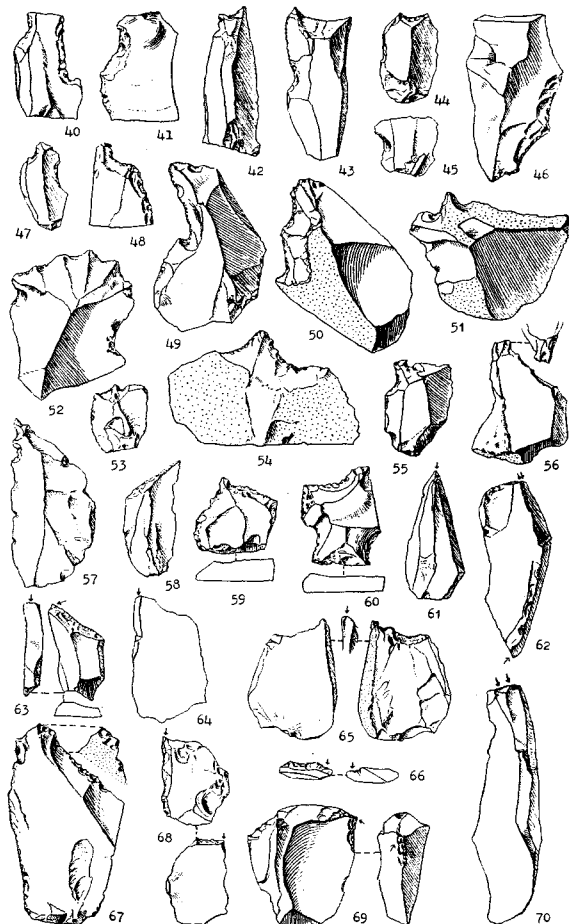
#### **V. Bondi Points.**

The series conforms in all respects to that of the south coast of New South Wales (McCarthy, 1943, 145–49, figs. 37–69). Narrow blades predominate in comparison with the broad and rudder forms.

*Conformation.*—Finished points with triangular transverse section are more numerous than those with trapezoidal section. Curved blades are poorly represented,

perhaps because of the homogeneous and easily worked materials. The butt end is up to 2 cm. wide. Points trimmed on the left margin, when the inner face is downwards, are more numerous than those trimmed on the right margin.

*Method of trimming.*—Study of the Singleton series has revealed additional evidence in regard to the manner in which the points were made. McCarthy (1943, 147) pointed



Figs. 40-70.—40-48, Concave scrapers. 49-58, Nosed flakes and blades. 57-60, Piercers. 61-70, Burinates. (Two-thirds natural size.)

out that the trimming was begun at the distal or point end on the inner edge (on the majority), or on both edges. The butt was either plain or faceted, or on a minority it was trimmed, thus leaving a section of plain edge along the margin. The usual practice then was to extend the trimming along the inner edge to the plain or faceted butt, and, finally, to trim the butt to a rounded shape to complete the point. Thus were produced two varieties: (a) a completely trimmed single-edged point, and (b) a point trimmed completely along the inner edge, and at the distal end on the outer edge also. Finally, the trimming on the (b) variety was completed along the outer edge and round the butt to make a completely trimmed double-edged point. As shown by the table, plain and faceted butts were often left untrimmed. The faceted butt may be wedge or trapezoid in shape. The well marked varieties of *bondi* points produced in the above manner were probably all used, although some constitute stages in the manufacture of the ideal or standard forms (McCarthy, 1943, 148, figs. 49-51). Exceptions to the above procedure in trimming are very few, one being occasional points trimmed at the butt end only.

*Partly trimmed.*—As shown in the table, all varieties are represented, but (b), (f) and (g) are scarce in the industry. Two specimens are trimmed at the butt end only. The series includes eighteen broad blades, 1.5-2 cm. wide, and up to 3.5 cm. long, nine of which are trimmed on one edge only. The rudder form is fairly common. One exceptional specimen has a trimmed butt, quite straight and at right angles to the margins, is 1.5 cm. wide, has an oblique shallow concave edge 2.25 cm. long, and is trimmed partly down the chord.

*One edge trimmed* (Figs. 84-92).—The series ranges from tiny narrow to broad blades 1.5 cm. long, to elongate narrow and broad blades 7.5 cm. long. There is only one specimen of the maximum length, the margin of which is lightly trimmed (Fig. 84), and it constitutes the longest *bondi* point yet recorded. Narrow blades predominate in this group. The majority have a convex and neatly trimmed margin, and a number bear humps not flattened out in trimming. One (Fig. 88), 1.75 cm. wide and 4.25 cm. long, has a trimmed nose on the corner of its butt and two tiny triangular projections along the thick margin. One (Fig. 92) has a nose in the middle of its trimmed margin. The trimming extends round the butt to the chord edge on a few specimens (Fig. 89). One has three small concaves round its butt end, and several (Figs. 86-87) have concave butts.

*Two edges trimmed* (Figs. 93-97).—There are many beautifully fashioned points in this group, on which the thick margin is flattened or rendered slightly convex by the trimming, so that they are very neatly backed. On the majority the outline of the trimmed margin is from straight to convex. One is of quartz and is 2.75 cm. long. Three have a convex distal end and a prominent point useful for piercing. The longest specimen is figured (Fig. 95), and it is the largest example of the type yet recorded. On many specimens in this group the butt is faceted on the outer edge and trimmed on the inner edge. The trimming extends round the butt to the chord edge on some specimens. The series ranges from 1.25 to 6.5 cm. long.

*Two margins trimmed.*—Fourteen specimens bear partial trimming on the chord, but none for its full length. One (Fig. 98) is a piece of very fine and hard chert trimmed along both lateral margins; the distal end is an oblique edge, 0.25 cm. long and lightly squilled. The butt bears a shallow concave on one side, a curved trimmed edge extends half-way across to where a piece has been broken off, and this concave edge is lightly trimmed. It is, in general terms, a bilateral symmetrical point, 3 cm. long, 1.75 cm. wide at the butt.

*Three edges trimmed.*—Fifteen specimens bear partial trimming on the chord in addition to the trimming of the two edges on the thick margin or back, but only one is trimmed along the full length of the chord.

*Butt.*—The butt is trimmed on the majority, as shown in the table, but attention is drawn to the difficulty of distinguishing faceted butts on the double-edge trimmed points on which the faceting is often effaced in the shaping of the butt; the faceted butt is thus commoner in this group than the table indicates.

Several very long points have a trimmed straight-edged butt, steep-faced, and at right angles to the margins. One has a semi-concave butt, two have shaped butts in the form of a nose, and the fluted butt of triangular shape (McCarthy, 1943, fig. 59) is well represented. Among the single-edged trimmed series five have transverse right-angled butts (Fig. 89). The pointed butt is common, there being sixty examples (Figs. 85-86).

*Thin margin use.*—The use of this margin ranges from primary squilling due to knife use to a saw-like edge, and trimming or scraper use which includes tiny concaves. One broken point has a trimmed nose on the corner of this margin.

*Piercer use.*—Trimming on the chord at the distal end in addition to that on the thick margin is present on twelve specimens only. The fact that so few *bondi* points are trimmed in this manner, both at Singleton and on the south coast of New South Wales, indicates that it was done for a special purpose, and was not merely intended to strengthen the point. The most probable use would be for puncturing the skin in connection with the letting of blood during ceremonies.

*Sizes.*—The following is an analysis of the lengths of the complete points, the balance lacking the distal end: 0-2 cm., 60; 2-3 cm., 157; 3-4 cm., 71; 4-5 cm., 41; 5-6 cm., 10; 6-7 cm., 4; 7-8 cm., 2. Those between 2 and 3 cm. are in the majority, and those less than 3 cm. definitely predominate, as on the south coast of New South Wales (McCarthy, 1943, 133, 149).

A large number of broken points were found on the surface, damaged by the cattle grazing over the paddocks; one of us (F.A.D.) has dug out large numbers of complete points, but has not found any broken ones in the deposit.

#### VI. Geometrical Microliths.

The geometrical microliths, comprising 245 specimens, constitute a more important group in this industry than on any of the south coast stations, where the highest total of sixty-six was for North Cronulla (McCarthy, 1943, 133). In addition, a total of 163 normal flake and blade implements, and 217 *bondi* points (including 14 of the rudder variety and 33 oblique trimmed blades) are less than 3 cm. long. Most of the geometrical microliths are well made, with evenly trimmed margins, and although irregular and humpy trimming occurs, the series is well developed. The pieces are usually trimmed on the inner edge of the margin, and the trimming often extends to the other edge, as on the *bondi* points.

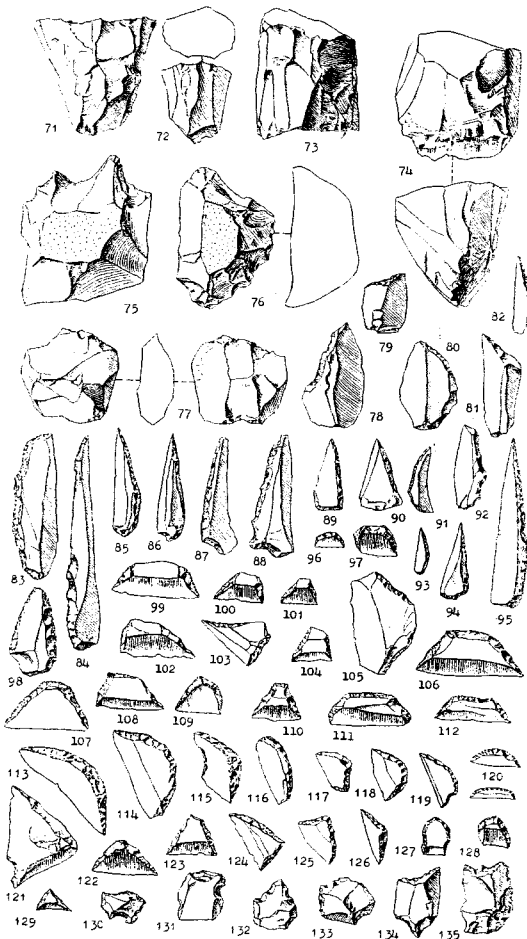
*Conformation.*—They are made from bladelets of either trapezoid or triangular transverse section broader and shorter on the average than those used for *bondi* points.

*Trapezoid.*—The type forms the most numerous series in the industry. There are two varieties, distinguished by the trimmed or untrimmed short parallel lateral margin. In both varieties are four main shapes, as follow: (a) elongate, including both symmetrical and asymmetrical forms; (b) medium, a symmetrical form in which the short parallel lateral margin is often the same length as the trimmed end margins; (c) short, including both symmetrical and asymmetrical forms, often broader than long; (d) one trimmed end margin is at right angles to the lateral margins. The proportions vary from elongate and narrow to short and broad, and a minority are as broad as, or broader than, their length. The (a) variety predominates, the (b) variety being scarcer than (c) and (d).

There are sixty-six specimens (Figs. 99-105) with the shorter parallel margin untrimmed. One exceptional example (Fig. 105) is 5 cm. long and 2 cm. wide, but has both pointed ends missing. There are four of the (d) variety. 1-3.5 cm. long.

There are fifty (Figs. 106-112) with the shorter parallel margin trimmed. The asymmetrical form is in the majority, and there are very few specimens of the symmetrical type. Nine have the shorter parallel margin defined by a sharp-edged peak (Fig. 108) at one or both ends. On two the two oblique end margins are concave (Fig. 110), giving them a tanged shape. 1-2.75 cm. long.

*Segment* (Figs. 113-120).—Most of the specimens are pointed at each end, but several are rounded and blunt. They are longer on the average than the other



Figs. 71-135.—71-74, Cores. 75, Nosed block. 76, Semi-discoidal block. 77, Biface discoid core implement. 78-82, Oblique trimmed blades. 83, Abrupt trimmed blade. 84-95, *Bondi* points. 96, Point trimmed on two margins. 99-112, Trapezoids. 113-20, Segments. 121, 123, Equilaterals. 122, 124-25, 129, Scalenes. 126, Isosceles. 127-28, Hat-shaped. 130-35, Special pieces. (Two-thirds natural size.)



geometrical microliths. In shape they vary from long and narrow to short and broad, and some are semi-circular. The chord is straight on all but one, the only crescent in the series. Two have a concave near one end of the chord (Fig. 115). One has two trimmed edges on the butt, which is faceted, and its chord is heavily worked, especially where it joins the edge of the butt. 1.75-4 cm. long, and 0.75-2 cm. wide.

*Scalene* (Figs. 122, 124-25, 129).—The junction of the two trimmed margins consists of a peak on one edge, or a sharp ridge extending from inner to outer face; this area on a minority is rounded. The series vary from elongate and narrow to short and broad forms. The most remarkable microlith (Fig. 124) in the collection is of the bracket type; its slightly convex trimmed margins joined by a prominent peak, and it is very carefully fashioned. 1-3 cm. long, three being 1 cm. only.

*Equilateral* (Figs. 121, 123).—A uniform series in which the two trimmed margins meet, on all but one specimen which is rounded, in a peak or ridge from inner to outer face. All are less than 1.5 cm. long.

*Hat-shaped* (Figs. 127-28).—Two specimens only, one of which is twice as wide as it is long, being 0.75 cm. long and 1.5 cm. wide.

*Isoceles* (Fig. 126).—Three are very narrow, only 0.7 cm. wide, in relation to their length, and seven are 1-1.5 cm. wide. One has a deep concave trimmed edge 1 cm. wide on its chord margin. One has a trimmed oblique end. 1.5-2.5 cm. long.

*Oblique trimmed blades* (Fig. 79).—The thirty-three examples are included in the total of *bondi* points, but as they appear to be distinctive and not intended to be made into points, they are included here. They are 1.5-3 cm. long, and up to 2 cm. wide. The trimmed oblique edge may be concave, straight or convex. Those more than 3 cm. long are included with the distal end scrapers.

*Discoids* are not represented.

*End or thumbnail* (Figs. 25-26).—There are only twenty-two distal end scrapers in the normal flake and blade group less than 3 cm. long, and of these five are duckbills. The majority are flattened, but some are high-crowned.

*Micro-burin*.—An example (Fig. 66) of the stigmatate type (Campbell and Noone, 1943, 294, figs. 37-41), 2 cm. long and 0.75 cm. wide. It has several trimmed concave edges on the same margin as the stigmatate.

*Special pieces*.—One (Fig. 132) is a symmetrical piece 2 cm. long, with a pronounced shoulder on one margin. One (Fig. 130) is a tiny piece 1.5 cm. long, with a convex-edged nose, and two pointed projections on its margin which is trimmed all round. One (Fig. 134) is a pointed oblique trimmed blade, trimmed on both margins of the point, with a straight faceted butt trimmed on its inner edge; it is 2.5 cm. long and 1.5 cm. wide.

One (Fig. 131) is a miniature blade 2 cm. long with a concave and nose on one corner. One (Fig. 135) is an *elouera*-like piece 2.5 cm. long, trimmed on one edge of the thick margin and butt-end, and on the distal end are two sharp piercer-like projections and a rounded nose separated by concaves. One (Fig. 133) is a rounded piece 2 cm. long, with a pointed crown on its upper surface, a concave and a piercer on the margin.

*Sizes*.—An analysis of the lengths of the geometrical microliths, with the exception of the oblique trimmed blades included with the *bondi* points, is as follows: 0-1 cm., 6; 1-2 cm., 157; 2-3 cm., 63; 3-4 cm., 13 (nine segments and one trapezoid); 4-5 cm., 4 (two segments and two trapezoids).

#### VII. Glass Implements.

The aborigines are known to have used glass obtained from the white man in various parts of Australia, especially in the Kimberley district. Backhouse (1843, 432) illustrated a death-spear armed with a single row of glass chips that he saw a native carrying near the Cambewarra Mountain, south coast of New South Wales. A large series of glass implements was collected at Singleton, the glass varying from 0.5 to 1 cm. in thickness, and comprising green, brown, blue, amber and white shades of colour. Patches of broken bottles, among which are the implements, were found in isolated localities, especially beside the railway line, river bank, the branch road through

Gowrie, near tree stumps, and along the margin of the terrace. None appeared to be embedded with the stone implements, nor have we dug them out from under the surface, but some pieces were stuck in the surface of the clay as a result of rain softening the ground. It should be pointed out that basic Australian stone flake and blade types are reproduced in the glass and other materials which are known to have been used in the Singleton district by the aborigines after contact with the early settlers. The fact that concave and nosed tools are so common in glass indicates that the most recent natives used much the same kinds of knapped implements as their terrace ancestors. No *bondi* points or geometrical microliths in glass were found. The series comprises side, end, concave and nosed scrapers, and piercers, a description of which is as follows:

*Side*.—Both straight and convex edges are well represented, and the nondescript fragments of glass used have from one to three trimmed margins, comprising side, side and end, double side, double side and end scrapers. The trimming is from either the concave or convex surface of the glass. One has two trimmed margins at right angles to each other, the corner where they meet being suitable for piercing work. Many of these specimens, and other pieces showing no signs of use, no doubt served as knives. 2-7 cm. long.

*End*.—The end of an elongate, narrow piece of glass is trimmed, and this restricted working edge varies from straight to convex. Two are trimmed on the outer edge of one end, the spall-scars extending down the convex surface as though for use in the same manner as a plane. One of the nosed scrapers has the same type of edge. 2-6 cm. long.

*Concave*.—A splendid series of examples, well used and heavily chipped. The concaves are 0.5-2.5 cm. wide, and up to 1 cm. deep. There are as many as three on the one piece of glass, and pairs are common. 2.5-6.5 cm. long.

*Nosed*.—Twelve have broad rounded noses, and five have narrow noses. The noses have the usual pairs of concaves bounding them, and on one lacking them the nose is on the end. Four have the nose on a corner, and three on an end. 2.5-6 cm. long.

*Piercers*.—The projections are narrow and carefully trimmed, with a concave on each side, and differ from the nosed type only in the sharply pointed and prepared piercer. There is one piercer on each specimen only, four at the end, three on the corner, and one on a lateral margin. One small example, 3 cm. long, is trimmed all round; it is elongate hour-glass in shape, with two small rounded noses worked from the concave surface of the glass on the same margin as the piercer, and a deep concave working edge worked from the convex surface on the opposite margin.

*Other materials*.—A number of fragments of crockery and insulator appear to have been used as scrapers, and are 2.5-3 cm. long. A piece of grey roof-slate, 10 cm. long, irregular trapezoid in shape, has its longest margin serrated for 7 cm., the serrations being small and close together.

#### Affinities.

The Singleton material belongs to the *elouera* industry, and agrees very closely in composition with the south coast stations, especially north Cronulla (McCarthy, 1943). The *tula* adze-flake, symmetrical point, and thirty *arapia*-like normal flake and blade implements and blocks are the only similarities with the industries of the interior, but they are considered to be fortuitous and of no cultural significance. The abundance of geometrical microliths supports the contention of McCarthy (1943, 151) that the *elouera* industry is a variant of the microlithic or *bondi* culture.

Miss L. Hall's study (1928) showed that all elements of the *elouera* industry excepting the geometrical microliths occur at Morna Point and Anna Bay, where grey chert and porphyry are the materials used. The industry is found throughout the Newcastle district, at the mouth of the Hunter River, and although the Australian Museum possesses a few geometrical microliths from this area, they appear to be scarce; grey chert is the principal material. The Singleton phase of the industry is found at Bulga, some fifteen miles to the south on Cockfighter Creek, where one of us (F.A.D.) has collected the implements on eroded patches of soil similar to the Singleton stations. It would be interesting to know whether the industry occurs on the terrace both lower

down and higher up the valley than Singleton, and also along the Goulburn and other tributaries wherever the terrace exists.

A matter of some importance is that both mortars and edge-ground axes are practically absent at Singleton—none of the former have been collected, and only one edge-ground blade which was found about half a mile from the main collecting site at Gowrie. One of us (F.A.D.) has suggested that the absence of mortars may be accounted for by the lack of seed and nut foods at Singleton, because mortars are found in association with the Kurrajong tree and the *Macrozamia* palm, on the slopes of the sandstone ranges near Bulga, and are used in the preparation of their seeds for food. The edge-ground axes present a different problem. They are ploughed up at Bulga, Belford, Milbrodale, and Maitland, and axe-grinding grooves *in situ* occur in the bed of Leonfield Creek, near Greta (Enright, 1936, 23) and at Bulga. These localities are all within thirty miles of Singleton, and the contention might be raised that they were axe-making centres because suitable pebbles and grinding stone were available, and that Singleton was a knapping site only; such an assertion, however, fails to explain why axes are not found in the latter district at all. Had they been in use by the natives who roamed over the alluvial flats, now under cultivation and used for dairying purposes, examples would most probably have been found. In the opinion of old residents near Singleton, the flood depositions of the Hunter River since the days of the aborigines, about one hundred years ago, have not been sufficient to bury axes too deeply for them to be turned up by the plough, and the only floods that appear to have risen to this level are those of 1897 and 1929. In addition, we could expect to find axes embedded in the terrace in association with the knapped implements or to be eroded from it had they been made or used by the same people. Thus a reasonable conclusion to reach appears to be that the knapped implements herein described are not associated with edge-ground axes.

Fawcett (1898, 153, 180) stated that fifty years previously, in about 1850, the weapons and implements used by the Wonnah-ruahs consisted of the ordinary spear, multi-pronged fishing spear, spear-thrower, clubs, shield, returning and non-returning boomerangs, tomahawks or hatchets made of a rudely sharpened stone of a hard dark colour, which was first chipped out and then ground to an edge, and fitted to a handle, knives made of flint used for cutting up meat, chips of flint or shells used in skinning animals, yam-sticks, bags made of plaited swamp-grass, nets, wooden bowls up to three feet long, and bark canoes. Their clothing consisted of cloaks made of opossum skins sewn together, a girdle, and *Nautibus* shell necklet. No indication is given of whether or not the author actually saw these natives with hafted stone axes, and using the flakes, or whether he surmised that they did. There is every reason to believe, therefore, that the natives whom the first white settlers and explorers met had an axe culture and used shells.

Only one *hache-courte*, or one end of a *sumatra*-type uniface pebble implement, is indicative of any *Kartan* cultural influence at Singleton, but implements of this group occur in abundance at Bulga. The uniface pebble implements at Singleton demonstrate an adaptation of the technique to local materials.

No other stone culture has been found near Singleton. It has been shown that axes are lacking, and one of us (F.A.D.) has searched extensively over the flats, but has not come across any other artefacts. The possibility must not be overlooked that the natives merely hunted in the area and camped elsewhere, but this is improbable in view of the game and fish available. Fawcett (1898, 152) stated that the Wonnah-ruah tribe consisted of between five and six hundred natives in a tribal district which included all the country drained by the Hunter River and its tributaries. Mr. W. J. Enright has informed us that the Wonnah-ruah group was a horde of the Kamilaroi tribe. Old residents of Singleton state that between fifty and sixty years ago they saw up to three hundred natives lined up in the town for food and blankets, but they came from many parts of the surrounding country; they camped regularly on various parts of Gowrie Station, according to Mr. White, who was born there and whose father was interested

in their welfare. They used glass, which they obtained from the residents, for implements.

There is no record of the use of stone barbs, such as *bondi* points or geometrical microliths, on the spears.

In the light of the above evidence, let us consider the antiquity of the industry. Three possibilities present themselves, as follow: (a) They were made by natives who lived on the terrace when it extended right across the valley. (b) They were made at some remote date subsequent to the formation of the present alluvial flats. (c) They were made by the people who were living in the area at the time of white settlement.

It might be mentioned that microliths are mesolithic in age in many parts of the world, but their use extends well into the neolithic and even into the bronze ages in some places. In Ceylon, N. A. and H. V. V. Noone (1940) found them on the surface of knolls and rises along grassy ridges, on the slopes of which were larger implements, and some of them were embedded to a depth of two feet, but there was nothing to indicate their antiquity. Campbell and Noone (1943, 303), from their study of South Australian microliths, reached the conclusion that while they are evidence of an extinct culture, there is no reason why their use did not survive till recent times.

Although the implements are embedded to a depth of six inches in the terrace at Singleton, the shallow layer covering them could have been caused by wind-blown dust lodging in the grass and constantly building up a greater thickness of soil over them. At present rain-water is eroding the plateau. At New Freagh there is a layer of sand covering part of the workshop.

In regard to (a), the extensive distribution of the implements on the terrace on both sides of the river, and their limitation to the terrace, form the most important evidence in support of their having been made by natives who lived on the terrace when it extended right across the valley. David (1907) stated that, "To the epoch of this maximum subsidence, when the raised beaches were formed, belong, perhaps, the high level alluvials, containing, near Branxton, the remains of the extinct elephantine marsupial *Nototherium*" (p. 340); and, "The highest level alluvials are of two types: (1) red sandy soils and ancient flood loams passing downwards into grittier material, and (2) coarser river gravels, in which jasper pebbles are very numerous and conspicuous . . . of considerable geological antiquity, as they belong to an epoch when the Hunter River was flowing at an altitude of one hundred feet above that of its present channel; obviously many thousands of years would be needed for the deepening of so wide a valley as that of the Hunter by as much as one hundred feet" (p. 288).

(b) It appears that the makers of the implements had access to the layer of pebbles at the base of the terrace, at Gowrie at least, and this factor is an important one in support of the conclusion that they were made subsequent to the formation of the alluvial flats. If this is so, the terrace stone-workers preferred to live on the high levels, as scattered fireplaces were noted among the implements, than on the river banks and flats. In any case, they carried the pebbles to the top of the terrace to make their implements. It must be remembered, also, that they are not associated with edge-ground axes, which were used by the most recent natives inhabiting the Hunter valley.

(c) The fact that the *elouera* industry occurs on what are commonly regarded as the most recent kitchen-middens in the Newcastle district and south coast areas indicates that it survived there till the coming of the white man, and this view is supported by its association with edge-ground implements, bone and shell tools, all of which are lacking at Singleton. The glass and crockery tools are obviously the product of the most recent aborigines, who also smoked clay-pipes, and although the nosed and concave scrapers in glass reproduce two types important in the terrace stone industry, it must not be forgotten that *bondi* points and geometrical microliths in glass have not been found, and there are no technical difficulties in their manufacture in this material.

The above evidence appears to indicate that the terrace implements form a pre-axe industry at Singleton, which has survived, minus the geometrical microliths, in other parts of the Hunter valley until the coming of the white man. It is possible that it is the oldest culture in the valley, but further information is required before the antiquity

of man in this area can be decided. Distributional data from terrace localities elsewhere in the valley will enable us to decide whether the industry occurs only at this level. Browne (1924) mentioned a similar terrace at Wingen, fifty-seven miles up the valley from Singleton.

#### Acknowledgements.

Our thanks are due to Mr. H. V. V. Noone for classifying the burinate implements, and to Miss N. Adams for assistance with the illustrations.

#### References.

- Backhouse, J., 1843.—*Narrative of a Visit to the Australian Colonies.*
- Breton, W. H., 1833.—*Excursions in New South Wales, Western Australia, and Van Diemen's Land during the years 1830-33.*
- Browne, W. R., 1924.—Notes on the Physiography and Geology of the Upper Hunter River. *Journal and Proceedings of the Royal Society of New South Wales*, lviii, 128-44, pl. vi.
- Campbell, T. D., and Noone, H. V. V., 1943.—South Australian Microlithic Stone Implements. *Records of the South Australian Museum*, vii, 231-307, figs. 1-117.
- David, T. W. Edgeworth, 1907.—The Geology of the Hunter River Coal Measures. *Memoir of the Geological Survey of N. S. Wales, Geology*, No. 4, Part i.
- Enright, W. J., 1936.—Aboriginal Axe Factory. *Mankind*, II, 23.
- Fawcett, J. W., 1898.—Notes on the Customs and Dialect of the Wonnah-Ruah Tribe. *Science of Man*, N.S., i, 152-54, 180-81.
- Hall, Lesley D., 1928.—Some Aboriginal Flakes from Morna Point, N. S. Wales. **RECORDS OF THE AUSTRALIAN MUSEUM**, xvi, 254-79, pls. xxxii-xxxvii.
- McCarthy, F. D., 1941.—Two Pebble Industry Sites of Hoabinhien I Type on the North Coast of N. S. Wales. **RECORDS OF THE AUSTRALIAN MUSEUM**, xxi, 21-26, pls. v-vi.
- , 1943.—An Analysis of the Knapped Implements from Eight *Blouera* Industry Stations on the South Coast of N. S. Wales. **RECORDS OF THE AUSTRALIAN MUSEUM**, xxi, 127-53, figs. 1-103.
- Mitchell, T. L., 1838.—*Three Expeditions into the Interior of Eastern Australia*, 2 vols.
- Noone, H. V. V., 1934.—A Classification of Flint Burins or Gravers. *Journal of Royal Anthropological Institute of Great Britain and Ireland*, lxiv, 81-92, figs. 1-4.
- Noone, N. A., and Noone, H. V. V., 1940.—The Stone Implements of Bandarawela. *Ceylon Journal of Science, G, Anthropology*, iii, 1-24, pls. i-ii.
- Tindale, N. B., 1937.—Relationship of the Extinct Kangaroo Island Culture with Cultures of Australia, Tasmania and Malaya. *Records of the South Australian Museum*, vi, 39-60, figs. 1-16.