A man of the 'Dai'yuri' tribe of the Edward River, North Queensland, using bone adze to make a light wood vessel. Photo: Donald Thomson.
Plate 2

A bivalve shell is being used to scrape a fighting pick. Eastern Arnhem Land.

Photo: Donald Thomson.

Courtesy of Mrs. D.F. Thomson.
Plate 3

Shell drills collected by W.E. Roth on Keppel Island, Queensland. These drills were used to pierce a number of different materials.

Courtesy of the Trustees of the Australian Museum.
Plate 4

Leilira knives: (left) quartzite blade with resin grip; (middle) bark sheath with resin coating; (right) leilira knife wrapped in melaleuca bark surrounded by fibre twine.

Photo: D.F. Thomson, 1953.

Courtesy of Mrs. D.F. Thomson.
Plate 5

A selection of hafted Leilira spearpoints from Ngillipidji, Walker River, Arnhem Land, collected in 1935. The spearpoint on the righthand end is protectively sheathed with a melaleuca bark wrapping and has a wrapped finger bone maidjabulla attached to the shaft. Note that the spearpoints lack symmetry. Photo: D.F. Thomson.
Plate 6

A trigonal point hafted as a short-handled fighting pick. Collected at Ngillipidji.

Photo: D.F. Thomson.
A step (left) and feather fracture (right) on the abraded and bevelled working edge of an experimental obsidian scraper used to work dense wood (#382). Both fractures have cone initiations and expand onto flat surfaces.

Width of field: 2mm X50

Detail of the fracture terminations depicted in plate 7. The lines running parallel with the termination of the feather fracture (right) are undulations, a natural fracture surface marking. The sharper lines that intersect the undulations at around 90° are termed 'lances'.

Width of field: 670um X150
A fracture on the working edge of an experimental obsidian tool used to scrape light wood (#324). The initiation site has sustained complex overlapping step fractures. The initial fracture is apparently of the feather variety but remains largely undetached, only the outline of the back wall being visible. However, a second major fracture has also occurred (termination arrowed), and this is of the step b variety.

Width of field: 330um X300

The snap fractured working edge of an experimental obsidian tool used to scrape fresh skin (#58). In this case the spurs between the snap fractures (arrowed) are slightly abraded back so that the fractures look like abruptly angled feather fractures. Width of field: 0.66mm X150
Plate 11

A very pronounced percussion ridge on an experimental volcanic tuff bipolar core. Points of intense crushing (white spots) and undetached flakes (arrowed) are visible. The central ridge is wavy because of alternate bifacial and bimarginal flake detachment.

Width of field: 36mm X21
Plate 12

Continuation of the percussion ridge depicted in plate 17. The large undetached flake is prominent along the righthand side of the ridge. At the centre there is large stub-like area of crushing and intense fracturing where a lateral ridge meets the percussion ridge. Hinge fractures can be seen on one margin.

Width of field: 20mm X25

Plate 13

The top edge of a fragment struck from an experimental obsidian bipolar core. The fragment has all the signs of bipolar flaking: crushing, percussion ridge and internal and surface fracturing. This artifact cannot be distinguished from a bipolar core. Width of field: 20mm X21
Plate 14

View from above of an experimental obsidian bipolar core (scalar variety) showing percussion ridge (ends are arrowed). The white areas are points of crushing.

Width of field: 20mm X21

Plate 15

Side view of plate 20 showing the intense and complex fracturing on the side of the ridge.

Width of field: 20mm X21
Plate 16

Intense fracturing of undetached (arrowed), hinge, retroflexed hinge and step varieties along the margin of a percussion ridge on an experimental flint bipolar core. There are no fractures on the opposite margin.

Width of field: 10mm X42

Plate 17

Crushing on a centrally located curved percussion ridge (colored white) on an altered basalt experimental bipolar core. Fractures are absent.

Width of field: 20mm X21
Plate 18

Damage at the base of an experimental volcanic tuff bipolar core with a percussion stub. This is a common feature on bipolar cores and can be equated with the 'punch-like fabricator' McCarthy describes. Note the severe overlapping fracturing and crushing.

Width of field: 20mm X21
A re-enacted scene of Aborigines (older men are Neil Morcum and Ted Dungay) flaking stone at Point Plomer (McCarthy 1947:411). The site is an old midden on a denuded coastal sand dune. The man and the boy are using the bipolar flaking method. Lying on the ground in the centre of the picture is a light wood shield. Photograph by T. Dick, 1914. Courtesy of the Trustees of the Australian Museum.
Plate 20

Abrupt retouch on a flake of volcanic tuff.
The fine step fracturing (arrowed a) along the edge resulted in detaching the larger flakes (arrowed b). Width of field: 20mm X21

Plate 21

A flake concavity in a volcanic tuff flake.
Fine overlapping step fractures occur along the edge during the process of detaching the larger hinge fractures. Width of field: 20mm X21
Plate 22

Step and hinge fractures on an unused adze flake from Papunya Aboriginal settlement.

Width of field: 3.32mm X30

Plate 23

Accidental fracturing on a volcanic tuff flake stored and transported with other flakes in a cloth bag. The test was designed to replicate an extreme case of post-excavation, archaeologist induced damage. The black coloration is ink which had been painted on the flake before the test. Width of field: 20mm X21
Plate 24

Freshly flaked trigonal spearpoints being hafted by an Aboriginal at the Ngillipidji quarry, eastern Arnhem Land. At this stage the points to be traded are wrapped in paperbark (lefthand side of frame). Photo: D.F. Thomson

Courtesy of Mrs. D.F. Thomson.
Plate 25

Bundles of trigonal stone spearheads packed in melaleuca bark and tied with fibre string, from the quarry at Ngillipidji. The points were packed to protect their edges from accidental fracture.

Collected and photographed by D.F. Thomson, 1935.

 Courtesy of Mrs. D.F. Thomson.
Plate 26

Detail of striations on an experimentally ground basalt axe. Striations are well defined and indicate fixed abrasive conditions (backscattered electron image). Width of field: 1.25mm X80

Plate 27

Same area as plate 26 but as a secondary electron image. The darker shading of the area of striation suggests alteration of the material that was subjected to pressure from the fixed abrasive particle - probably indicates compaction.

Width of field: 1.25mm X80
Plate 28

A different part of the same ground surface depicted in plate 26. Fine striations can be seen running inside the larger ones. Fixed abrasive conditions during their formation are evident (backscattered electron image).

Width of field: 1.25mm X80

Plate 29

Secondary electron image of area depicted in plate 28. Width of field: 1.25mm X80
Plate 30

Detail of fine striations running parallel within a larger striation on the experimentally ground basalt axe depicted in previous plates 26, 27, 28, 29. These fine striations were probably caused by the small facets on a fixed abrasive particle. Width of field: 125um X800

Plate 31

Striations on the surface on an experimentally ground basalt axe blank. Continuity and degree of definition indicates fixed abrasive conditions (backscattered electron image).

Width of field: 1mm X100
Plate 32

Optical micrograph of glass surface abraded with the carborundum particles.

Width of field: 20mm X21

Plate 33

Detail of plate 32.

Width of field: 1.4mm X86
Plate 34

The same abraded glass surface when viewed with the SEM. Width of field: 1.25mm X800

Plate 35

Detail of plate 34. The carborundum particles act as sharp indenters, producing a classic free abrasive cracking pattern.

Width of field: 125um X800
Plate 36

Optical micrograph of glass surface abraded with fixed carborundum particles. Closely packed striations are discernable individually in the lower half of the frame but merge into an area of intense abrasion (overlapping striations) in the upper portion of the frame.

Width of field: 20mm X21

Plate 37

The same striated glass surface when viewed in the SEM. Width of field: 1.25mm X80
Plate 38

Detail of plate 37. Width of field: 125um X800

Plate 39

Detail of plate 38. Striations are of variable form - possible fine sleeks, furrow scratches and a line of conchoidal fractures. Clearly fixed abrasive conditions.

Width of field: 41um X2400
Deep and well defined striations on a quartzite surface that was experimentally ground. They are a good example of the 'continuous furrow' type as they are 'torn' on the inside. Quartz grains at the surface are fractured and the abrasive leveling results in a 'matt' appearance. Striations are clustered in sets which are superimposed at angles between $80^\circ - 90^\circ$ to the working edge.

Width of field: 10mm X42

A detail of the surface depicted in plate 32. At higher magnification in the SEM, finer striations can be detected on this granular material (secondary electron image). The exact nature of these striations cannot be determined although their length and continuity indicates fixed abrasive conditions. Width of field: 1mm X100
Plate 42

The pitted surface of an experimentally ground stone axe. The surface is uniformly levelled and individual grains are visible. Striations are totally absent because grains are torn out (optical magnification; specimen gold coated). Width of field: 1.4mm X86

Plate 43

Highly polished lateral surface of the sago pounder depicted in plate 44. 'Sickle polish' has a typical 'wet' appearance. The edges are well rounded and polish is concentrated on the ridges and undulations of flake scars. Width of field: 14mm X21
Plate 44

Chert head in a sago-pounder collected in the New Guinea Highlands by J.P. White. Although it is not immediately apparent in the photograph the flat platform and most of the lateral faces are highly polished through use.

Photographed by David Smith.
Plate 45

Use-polished flint and chalcedony 'sickle' blades from Teleilat Ghassul (4th millennium), and Beida (7th millennium), excavated by J.B. Hennessy, approximately 4/5th natural size.
Plate 46

Dentated edge of 'sickle' blade 2. Note edge rounding on an old dentation and the fresh dentation to the left. Surface is smooth and highly polished.

Width of field: 1.32mm X76

Plate 47

Detail of plate 46. Very fine flaws can be seen in the polished surface. Also some striations and large, internally textured pits.

Width of field: 133um 750
Plate 48
Polished surface of the same sickle blade. There are a number of striations, most running roughly parallel to the surface. The cause of the other striations is not known. Surface is very flat with irregular pitting. The dark and bright spots are contamination. Width of field: 400um X250

Plate 49
Fine detail of the polished surface on sickle 2. Remnants of the original fracture surface in the form of pits and large depression (bottom left) be accompanied by scattered furrow striations (e.g. middle lefthand edge of frame). Width of field: 125um X800
Plate 50

Unpolished surface of sickle blade.

Width of field: 1mm X100

Plate 51

The polished surface of a sickle blade excavated at Telleilat Ghassul, Jordan. The base of a dentation in the cutting edge can be seen in the lower righthand corner of the frame. Remnant pits are clearly visible on the smoothed surface (the white spots are depressions). Tool coated with gold and tilted at 45°.

Width of field: 1.0mm X100
Plate 52

Detail of plate 51.

Plate 53

A closer view of one of the pits in the use-polished surface in plate 52. The lee edge is rounded while the forward edge appears to be abrupt. The flat polished surfaces around the pit are minutely textured.

Width of field: 33um X3000
Area of unpolished surface on the sickle blade that is the subject of the previous photographs.

Width of field: 100um X1000

The use-polished surface at higher magnification.
The lee sides of some pits are more rounded.
The pit at the bottom edge of the frame appears to have a 'comet tail'.

Width of field: 100um X1000
Plate 56

Sickle blade from Telleilat Ghassul. The frosted surfaces are unpolished. The highly polished flat upper face is minutely pitted - (pits shadowed with gold).

Width of field: 10mm X42

Plate 57

Detail of the irregular shaped pits on the polished surface. The viewer will probably need to invert the image.

Width of field: 4.8mm X84
Plate 58

Use-polished surface of sickle blade 4. The dark area is the polished surface.

Width of field: 200μm X500

Plate 59

Detail of polished surface showing the rugged pits.

Width of field: 66μm X1500
Plate 60

Polished surface of sickle blade 5. Base of indentation in the working edge is at the top of the photograph. White spots are pits in the dead smooth surface. SEM secondary electron image. Width of field: 330um X300

Plate 61

Repeat of the previous photographs. Back-scattered electron image.

Width of field: 400um X230
Plate 62

Polished surface of chert sickle blade 3.

Width of field: 0.66mm X150

Plate 63

The pit on sickle blade 3. The vertical black line is contamination caused by the electron probe. Width of field: 200um X500
Plate 64

Further detail of pit showing the rugged interior.
The pit is obviously a cavity in the original stone. Margins are very irregular and flaws are apparent. Width of field: 166um X1500

Plate 65

Detail of the rugged edge of the pit does not suggest large scale surface flow of silica. The fine cracking of the flat surface may be grain or crystal boundaries.

Width of field: 20um X5000
Plate 66

Further detail of the edge of pit showing very fine dark lines which may be grain boundaries.

Width of field: 70u X15000
Plate 67
In the experimental skinning operation the edge of the tool came into contact with the exposed femur of the kangaroo.

Plate 68
Tendon in the leg of the kangaroo attaches itself to the membrane on the skin at the distal end of the femur, and must be peeled off with the stone tool.
The pelt peels off the body of the kangaroo carcass without much need for a tool. The white membranous material (the film between muscle and skin) offers no significant resistance to the edge of the stone skinning tool.

Partially macerated fresh kangaroo meat with the experimental volcanic tuff tool at the top of the frame.
Plate 71

Experiment 63. The experimentally chopped frozen meat is exhibited with the tuff chopper sitting at the righthand side.

Plate 72

A detailed view of the frozen meat showing that the fibres separate easily because the moisture in the meat does not freeze en-bloc but occurs as particles and crystals. Although the meat is very solid in bulk it does not resist the cleaving impact of a small stone chopper.
The Aboriginal hunters dramatically striding forward wear skin cloaks engraved with designs. The skin side is worn facing out. Setting is in the Blue Mountains. 'Natives Chasing Game' by Eugene Von Guerard, oil 1854. Courtesy of The National Library of Australia.
Plate 74

In the kangaroo subcutaneous muscle is attached to the inside of the skin in the region of the forearm, and this muscle must be scraped off before the skin can be trimmed and sewn.

Plate 75

Experimental scraping of fresh grey kangaroo skin. The protein membrane is partly detached and lies bunched up in the centre of the skin.
Plate 76

Detail of partially scraped grey kangaroo skin showing the membrane in the upper half of the photo and the 'cleaned' skin in the lower half. Once the membrane is detached no more fleshing or thinning is necessary - the base of the hair follicles are visible as black dots on the cleaned part of the skin.

Plate 77

Experimentally scraping dry grey kangaroo skin with an obsidian flake. The dry membrane easily comes off in strips.
Plate 78

Detail of abrasion on the undersurface of an experimental obsidian tool used to scrape a fresh sand impregnated kangaroo skin (#59). The working edge of the tool is beyond the top of the frame.

Width of field: 200 microns. X500

Plate 79

Detail of the abrasion on the very edge of the obsidian tool (#59). Fine detail is obscured by a coating of protein residue.

Width of field: 30 microns. X2600
Montage of the same tool (#59) showing abrasion extending inward from the working edge. Ultrasonic cleaning in acetone failed to remove protein residue which obscured much of the surface detail. It can be seen however, that the abrasion is in the form of individual pits rather than furrows, indicating that the abrasive agent was not fixed.

Width of field: 125 microns X800
Plate 81

Flint tool with microfossils visible used to scrape dry sandy skin. This is a view of the worn rounded edge from the underside: the opposite margin is fractured (#77).

Width of field: 10mm X42

Plate 82

The abraded and striated underside margin of an experimental obsidian tool used to scrape dry sand impregnated kangaroo skin (#80). The irregular profile of the working edge is due to snap fracturing.

Width of field: 10mm X42
Plate 83

Abrasions on the underside of the working edge of an experimental obsidian tool used to scrape dried sandy kangaroo skin (#81). There is a partly illuminated feather fracture on the righthand side of the frame. Width of field: 20mm X21

Plate 84

'Frosted' smoothing on the underside margin of the working edge of an experimental quartzite tool used to scrape a dry sandy kangaroo skin (#89).

Width of field: 4.8mm X84
Plate 85

Heavily abraded and striated bevel on the underside of the experimental tool used to scrape dried skin (#84). The abrasion was caused by sand particles fixed on the skin while it was drying.

Width of field: 20mm X21

Plate 86

Enlargement of the bevel on experimental tool #84. Width of field: 10mm X42
Plate 87

A 2mm abraded bevel on the underside of a basalt flake used to scrape dry sandy kangaroo skin (#87).
Width of field: 20mm X21

Plate 88

Looking down on a striated and smoothed bevel on tool #92 used to rub a dry kangaroo skin.
Width of field: 10mm X42
Plate 89

The flattened, smoothed and furrow striated surface of an olivine basalt experimental skin rubbing tool (93). The form of the striations indicates the direction in which the tool was moved.

Width of field: 20mm X21
Plate 90

Engraved lines on a possum skin cloak in the Queensland Museum. The incisions are deep and clean, indicating that a sharp flake was used to cut them, and the ridge on one side of these grooves suggests that the tool was held at an angle of around 50° - 90°. The incisions give the skin pliancy.

Plate 91

Experimentally engraving a dried kangaroo skin with a tuff flake.
Plate 92

Pronounced smoothing and edge rounding on the working edge of an experimental volcanic tuff tool used to engrave kangaroo skin (#97). Long furrow striations run roughly parallel to the edge. Reflected polarised light.
Width of field: 10mm X42

Plate 93

Part of the working edge of a volcanic tuff flake used to engrave a dry kangaroo skin (#100). Edge rounding is pronounced and smoothing is accompanied by broad furrow striations which run parallel with the edge. The striations result from fragments broken off the edge during use. Width of field: 1.35mm X100
Plate 94

Detail of the smoothed and striated surface depicted in plate 93. The macroscopic "smoothing" is no longer evident and the surface is resolved to a rough topography with what appears to be a section of a broad, shallow furrow taking up the lower part of the frame. Width of field: 135um X1000

Plate 95

Slit-like marks in a possum skin cloak from Queensland.
Plate 96

Slit-like awl marks on a possum skin cloak from Queensland. Clearly not made with a bone awl.

Plate 97

Slit-like awl marks on another possum skin cloak from Queensland.
Plate 98

Striations on an experimental obsidian awl (#142). These striations, which are probably caused by foreign sand particles, are too fine to be seen by the naked eye in ordinary light, and many of them may be sleeks. The apex of the awl is a cleanly snapped facet.

Width of field: 7mm X42

Plate 99

A spall, initiated from the snapped apex (not in view) of an experimental awl used on a dried skin (#139). Width of field: 6.8mm X42
Plate 100

Striations and abrasion on an experimental obsidian awl. Most of the striations are concentrated on one edge (see use-wear description for #143). They are clearly furrows and probably have an autogenetic origin.

Width of field: 7mm X42

Plate 101

The use-damaged working edge of a volcanic tuff flake employed in experimentally sawing bone (#156). Smaller fractures can be seen positioned along the initiation edges of the snap fractures. Width of field: 10mm X42
Plate 102

The damaged working edge of a radiolarian chert flake used experimentally to saw kangaroo bone (#168). The snap fractures are about 1 - 1.5mm in thickness and within them are very small step and hinge fractures.

Width of field: 10mm X42

Plate 103

Side-on view of the snap fractured edge (along top) depicted in the previous photograph (#168). Note how irregular the edge has become.

Width of field: 10mm X42

Plate 103a

Hinge and step use-fractures positioned along one side of the working edge of a volcanic tuff tool used to saw bone (#159). The fractures are generally deep but as the edge angle of this tool is broad (94°) this pattern does not fall within the diagnostic range. This fracturing does however result in a wavy edge profile.

Width of field: 20mm X21
Plate 104

Hafted quartz drill points collected by W.E. Roth on Keppel Island. Courtesy of the Trustees of Australian Museum.
Plate 105

Stub-like apex and use-fractures on a flint point used to experimentally drill turtle shell.

Width of field: 10mm X42

Plate 106

Use-fracturing along one face of a volcanic tuff point used to experimentally drill kangaroo bone (#176). The apex is reduced to a ridge with overlapping step fractures.

Width of field: 14mm X42
Plate 107

Rounding at the apex of an andesitic basalt point used to experimentally drill kangaroo bone (#187). Rounding also extends down the lefthand edge. This tool was only moderately successful. Width of field: 4.8mm X84

Plate 108

Experimentally drilling Baler Shell with a hafted volcanic tuff point.
The fractured apex of an experimental flint drill used to pierce Nautilus shell (#205). The apex is dulled by minute fracturing.

Width of field: 10mm X42

Experimental flint drill used to pierce Nautilus shell (#206). The apex is rounded through complex microfracturing. One lateral edge is also fractured and has an irregular profile. The white material is shell carbonate compacted into small depressions.

Width of field: 7mm X42
Plate 111

Fractured tip of an experimental radiolarian chert drill used to enlarge a drill-hole in Nautilus shell (#208). One 84° edge has been spalled. Width of field: 10mm X42

Plate 112

Opposite face of the experimental shell drill. X42
Plate III

Looking down on the worn apex of a successful obsidian drill experimentally used on mussel shell (#201). The areas of high asperity are highly fractured ridges along the three edges that formerly met at the apex. These ridges are flattened. All the larger concavities are step fractures (e.g. lower righthand corner) or are the remnant terminations of step, hinge and retroflexed hinge fracture scars.

Width of field: 2mm X50

Plate IV

The apex of the same obsidian drill (#201) viewed from a position lower and more to the left. The remnant terminations are more centrally placed in this photograph. All the sets of linear markings in view are fracture lances and not use-striations.

Width of field: 2mm X50
Plate 115

Extreme detail of highly abraded area on one of the worn ridges on the obsidian used on Mussel shell (#201). Fracturing is very complex and there is considerable internal cracking. Width of field: 100um X1000

Plate 116

An experimental rhyodacitic volcanic drill tip used to pierce Nautilus shell (#210). The apex is well rounded and use-fractures can be seen along a margin of one of the edges.

Width of field: 10mm X42
Plate 117

The worn tip of an experimental hafted volcanic tuff drill used to pierce Baler shell (#212). This tool was more successful in enlarging a hole than in initiating one. The snapped apex is smoothed and well rounded, and the lefthand lateral edge is also well rounded. Overlapping step fracturing also occurs. Width of field: 10mm X42

Plate 118

The rounded and smoothed ridge-like apex of an experimental silicrete drill used to pierce Baler shell (#219). White material is compacted bone carbonate. Width of field: 7mm X42
Plate 119

The worn tip of a prehistoric drill from Motopore, New Guinea, dated to between 1200-1700 AD (K22/1/6/683). This fracture damage is indistinguishable from the fracturing on the tips of fine silicate experimental hand-held shell drills. Shell carbonate is preserved in the use fractures.
Width of field: 7mm X42

Plate 120

The rounded and minutely fractured tip of another probable bow drill from Motopore (K23/1/6/181). The rounding is similar to that on the less fine silicate drills used in the shell drilling experiments.
Width of field: 7mm X42
Experimentally scraping sweet potato with a flake held at 90° to the tuber.

Experimentally slicing sweet potato with an obsidian flake held in a leather pad.
Plate 123

Edge rounding, abrasion and intersecting continuous and discontinuous furrow striations on the underside face of an obsidian flake used experimentally to slice sand impregnated sweet potato (#232). Striations appear to be mostly continuous. Width of field: 10mm X42

Plate 124

Detail of the previous photograph but under polarised light which gives the striations more definition. Orientation is best done from the feather fracture at the righthand side of the frame. The area depicted in the following SEM microphotographs (plates 125, 126) is arrowed. Width of field: 4.8mm X84
Plate 125

Detail of the same surface on the obsidian slicing tool (#232), viewed in the SEM. Striations appear as discontinuous furrows.

Width of field: 2mm X50
Plate 126

Detail of plate 125. Intersecting sleeks (arrowed) are now clearly visible. Furrow striations are of various kinds: sliding indenter causing hertzian cracks (arrowed b) and deep continuous or discontinuous furrows which are the result of intersecting cracks (areas of intense, irregular pitting). Sometimes all features can be found in a single striation.

Width of field: 200um X500
Plate 127

Another area of the same surface on the sweet potato slicer (#232). Isolated pits, sleeks and intersecting discontinuous furrows are visible.

Width of field: 333um X300

Plate 128

Detail of plate 127.

Width of field: 100um X1000
Plate 129

Grain structure of *E. crebra*. Cells are small and thick-walled. The large spheres are vessels. Photograph by K. Bamber. X85

Plate 130

Grain structure of *B. acerifolium*. Cells are large and thin-walled. The large spheres are vessels. Photograph by K. Bamber. X85
Plate 131

A re-enactment by central coast Aborigines of procuring wood from a fig tree to make a shield. Large pointed wedges are hammered into a flitch deeply cut into the bark and wood. Photographed at about 1910 by Thomas Dick. Courtesy Trustees of the Australian Museum.
Plate 132

One of the last contacted Aborigines demonstrating the method of chopping out a spearthrower blank. The quartzite chopping tool is used at roughly 90°. Walter James Range, 1963. Photograph by D.F. Thomson. Courtesy of Mrs. D.F. Thomson
Plate 133

Variable edge rounding and smoothing on an experimental olivine basalt chopping tool used on light wood (#241). Wood fibre is compacted into small depressions and pits in the contact surfaces of the tool. Width of field: 20mm X21

Plate 134

Intense abrasion and striation on an experimental obsidian chopping tool used on sand impregnated light wood (#237). The abraded area is an area of intensely overlapping striations. Outside this abraded area individual striations become visible. Note that they curve. Width of field: 14mm X21
Plate 135

Detail of the transitional zone between abrasion and striations. Visible striations are continuous furrows. Width of field: 7mm X42

Plate 136

Detail of the striations on the obsidian chopping tool depicted in the previous figure (#237).
Width of field: 7mm X42
Plate 137

Again the same surface but at one end of the working edge (#237). Striations are aligned in sets and intersect. This striating is similar to the early stages of the development of abrasion on the tool, before striations become too concentrated.

Width of field: 14mm X21

Plate 138

Opposite face of the light wood chopping tool (#237). Striation and abrasion is much more extensive, the zone being up to 10mm wide.

Width of field: 20mm X21
Plate 139

An Aborigine sawing barbs on a karimpa spear with a chalcedony flake. Photograph by Brian Hayden, 1971.
Plate 140

Experimentally sawing light wood with a rhyodacitic volcanic flake.

Plate 141

The rounded abraded and striated working edge of an experimental obsidian flake used to saw sand impregnated light wood (#269). Two hinge fractures along the edge occurred before the abrasion. The near vertical lines are lances, a natural fracture surface marking. Polarised light.

Width of field: 10mm X38
Detail of the abrasion and edge rounding on the edge of experimental saw (#269). There are a number of furrow striations visible in the abraded zone. The near vertical lines are lances.

Width of field: 964um x140

Further detail of the abraded surface (#269).

Dark lines are lances. Width of field: 270um x500
Plate 144

Detail of plate 143. Definite linear orientation of pits and fractures. Much of the detail is obscured by compacted residue from the wood.

Width of field: 74.25um X1800

Plate 145

Smoothing and edge rounding on the working edge of a volcanic tuff flake used experimentally to saw sand impregnated dense wood (#282). Long striations associated with the smoothing are not visible under this angle of lighting.

Width of field: 4.8mm X84
Plate 146

Pitting and fine texturing on the lateral face of an experimental quartz flake used to saw green light wood (#274). This damage was almost certainly caused by fragments breaking from the tool during use.

Width of field: 10mm X38

Plate 147

Patches of abrasion (which appear as white areas) on lateral face of an experimental quartz flake used to saw sand impregnated green dense wood (#293). Width of field: 20mm X21
Plate 148

Experimentally drilling light wood with a hand-held volcanic tuff point.

Plate 149

Concavities step fractured on one face of a silcrete point used to experimentally drill green dense wood (#310). The apex of the drill is somewhat rounded through use. Width of field: 7mm X21
Western Desert Aborigine scraping an adze stick by holding the stone scrapper at an angle of approximately 75° to the wood. Labbi-Labbi rockhole. Photograph by D.F. Thomson, 1957.

Courtesy of Mrs. D.F. Thomson.
An Aboriginal informant using a small chalcedony tool with a 90° edge to scrape a spear point at an angle of 0° - 5°. Tool is being drawn towards the operator. Photographed by Brian Hayden.
Plate 152

Aboriginal informant using a chalcedony flake with a 90° edge angle to scrape a spearshaft at a low angle. The tool is being drawn towards the operator. Photo: Brian Hayden.
Plate 153

Western Desert Aborigine scraping a woman's digging stick by using the tool at an angle which is less than $10^\circ$ to the wood. Labbi Labbi rockhole, 1957.

Plate 154

Western Desert Aborigine using a denticulate stone scraper to smooth the shaft of a woman's digging stick. The stone tool is held at an angle of approximately 30° to the wood.

Plate 154

Tenacious resin coating (smooth dark area) on the underside margin of the edge of an experimental flint dense wood scraper (#333). In the optical microscope the resin coated area is highly reflective and it can be easily mistaken for use-polish.

Width of field: 500µm X200

Plate 155

Continuous furrow striations on the underside of an experimental obsidian scraper (hand-held) used on dense wood (#337). The striations, which are angled at 80° - 90° to the working edge and are up to 4mm long, are autogenetic.

Width of field: 3.5mm X84
Plate 156

Fine autogenetic striations on the underside margin of an experimental obsidian dense wood scraper (#337). The large diagonal lines on the lefthand side of the frame are caused by reflection from natural fracture surface markings. Width of field: 3.5mm X84

Plate 157

Autogenetic striations on the underside of an experimental obsidian dense wood scraper (#337). The two parallel striations originate in a use-fracture. The furrow on the lefthand side is deep and near its end there is a large pit which is likely to be the result of the abrasive particle shattering. Continuing on from this pit, in alignment with the furrow are very fine striations which may be sleeks. These fine striations were undoubtedly caused by the fragments of the original particle and debris from the pit.

Width of field: 3.5mm X84
Plate 158

Heavy autogenetic pitting and striation on the under­side margin of a quartz dense wood (#353). The working edge itself is highly abraded and a very small portion of this can be seen in the top left­hand corner of the frame.

Width of field: 165μm X600

Plate 159

Chalcedony flake hafted as a dense wood scraper. The flake is very effective in finely shaving the wood.
Plate 160

Light smoothing or polish on the underside of the rounded edge of a hafted volcanic tuff flake used to scrape light wood (#355).

Area of surface levelling is restricted to the very edge (periphery of area is arrowed).

Black coloration is foreign material, probably resin from the wood.

Width of field: 2mm X50

Plate 161

Smoothing and striation on the underside face of a hafted experimental scraper used on light wood impregnated with grains of sand (#357). Striations are furrows angled at around 75°.

Width of field: 10mm X42
Plate 162

Smoothing and scattered furrow striations on the underside of a hafted experimental scraper used on light wood (#359).

Width of field: 4.8mm X84

Plate 163

Smoothing and heavy striation on the underside of a hafted experimental scraper made from rhyodacitic volcanic (#363). This tool was used on green light wood impregnated with sand grains. Furrow striations are angled at around 80° to the working edge.

Width of field: 20mm X21
Plate 164

Detail of the smoothing and striation on #363. Width of field: 10mm X42

Plate 165

Detail of the striated and smoothed area on #363 which is depicted in the preceding optical microscope photographs. Viewing the worn surface at this magnification with the SEM reveals tearing of the surface. Striations are still visible.

Width of field: 1mm X100
Plate 166

Higher magnification of the surface depicted in the preceding photographs (#363). Although clearly defined furrow striations are no longer apparent the direction in which the tool was moved during use is evident from the linear trends.

Width of field: 330um X300

Plate 167

At this magnification the smoothed surface of #363 has a rugged topography. There are small patches of smoothing on high areas.

Width of field: 100um X1000
Plate 168

Very small areas of smoothing on #363 may be lightly striated. The surface is heavily fractured: note the torn plate-like crystals in the lower part of the frame. Width of field: 33um X3000

Plate 169

Shallow step fractures on the underside of a hafted experimental scraper used on medium-light (#365).

Width of field: 20mm X21
Plate 170

Adzing green light wood with an experimental adze. The positioning of the hands is the best way to grip the tool.

Plate 171

Fracture damage on the convex underside of a pre-historic tula flake (Bourke's Cave 1/1 Al 24) excavated by H.R. Allen in western N.S.W. The rather severe step fracturing very probably resulted from incorrectly using or hafting the tool. This fracture damage, which is rare on a tula', suggests that the edge has struck the wood at too high an angle.

Width of field: 27mm X21
Plate 172

Adzes made from fine-textured silicate are very effective on the light wood. Wood shavings are much larger than those produced by dense wood adzing.

Plate 173

Very heavy furrow striations on the underside of a volcanic tuff adze experimentally used to work green medium-light wood impregnated with sand (#406). Small use-fractures, shadowed on the edge, are worn down by abrasion. Striations accentuated by the low angle of lighting, are angled in two directions, 90° and 80°.

Width of field: 10mm X42
Plate 174

Smoothing and well defined 90° striation on the underside of an experimental flint adze used to work sand impregnated green light wood (#397).

Width of field: 2mm X50
Plate 175

Extensive smoothing and linear trends on a kutitji adze flake used by Aborigines to adze a light wood bowl. Collected by Brian Hayden. Foreshortened view from side. X30

Plate 176

The same area of the kutitji adze flake viewed from above.

Width of field: 3.73mm X30
Smoothing and heavy striation on an adze flake used by Aborigines at Papunya settlement in the Western Desert. $80^\circ - 90^\circ$ striations are clearly defined.

Width of field: 1.58mm X60
Plate 178

Re-enactment of Aborigines procuring bark from stringbark trees along the northern N.S.W. coast. Photographed by T. Dick, c.1910.

Courtesy, Trustees of the Australian Museum.
Wood fibre and resin adhering to an experimental scraper used on *tetradonta* bark (§438). X2.5 approx.

Experimentally scraping the outer bark of *E. agglomerata*. The bark fibre is very loose and contact is made with both surfaces of the hafted flake. The fibre is not pressed down onto the upper face of the tool.
Plate 181

Experimentally planing the charred outer bark of *E. agglomerata* with a hafted scraper.

Plate 182

Cross-section of *Eucalyptus agglomerata* bark used in the bark working experiments. The orange outer bark is stripped off leaving the flexible, more compact yellow inner bark.
Plate 183

Snap fracturing and smoothing along the margins of these fractures on the underside of an experimental bark scraper (#437).

Width of field: 20mm X21

Plate 184

Detail of the smoothing on #437 which is the subject of the previous photograph.

Width of field: 4.8mm X84
Plate 185

The distinctive flat bevel (arrowed) on a bevelled pounder excavated by L. Haglund at a site in the Pumice Stone Passage (QE 1764-56).

Photographed by D. Smith.
Plate 186

A dried *Blechnum indicum* plant with a part of the rhizome. Photographed by D. Smith.
Plate 187

A two hectare Blechnum indicum swamp on Bribie Island, south-east Queensland. This fern species, once widely distributed along the eastern Australian coast, is now found only in small pockets. It was heavily exploited by Aborigines for food.

Plate 188

An Aborigine re-enacting the pounding of Blechnum indicum on Bribie Island. The tool being employed is probably a bevelled pounder.

Photographed by T.L. Bancroft, circa 1890.
Plate 190

The flat bevel on a silcrete or quartzite bevelled pounder collected by F.P. Woolston. View is from above.
Width of field: 20mm X21

Plate 189

Cross-section of a dried *Blechnum indicum* rhizome. The 'steles' or water carrying vessels, are arranged in a circle within the white farinaceous matter.
Width of field: 20mm X21
Plate 191

Detail of the pitting on the flat bevel depicted in the previous photograph.

Width of field: 10mm X42

Plate 192

Further detail of the pitting on the flat bevel. Smoothing and striation are entirely absent.

Width of field: 5mm X84
Plate 193

Detail of the flat bevel on a bevelled pounder made from a volcanic stone (QE 9764-36). Pitting is the only wear feature on the bevel but a lateral face adjoining the bevel is smoothed and has linear trends angled at 90° to it.

Width of field: 14mm X21

Plate 194

Further detail of the pitting on the flat bevel depicted in plate 193.

Width of field: 10mm X42
Plate 195

Rounding (pale white areas) on two edges of a flake from Ingaladdi (W/8/II8 027). The orange coloured surface is cortex.

Width of field: 10mm X42

Plate 196

Beveling and smoothing of a projection on a quartzite flake from Ingaladdi (N/8/II8 018). The bevel has only a very slight curvature.

Width of field: 20mm X21
Plate 197

A flat smoothed bevel on the working edge of a 'microlithic end scraper' (WAM A16518) or, more accurately, a thumbnail scraper (see fig. 4.2a) excavated at Puntutjarpa rockshelter. Large retouch scars are visible in the upper half of the plate. Coarse furrow striations and linear trends are angled at 90° across the bevelled edge.

Width of field: 2.5mm X56

Plate 198

Another view of the bevelled edge depicted in plate 197.

Width of field: 2.5mm X36
Plate 199

Detail of the bevel depicted in plates 197, 198.
A linear trend is still visible.
Width of field: 1mm X100

Plate 200

Further detail of textured surface of abraded bevel.
Width of field: 125mm X800
Plate 201

The type and form of fracturing which includes internal fracturing (cracks) on opposing ends of this chert artifact from Ingaladdi (W/8/II6 129) suggests quite strongly it sustained bipolar percussion. It has been tentatively identified as a burin by the classifier.

Width of field: 20mm X21

Plate 202

Fracturing on the opposite end of the artifact depicted in plate 201.

Width of field: 20mm X21
Basalt chopping tool with extensive smoothing and a well rounded working edge. (QE 9764-14; Pumice Stone Passage). The working edge is about 9 cm long. Photographed by David Smith.
Plate 204

Extensive smoothing on the side of a basalt chopping tool excavated by L. Haglund at Pumice Stone Passage (QE 9764-20). Note the furrow striations.

Width of field: 20mm X21

Plate 205

Detail of the smoothing, striation and edge rounding on the chopping tool depicted in plate 204.

Width of field: 10mm X42
Plate 206

Detail of the smoothing and striation on a chopping tool excavated from a site along the Pumice Stone Passage (QE 9764-14). The striations are oriented at angles 80° - 90° to the working edge.

Width of field: 4.8mm X84

Plate 207

Edge rounding, smoothing and 80° - 90° striation on a chopping tool excavated by L. Haglund from a site in the Pumice Stone passage (QE 9764-26; see fig. 4.46).

Width of field: 20mm X21
Plate 208

Pronounced edge rounding, smoothing and $80^\circ - 90^\circ$ striation on a volcanic chopping tool excavated by L. Haglund at a site in the Pumice Stone Passage (QE 9764-14).

Width of field: 20mm X21

Plate 209

The step fractured, smoothed, striated and rounded edge of an elouera from Emu Cave I at Lapstone Creek (level 45-54). The ridges at the terminations of the probable use-fractures are also rounded. Artifact material is volcanic tuff.

Width of field: 10mm X42
Plate 210
Detail of the furrow striations.
Width of field: 4.8mm X84

Plate 211
Further detail of the Emu Cave I elouera. Striations become poorly defined at this high magnification but appear as very broad furrows.
Width of field: 2.4mm X168
Heavy striation on the 'polished' or smoothed surface of a so-called elouera from Capertee, site 3 (E60068/3B8). The working edge is well rounded. The white material encrusted on parts of the surface is carbonate while the black patches are manganese stains. Both these deposits occurred while the tool was in the ground. The artifact material is identical to the experimental volcanic tuff.

Width of field: 20mm X21

Detail of plate 212. The furrow striations intersect probably because the tool was rehafted in a slightly different position.

Width of field: 10mm X42
Plate 214

The fractured and heavily striated surface on the opposite face of the 'use-polished elouera' which was the subject of the previous photographs. One of the fractures may be post excavation damage.

Width of field: 20mm x 21

Plate 215

Detail of the striated surface depicted in plate 214. Furrow striations are continuous and sub-parallel.

Width of field: 7mm x 42
Plate 216

Detail of plates 214, 215. Furrow striations are sub-parallel.

Width of field: 3.5mm X84

Plate 217

Heavy sub-parallel striation on smoothed surface of a 'use-polished' elouera excavated by J.V.S. Megaw at Gymea Bay (109.D. A14-18). Edge rounding is also very pronounced.

Artifact material is volcanic tuff.

Width of field: 7mm X42
Plate 218

Use polished backed flake from Oenpelli (0/2 E55310). The polish is not intense because the artifact material is dolerite.

Width of field: 20mm X21

Plate 219

Use-polished quartzite backed flake from Oenpelli. The working edge is well rounded and the truncated quartz grains are brilliantly reflective.

Width of field: 20mm X21
Plate 220

Extreme edge rounding and use-polish on a backed flake from Oenpelli.
Polarised light. X45

Plate 221

Edge rounding and use-polish on a quartzite Oenpelli backed flake. Boundaries of truncated quartz grains are clearly visible. X30
Plate 222

Detail of the flattened and smoothed quartz grains near the edge of a use-polished quartzite backed flake from Oenpelli (0/2 E55309).

Width of field: 20mm X21

Plate 223

Edge rounding and use-polish on a chert flake from Goose Camp 4. As with the previous polished flake the surface is finely textured.

Width of field: 330um X300
Plate 224

Detail of the microtopography on the polished surface depicted in plate 223. Small undulations are evident.
Width of field: 33um X3000

Plate 225

Further detail of microtopography on the polished surface depicted in plates 223, 224. Although the surface is fairly smooth there are still flaws and undulations.
Width of field: 10um X10000
Plate 226

A use-polished chert flake from Goose Camp 4 near the South Alligator River in western Arnhem Land. The edge is well rounded and the polished surface displays some surface topography.

Width of field: 0.62mm X160

Plate 227

Detail of the fine 'frosted' texture on the polished surface of the chert flake depicted in the previous photograph.

Width of field: 36um X2800
Plate 228

Montage of surface of a quartzite use-polished flake from Goose Camp 4. The working edge is at the top righthand corner. Striations are angled at about 90° to that edge. All irregular features on the surface are pits and rugged depressions. Source of electrons is from the top righthand corner. Backscattered electron image.

Width of field: 0.83mm X60
Plate 229

Enlargement of the polished surface depicted in the topmost photograph in the preceding montage. Furrow striation running at $90^\circ$ to the working edge are evident. The surface is pitted (all non-linear features are pits) with large depressions which are remnants of the original fracture surface, and very small pits which are either directly due to abrasion during tool-use or are small flaws in the quartzite matrix.

Width of field: 83mm X120

Plate 230

The use-polished surface of a quartzite flake from Goose Camp 4. The flat polished surface adjoins an unmodified fracture face which drops away at an angle. The edge of the rounded working edge is at the top left-hand corner of the frame. Irregular features on polished surface are pits. Backscattered electron image.

Width of field: 1.66mm X60
Plate 231
Smoothed surface of a use-polished quartzite backed flake from Oenpelli. Surface is very finely striated at approximately 90° to the edge (beyond top of frame). Source of electrons is from the top lefthand corner (irregular features are pits). Back-scattered electron image.
Width of field: 330um X300

Plate 232
Enlargement of previous photograph. Striations are still visible, more or less as linear trends. The pits are remnants of the depressions and concavities in the original fracture surface. The surface is very finely pitted. Backscattered electron image.
Width of field: 100um X1000
Plate 233

Further enlargement of polished surface on quartzite backed flake from Oenpelli. Smoothed surface at this magnification is extensively pitted and/or torn. Linear trends are still evident. Backscattered electron image.

Width of field: 33um X3000

Plate 234

Fresh fracture face on use-polished quartzite backed flake from Alligator Rivers region. Fractured quartz grains are surrounded by cryptocrystalline quartz cement.

Width of field: 330um X300
Plate 235

Further enlargement of the fresh fracture surface. The surface of the fractured quartz grains are very smooth and almost flawless. The surface is, however, very irregular in the large scale. Fine particles of cement and small flakes, all fracture debris, adhere to the surface of the quartz grains.

Width of field: 50um X2000

Plate 236

Detail of a different area of the same freshly fractured surface. Note the smoothness of the surface.

Width of field: 33um X3000
Plate 237

The brightly polished face of a use-polished elouera from the Alligator Rivers region. The working edge is well rounded and the flattened quartz grains can be distinguished from the surrounding cryptocrystalline cement.

Width of field: 1mm X50

Plate 238

Enlargement of a part of the brightly polished surface depicted in the previous photograph.

Width of field: 660um X150
Plate 239

High magnification detail of the surface of a quartz grain on the brightly polished face depicted above. The surface is finely flawed and completely altered from its pristine state (see plate 236). The nature of the surface transformation is a mystery.
Width of field: 10μm X10000

Plate 240

The opposite dull polished face of the backed flake depicted in the previous photographs. Surface is very irregular.
Width of field: 1mm X50
Plate 241
Detail of the matt polished area depicted in the previous photograph. The individual quartz grains are rounded and project above the surrounding cryptocrystalline cement.
Width of field: 660um X150

Plate 242
Detail of a quartz grain on the matt polished surface of the quartzite backed flake depicted in the previous two photographs. The surface relief appears to be due to a transfer of cryptocrystalline cement particles to the surface of the quartz grains.
Width of field: 165um X600
Plate 243
The flat bevel on the edge of a small horsehoof core from Dandaragon, W.A., (W A M A21900). This wear could have resulted from scraping dried kangaroo skin.
Width of field: 20mm X21

Plate 244
Detail of the bevel depicted in plate 244. Furrow striations are oriented at 90° across the 1mm wide bevel.
Width of field: 10mm X42
Plate 245
An experimental quartzite core of horsehoof shape with the detached flakes laid out around it. The hammerstone was a basalt pebble. Hibiscus bloom indicates the scale.

Plate 246
Side-on view of the experimental horsehoof core. Note the step and hinge fracturing around the striking platform.

Plate 247
View of the striking platform on the experimental horsehoof core.
Plate 248

The rounded and smoothed apex of a white quartzite uniface point (pirri) from Sleisbeck (NT 6A/825/65). There is a fresh flake scar (heavily shadowed) on the righthand side of the tip. This wear is comparable to use-wear on experimental drills.

Width of field: 13mm X21

Plate 249

Step fractures emanating from the tip of a bifacially flaked point excavated at Sleisbeck (NT6 A3744/25). This damage is likely to have resulted from projectile impact.

Width of field: 15.6mm X21
Plate 250
Well preserved radiolaria in the chert employed in the tool-use experiments. Photographed under plain light with bedding parallel to the vertical margin. Courtesy of the Geological Survey of N.S.W.
Width of field: 5.8mm X37

Plate 251
Fossils including three species of Bryozoa, sea urchin spines, sea cucumber spicules and possibly Ostracodes and Foraminifera in the flint artifact material employed in the experimental tool-use operations. Photographed under plain light with bedding parallel to the vertical margin.Courtesy of the Geological Survey of N.S.W.
Width of field: 5.8mm X37