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SURFACE TEXTURES AND OTHER FEATURES  
OF DIAMONDS

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A dissertation submitted to the University  
of Cape Town in part fulfilment of the  
requirements of Doctor of Philosophy.

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VOLUME I    FOREWORD  
              ABSTRACT  
              CONTENTS  
              CHAPTERS 1 TO 19  
              ACKNOWLEDGEMENTS  
              REFERENCES

VOLUME II    FIGURES 1 TO 104  
              TABLES 1 TO 29

VOLUME II

## LIST OF FIGURES

Figure		Page
1	The equilibrium between diamond and graphite, examples of calculated geothermal gradients and dry and water-saturated eclogite solidii.	1
2	Green and brown surface staining.	2
3	Common forms of diamond crystal.	3
4	Truncation of growth layering by tetrahexahedroid surfaces.	4
5	The relationship between the diamond tetrahexahedroid and its enclosing octahedron.	5
6	Tetrahexahedroid mass as a percentage of the mass of the enclosing octahedron, plotted against tetrahexahedroid mass.	6
7	Cubes at various stages of resorption to tetrahexahedroida.	7
8	The thermodynamic regions of spontaneous nucleation and growth of the forms of synthetic diamond produced in the nickel-carbon system of the solvent-catalyst process.	8
9	The dimensions compared to determine the predominant form.	9
10	Breakage surfaces.	10
11	Examples of distorted crystal forms.	11
12	Rhombic dodecahedral forms with ribbed surfaces.	12
13	A curve-faced, rhombic dodecahedral crystal displaying rhombic serration.	13
14	Paired pseudohemimorphic crystals.	14
15	A combined form crystal exhibiting distinctly concave, tetrahexahedroid "A" edges.	15
16	Nearly spherical crystals.	16
17	The "positive" and "negative" orientations of surface features on crystal faces of the three main forms of diamond.	17

Figure		Page
18	A diamond treated for 1 hr in fused sodium hydroxide at 720°C.	18
19	The disorientation of crystal edges in octahedron-cube combined forms.	19
20	Synthetic, cubo-octahedral diamonds treated in "dry", fused kimberlitic materials in molybdenum capsules at 30 kb pressure.	20
21	Graphitization etch pits on an octahedral crystal face.	21
22	A triangular plate modified by resorption.	22
23	Shield-shaped laminae on an octahedral crystal face.	23
24	Flat-bottomed and point-bottomed, negatively-oriented trigonal pits.	24
25	Hexagonal pits on an octahedral crystal face.	25
26	Hexagonal pits containing trigonal pits.	26
27	Serrate laminae on an octahedral crystal face.	27
28	Positively-oriented trigonal pits.	28
29	Negatively-oriented tetragonal pits on a cubic surface.	29
30	Crescentic steps on a cubic surface.	30
31	Pointed plates and octahedral crystallites.	31
32	The designation of crystal edges and the traces of octahedral planes, shown for a pair of tetrahexahedroid surfaces joined at a "C" edge.	32
33	Terraces developed about six-fold axial corners of tetrahexahedroida.	33
34	Elongate hillocks.	34
35	Hexagonal pits developed on the sides of large hillocks on tetrahexahedroid surfaces.	35
36	Low-relief surfaces.	36
37	Pyramidal hillocks.	37

Figure	Page	
38	Zigzag texture.	38
39	Corrosion sculpture.	39
40	Shallow depressions.	40
41	Microdisk patterns.	41
42	Patterns of micro-pits.	42
43	Fine striation with edge enhancement.	43
44	Transverse hillocks.	44
45	Imbricate wedge-forms.	45
46	A macle line on a combined form crystal.	46
47	Lamination lines and shagreen texture.	47
48	Chemically-polished surfaces.	48
49	Ruts.	49
50	Network patterns.	50
51	Inclusion cavities.	52
52	Pitted hemispherical depressions.	53
53	Knob-like asperities and ribbed dodecahedral surfaces.	54
54	Pitted disks.	55
55	Circular micro-pits on low-relief surfaces.	56
56	Coarse frosting.	57
57	Fine frosting.	58
58	Scratch-like markings.	59
59	The concentric features developed at a ballas surface.	61
60	Graphite crystallites on the surface of a diamond from eclogite xenolith P.J.L. 18.	62
61	Percussion figures and spall scars.	63
62	An abraded crystal edge.	64
63	Ground scratch-like markings.	65

Figure		Page
64	Mechanically-polished surfaces.	66
65	A diamond rounded artificially by 4 days of treatment with other diamonds in a wind-circuit attrition cell.	67
66	The degrees of abrasion distinguished among tetrahexahedroids.	68
67	Three diamonds exposed at the surface of xenolith AK 1/9.	69
68	Two diamonds exposed at the surface of xenolith AK 1/10.	70
69	A broken diamond exposed upon xenolith AK 1/111 being broken.	71
70	Freshly broken surfaces of diamond exposed as a nearly continuous ring at the surface of xenolith DB 1.	72
71	A diamond exposed at the surface of xenolith DB 2.	73
72	Diamond exposed at the surface of xenolith DB 3.	74
73	A broken octahedron exposed at the surface of xenolith DB 4.	75
74	Five pieces of diamond exposed at the surface of xenolith DB 5.	76
75	A chipped, sharp-edged octahedron exposed at the surface of xenolith DB 6.	77
76	A chipped, sharp-edged octahedron exposed at the surface of xenolith DB 7.	78
77	A group of octahedral crystals, devoid of the effects of any resorption or etching, exposed at the surface of the garnet grain DB 8.	79
78	Diamonds recovered from xenolith PJL 18.	80
79	The diamonds of xenolith AK 1/110.	81
80	Size frequency distribution of diamond crystals recovered from specimen AK 1/110.	82
81	The re-assembled xenolith HRV 247.	83
82	Size frequency distribution of diamond crystals recovered from xenolith HRV 247.	84
83	Diamond and graphite crystals of xenolith HRV 247.	85

Figure	Page	
84	Size frequency distribution of diamond crystals recovered from specimen XRV 22.	86
85	Diamond and graphite crystals from xenolith XRV 22.	87
86	Features of the diamond and graphite crystals in xenolith JJG 531.	88
87	A sharp-edged octahedral diamond and some euhedral to slightly rounded graphite crystals recovered from xenolith AK 1/25.	89
88	Examples of the graphite crystals in graphite eclogite xenoliths.	90
89	Graph for determining the 95 per cent confidence limits for a percentage, according to the number of items involved in the determination.	91
90	Southern African kimberlite localities included in the present study.	92
91	Generalized geological section of the De Beers Mine.	93
92	The abraded four-fold axial corner and "A" edges of a Finsch Mine tetrahexahedroid.	94
93	Generalized geology of the Premier Mine at the 538 m level.	95
94	Some peculiarities among Orapa diamonds.	96
95	The generalized geology of Pipe BK 9.	97
96	Plot of the percentages of minus 11 plus 9 diamonds which exhibit vestiges of octahedral or cubic crystal surfaces, against the approximate, recoverable diamond grade of host kimberlites.	98
97	Plot of the percentage of minus 11 plus 9 diamonds classified as either octahedra or cubes, against the approximate, recoverable diamond grades of host kimberlites.	99
98	Locality map and palaeo-drainage for the Western Transvaal.	100
99	Locality map for Namaqualand and neighbouring areas.	101

Figure		Page
100	Plots of some of the colour characteristics of the diamond samples from Namaqualand and neighbouring areas.	102
101	Plots of the percentages of the diamonds in samples from Namaqualand and neighbouring areas, which display particular, morphological features.	103
102	Plots of the percentages of the diamonds in samples from Namaqualand and neighbouring areas, which display particular, pristine surface textures.	104
103	Plots of the percentages of the diamond in samples from Namaqualand and neighbouring areas, which display particular abrasional features.	105
104	Locality map for New South Wales, Australia.	106

LIST OF TABLES

Table		Page
1	Diamond sieve aperture diameters, the approximate size of diamond passing through each sieve and the approximate average size of the diamonds in each sieve class.	107
2	Details of the kimberlitic diamond samples studied.	108
3	Details of the samples studied from placer deposits.	111
4	Chemical composition of the starting materials used for diamond-etching experiments at 30 kilobars pressure.	113
5	Details of the experiments at 30 kilobars and of the diamond features produced.	114
6	The relative ages and likely conditions of formation of some diamond characteristics.	115
7	Particulars of diamond- and/or graphite-bearing eclogite xenoliths studied.	117
8	Details of the diamond and graphite crystals in eclogite xenoliths.	119
9	The diamond "grade" of some eclogite xenoliths.	121
10	Eclogite xenolith HRV 247 : details of the portions treated and of the free carbon phases recovered.	122
11	Eclogite xenolith HRV 247 : the percentages of the main crystal forms and of diamonds displaying particular surfaces, for the various sizes recovered.	123
12	Examples of approximate, 95 per cent confidence limits for percentage data involving particular numbers of diamonds.	124
13	The percentage distributions of diamond colours in kimberlitic samples.	125
14	Percentage distributions of main crystal forms and of diamonds exhibiting particular surfaces, in kimberlitic samples.	127

Table	Page
15 The approximate percentages of crystals of particular shapes, in some of the kimberlitic samples.	130
16 The percentage distributions of diamonds displaying unrestricted surface textures, in kimberlitic samples.	132
17 The percentages of diamonds with tetrahexahedroid surfaces which display particular tetrahexahedroid surface textures, in kimberlitic samples.	135
18 The percentages of diamonds with octahedral faces which display particular octahedral surface textures, in kimberlitic samples.	138
19 The percentages of diamonds with cubic surfaces which display particular cubic surface textures, in kimberlitic samples.	141
20 The main characteristics of a sample of diamonds recovered from metamorphosed Grey Kimberlite at the upper contact with a gabbro sill at the 370 m level of the Premier Mine.	144
21 Percentage distributions of diamond colours in samples from placer deposits.	145
22 Percentage distributions of main crystal forms and of diamonds exhibiting particular surfaces, in samples from placer deposits.	147
23 The approximate percentages of crystals of particular shapes, in samples from placer deposits.	149
24 Percentage distributions of diamonds displaying unrestricted surface textures, in samples from placer deposits.	151
25 The percentages of crystals with tetrahexahedroid surfaces which display particular tetrahexahedroid surface textures, in samples from placer deposits.	153
26 The percentages of diamonds with octahedral crystal faces which display particular octahedral surface textures, in samples from placer deposits.	155

Table	Page
27 The percentages of diamonds with cubic surfaces which display particular cubic surface textures, in samples from placer deposits.	157
28 The percentages of diamonds abraded to particular degrees and the percentages displaying percussion markings.	159
29 The percentages of light brown to brown and other diamonds displaying breakage surfaces and displaying lamination lines, in some samples.	161

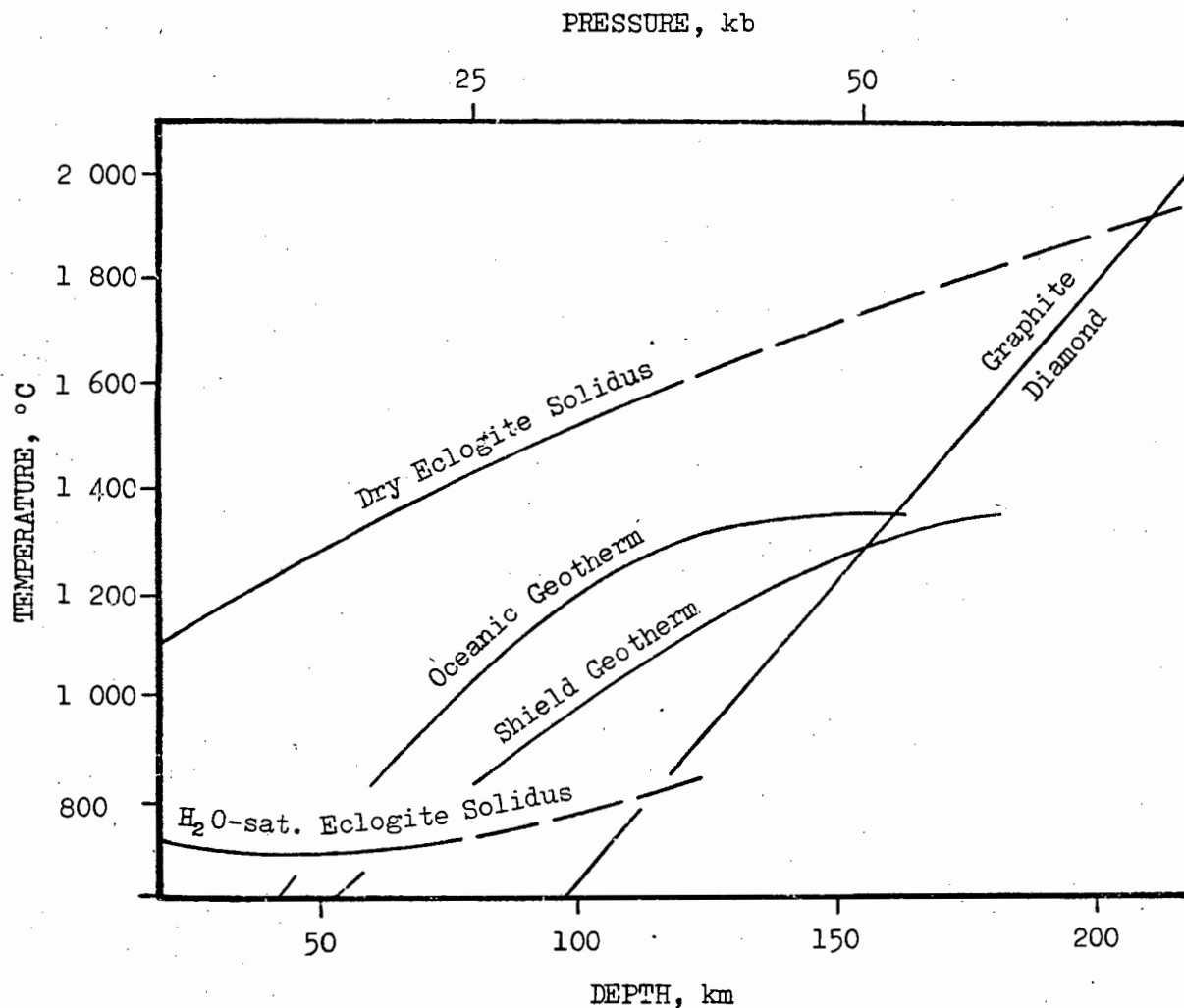
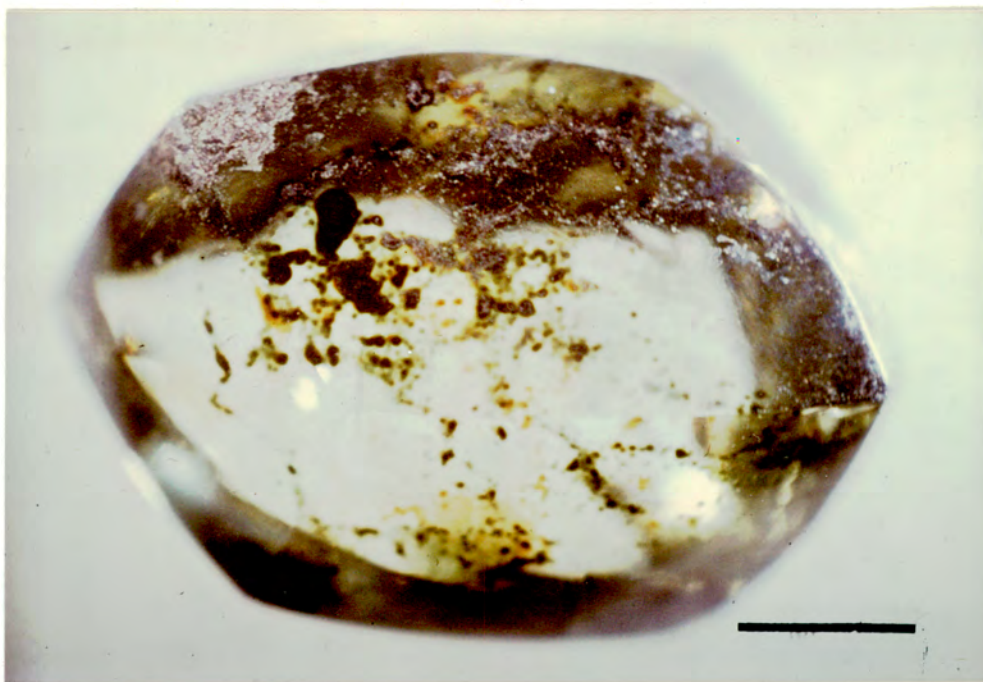


Figure 1. The equilibrium between diamond and graphite (Berman, 1979), examples of calculated geothermal gradients (Harte, 1978) and dry and water-saturated eclogite solidii (Ito and Kennedy, 1974 and Gupta and Yagi, 1977, respectively).

According to the data shown, diamond is stable at depths greater than 154 km beneath shield regions and 160 km beneath oceanic regions. It is possible for diamond to crystallize from late-stage, water-rich eclogitic liquid at these depths. Diamond crystallization from such liquid is possible at shallower depths only if the liquid is able to cool below ambient temperatures. Diamond cannot crystallize from dry eclogite magma at depths shallower than 205 km.

a)



b)

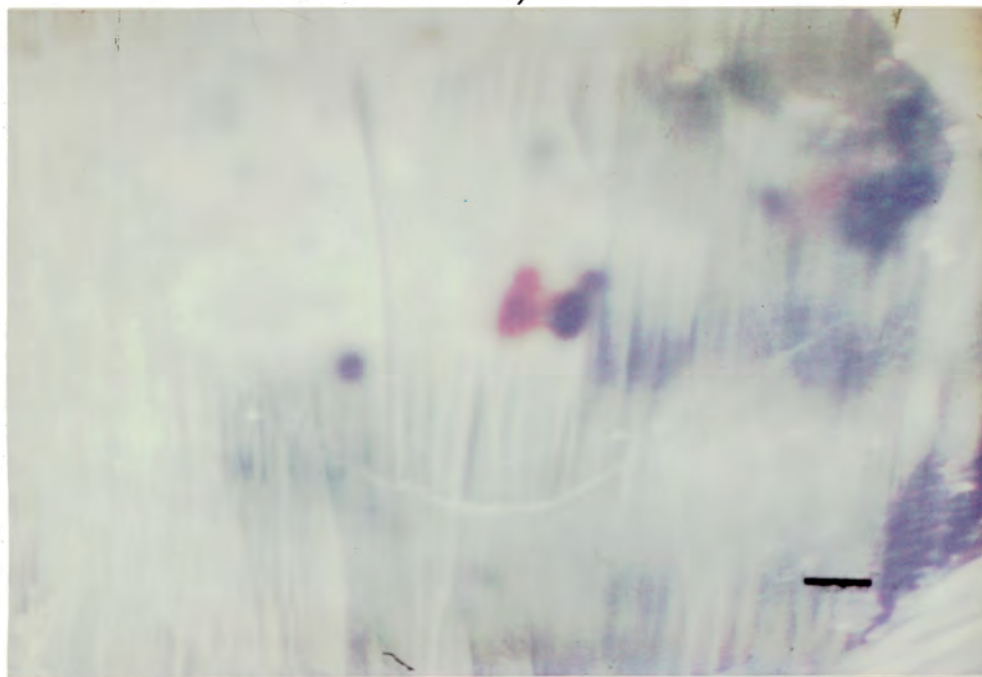


Figure 2. Green and brown surface staining. (Examples from the Witwatersrand Basket, photographed in white light).

- a) Intense green blotches and green and brown spots.
- b) Green spots, and a composite of brown spots next to a green stain of similar outline, on a lightly green-stained background. The brown staining must have been produced first, as green staining. Its present colour is ascribed to heating which also moved the diamond slightly in relation to the radiation source. Subsequent irradiation produced the green stains.  
The scale bars are 1 mm in a) and 0,1 mm in b).

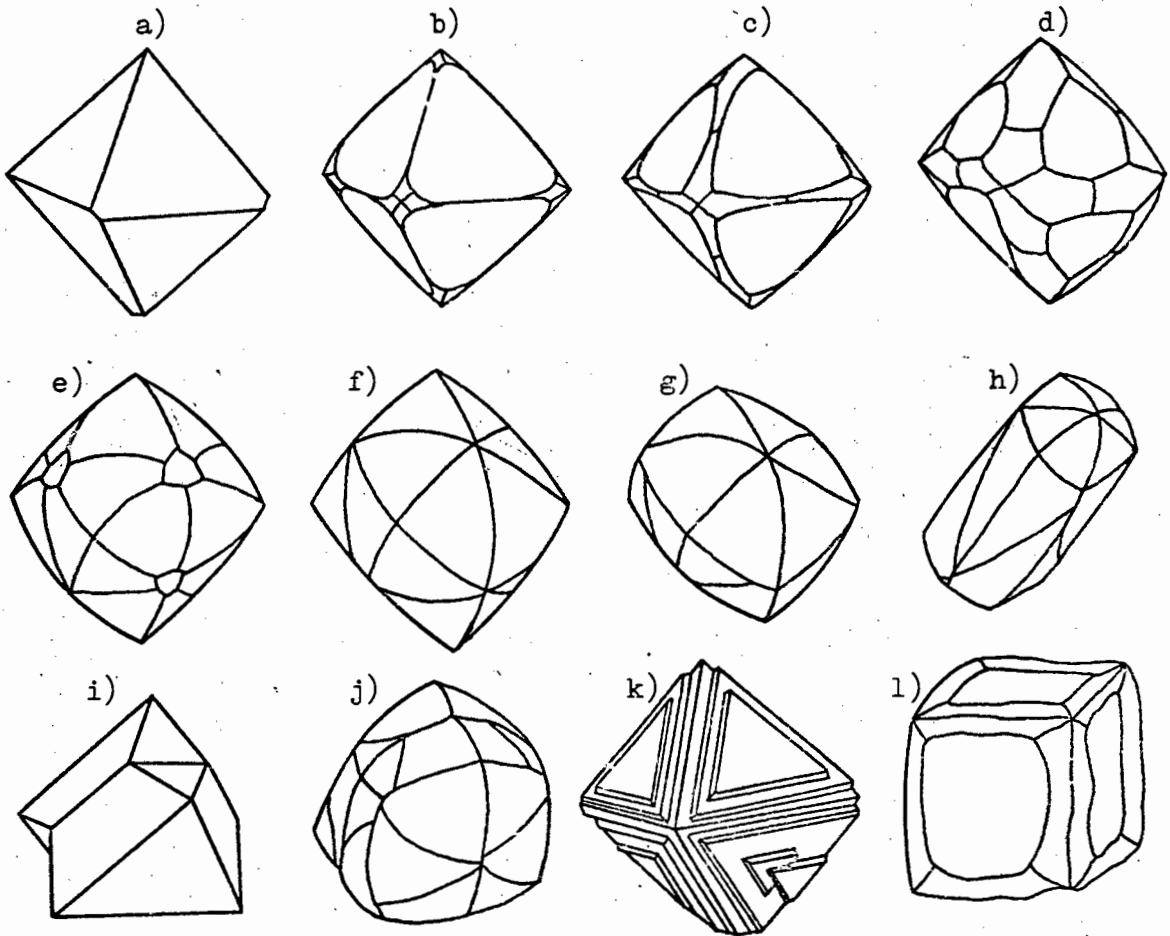


Figure 3. Common forms of diamond crystal.

- a) Octahedron.
- b) to e) Various combinations of octahedron and tetrahexahedroid, ranging from an octahedron with rounded corners to a predominantly tetrahexahedroid form.
- f) Tetrahexahedroid.
- g) Flat tetrahexahedroid.
- h) Elongate tetrahexahedroid.
- i) Contact-twinned octahedron (macle).
- j) Contact-twinned tetrahexahedroid (macle).
- k) Layered octahedron (layering can produce striated, pseudo-tris-octahedral and pseudo-dodecahedral forms). Layering may be associated with crystal growth in which case each layer is a triangular plate (see Article 6.2.2.). These are sometimes arranged imbricately, as at the lower right surface.
- l) Indented cube with subordinate tetrahexahedroid form.

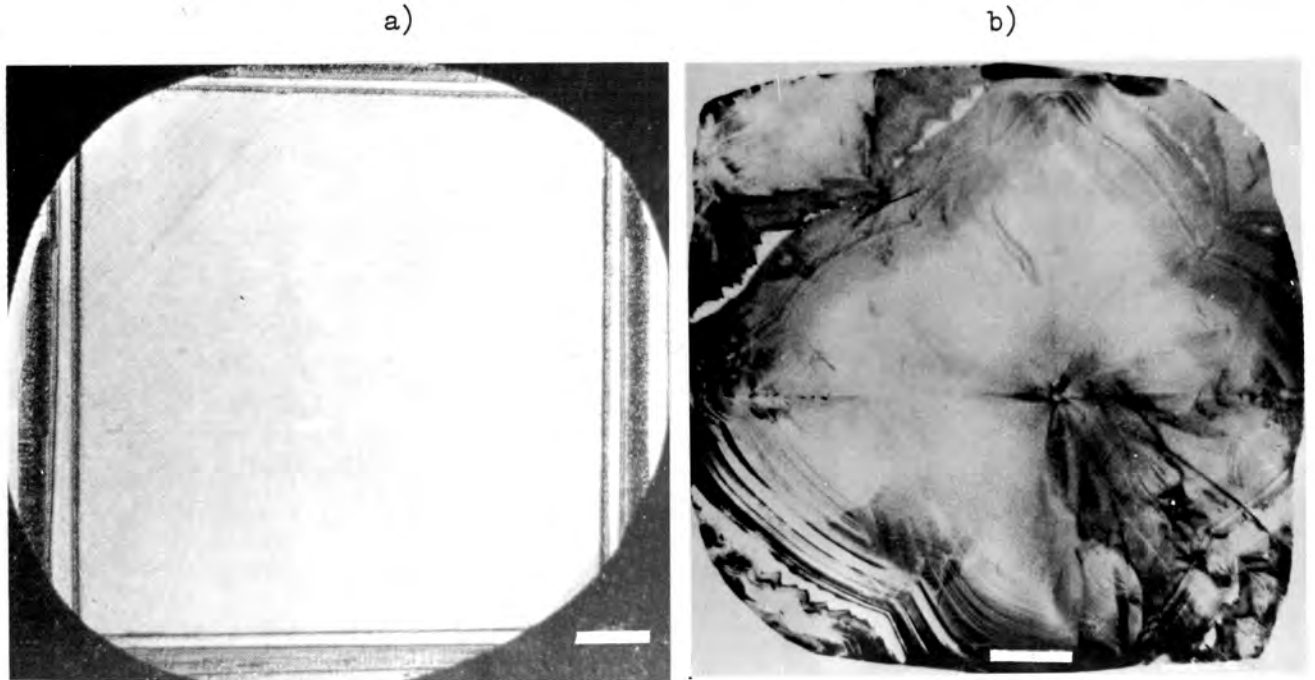


Figure 4. Truncation of growth layering by tetrahexahedroid surfaces.

- a) An optical micrograph of a tetrahexahedroid sectioned at a cube plane, with octahedral layering disclosed by laboratory etching (Seal, 1963).
- b) An X-ray section topograph of a tetrahexahedroid with mamilliary, cuboid growth layering (Suzuki and Lang, 1976).  
The scale bars are 0,1 mm in a) and 1 mm in b).  
(Both illustrations are reproduced by courtesy of the publisher).

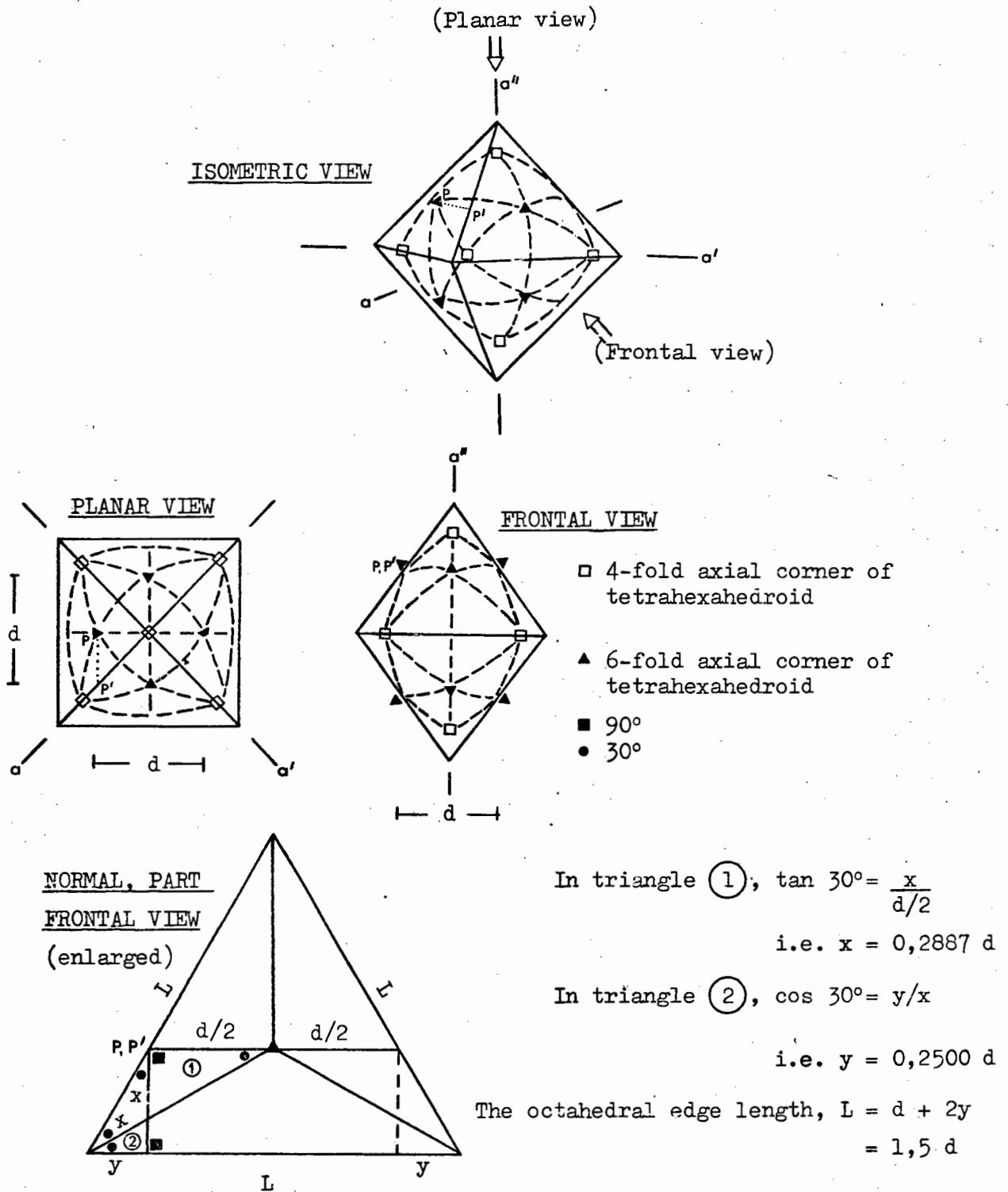


Figure 5. The relationship between the diamond tetrahexahedroid and its enclosing octahedron.

Isometric, planar and frontal views are shown. Geometrical relationships are explained in an enlarged, normal view of one octahedral face. A tetrahexahedroid six-fold axial corner (P) and a projection of it (P') are shown in some of the views.

The normal, part frontal view shows that the edge length (L) of the enclosing octahedron is simply related to the distance (d) between diagonally-opposed, six-fold axial corners of the tetrahexahedroid.

The volume of an octahedron is given by  $0,4714 L^3$ . With d in mm and the density of diamond as 3,515 g/ml:

the mass of the octahedron enclosing a diamond tetrahexahedroid

$$= 0,4714 (1,5d)^3 \cdot 0,003515 \cdot 5 \text{ carats}$$

$$= 0,008285 (1,5d)^3 \text{ carats}$$

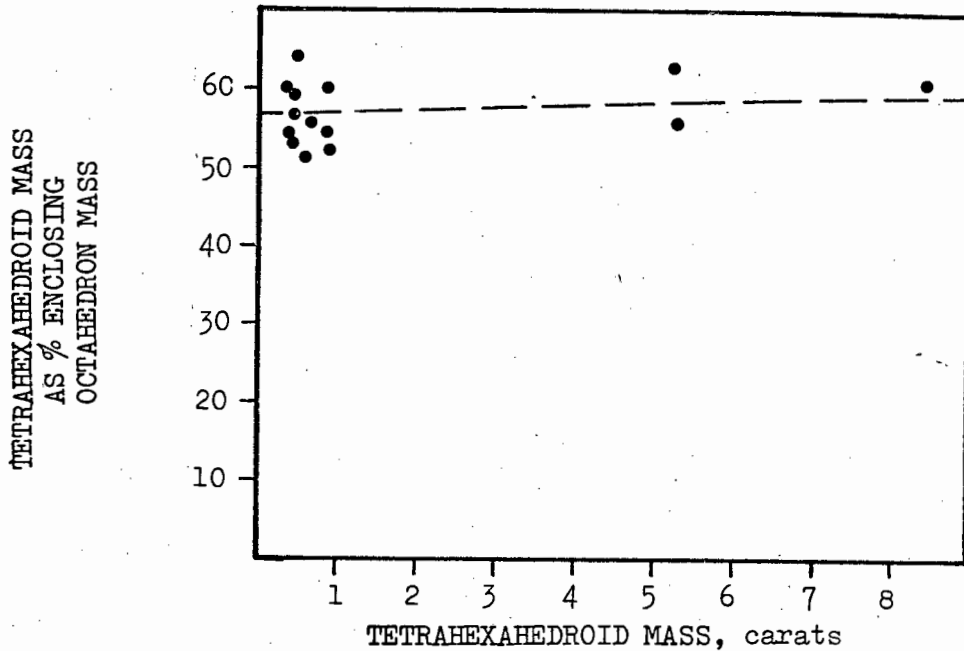


Figure 6. Tetrahexahedroid mass as a percentage of the mass of the enclosing octahedron, plotted against tetrahexahedroid mass.

Measured tetrahexahedroid masses were converted to percentages of the calculated masses of enclosing octahedra (see Figure 5). These results are plotted against the measured tetrahexahedroid masses.

The plot demonstrates that the conversion of an octahedron to a typical tetrahexahedroid involves a minimum mass loss of approximately 45 per cent. All of the tetrahexahedroida which were measured exhibit some degree of distortion. The average value of  $d$  (Fig. 5) was used in each calculation. The scatter in the data points is probably largely a consequence of inaccuracies in the measurements but also reflects variations in the degree of curvature between crystals.

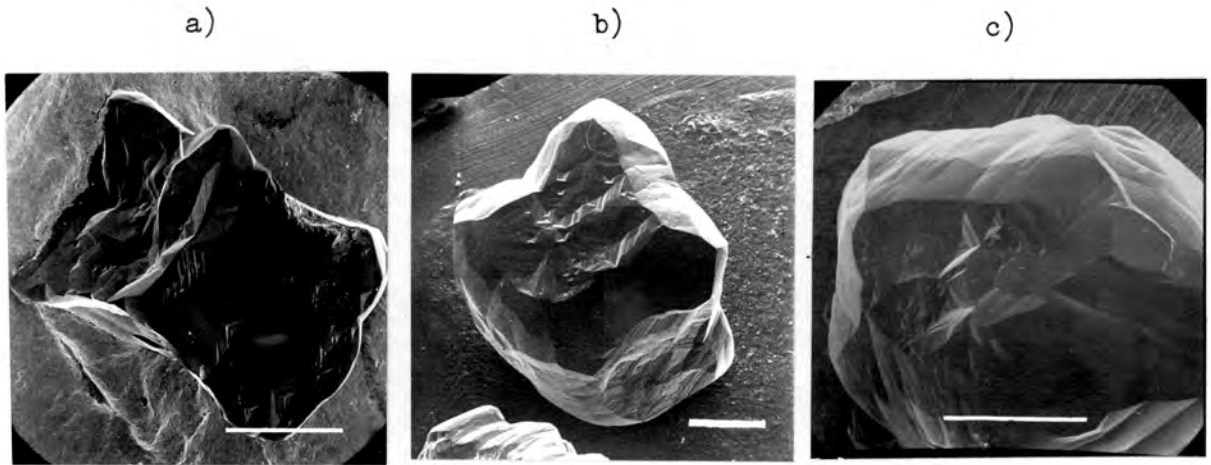
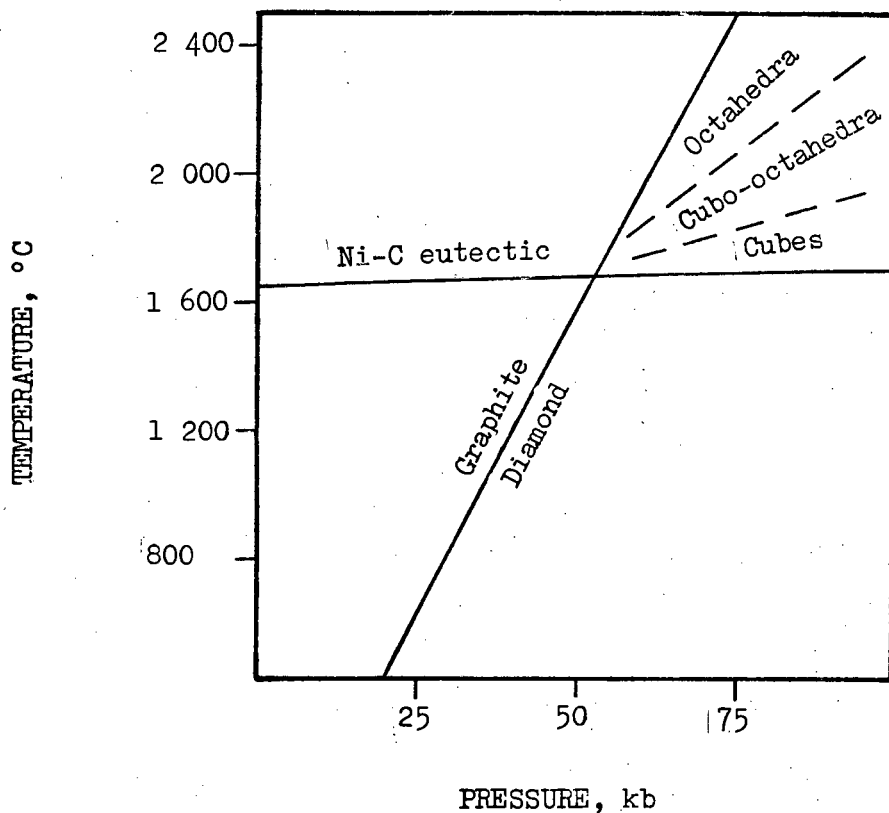


Figure 7. Cubes at various stages of resorption to tetrahedra.

The indentation of cubic surfaces is most pronounced in the initial stages of the conversion a) and least pronounced in the latter stages c). The steepness of subordinate, indented surfaces in c) suggests that indentation continues while tetrahedroid surfaces are developing. The scale bars are 1 mm.



**Figure 8.** The thermodynamic regions of spontaneous nucleation and growth of the forms of synthetic diamond produced in the nickel-carbon system of the solvent-catalyst process (simplified after Giardini and Tydings, 1962 and Bezrukov, Butuzov and Gorokhov, 1970).

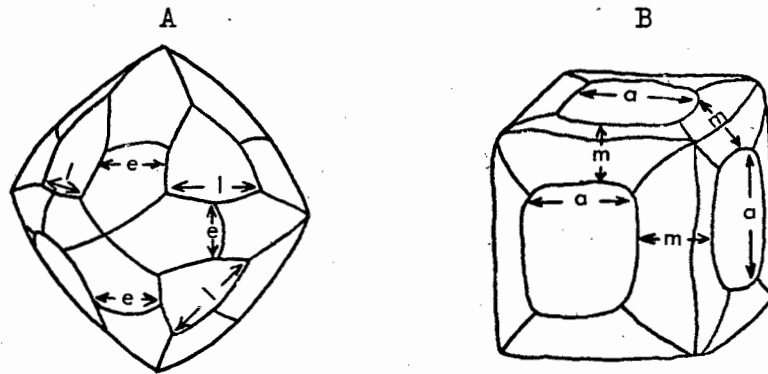


Figure 9. The dimensions compared to determine the predominant form.

- A. Octahedron-tetrahexahedroid combination.  $l > e$  = octahedron;  
 $e > l$  = tetrahexahedroid.
- B. Cube-tetrahexahedroid combination.  $a > m$  = cube;  $m > a$  = tetrahexahedroid.

Average dimensions are used. In practice it is seldom necessary to make accurate measurements.

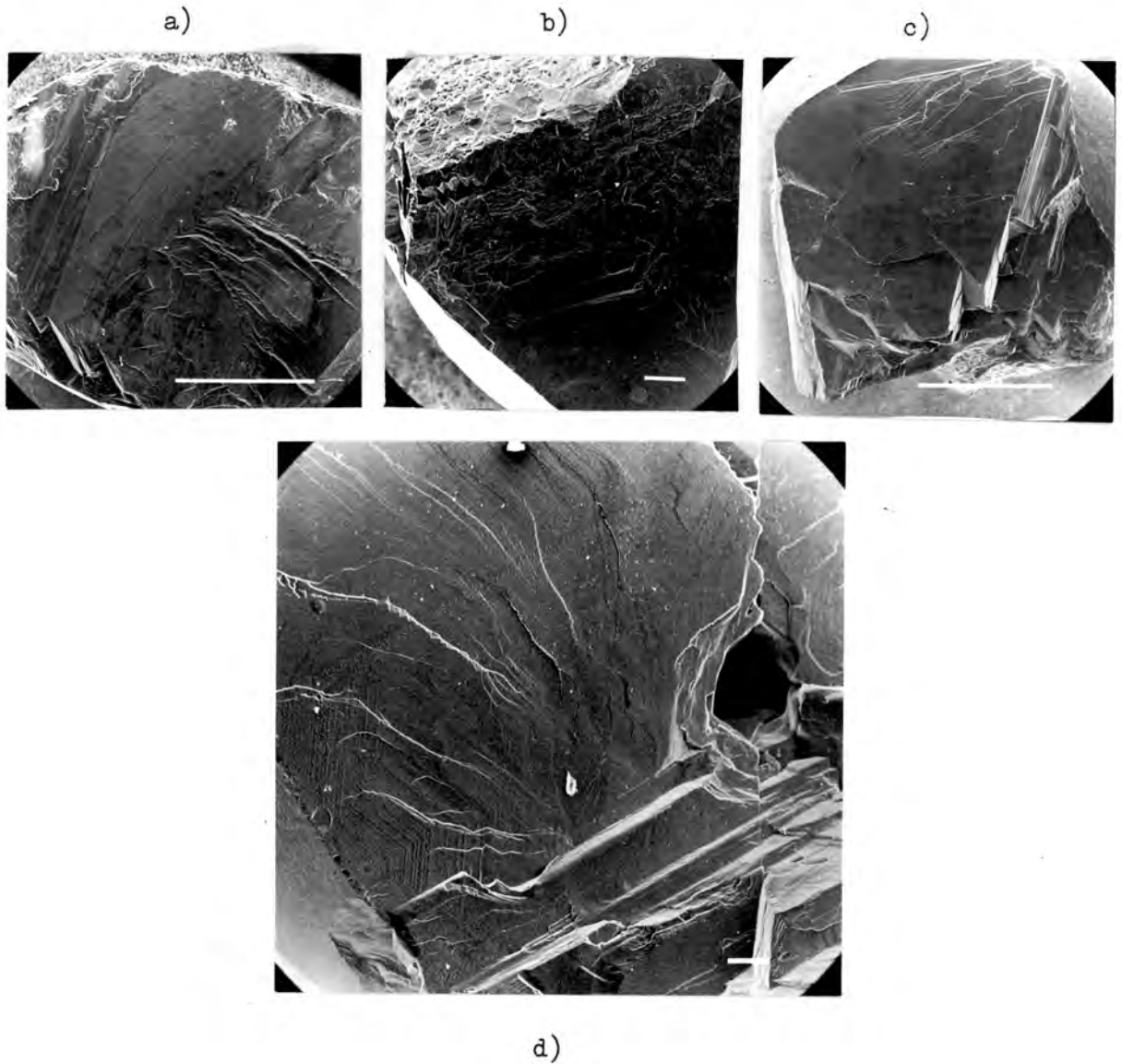


Figure 10. Breakage surfaces.

- a) Stepped, octahedral cleavage and subconchoidal fracture surfaces.
  - b) Strongly etched cleavage surfaces.
  - c) A common variety of cleavage surface. Most of the surface is "fresh" but a patch at the extreme left is etched. The etched portion is probably the side of a rut (Article 6.5.4.) and post-etching cleavage followed the same plane of weakness at which the rut developed.
  - d) Thinly-stepped octahedral cleavage surface at which light etching has disclosed traces of internal structure. The hole at the right is probably the cavity vacated by an inclusion which was responsible for the diamond breaking.
- The scale bars are 1 mm in a) and c), and 0,1 mm in b) and d).

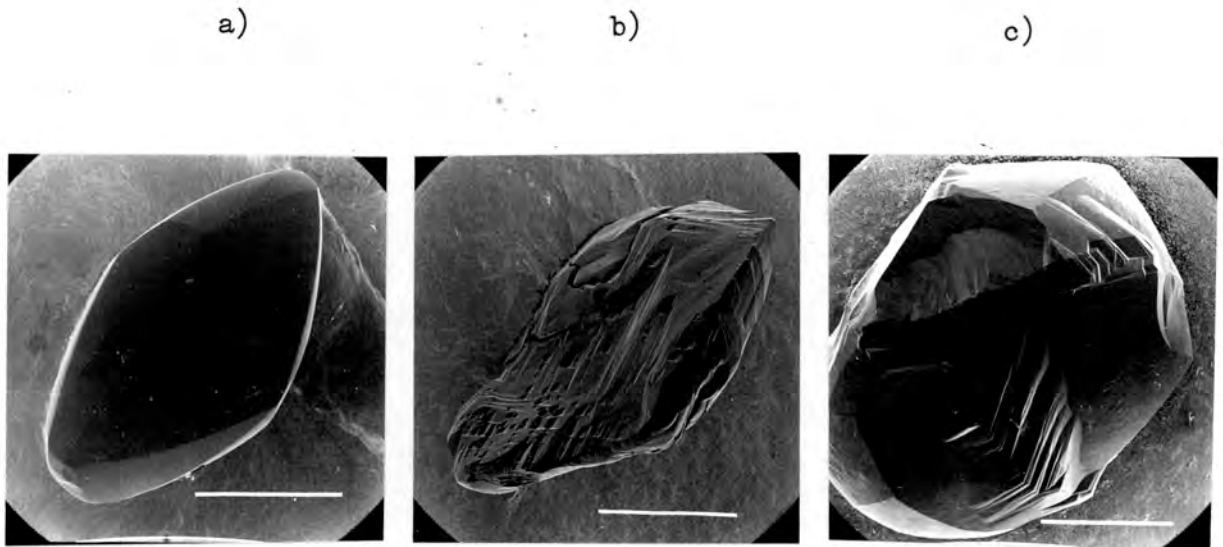
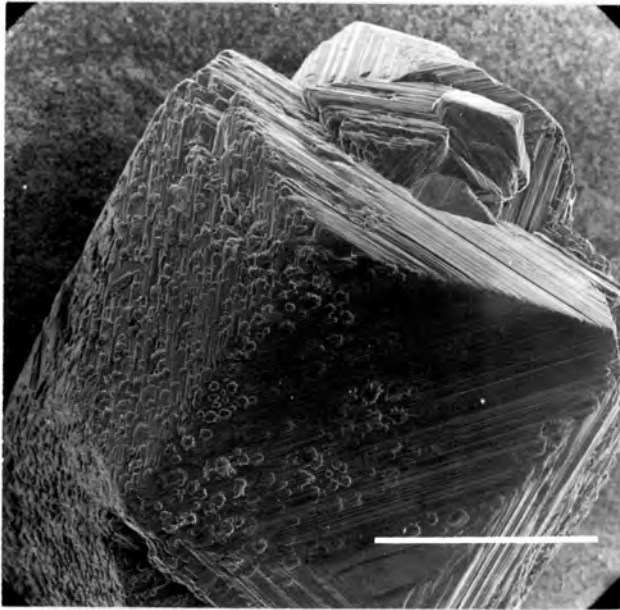


Figure 11. Examples of distorted crystal forms.

- a) An elongate tetrahexahedroid.
  - b) A flat, irregular tetrahexahedroid which may owe its shape to plastic deformation. Pits are localized at lamination lines (which are considered to result from plastic deformation, see Article 6.5.2.) at the lower left.
  - c) A tetrahexahedroid with bulges marked by lamination lines. The bulges are best explained by a relative resistance to resorption at the outcrops of the lamination lines.
- The scale bars are 1 mm.

a)



b)

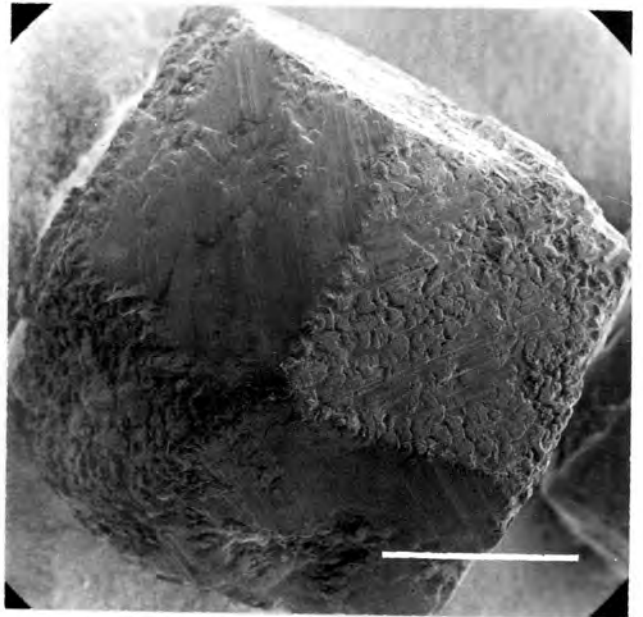


Figure 12. Rhombic dodecahedral forms with ribbed surfaces.

Knob-like asperities (Article 6.5.8.) are usually developed on ribbed dodecahedral surfaces, as on some faces of the aggregate in a). These knob-like features are subdued in b). The scale bars are 1 mm.

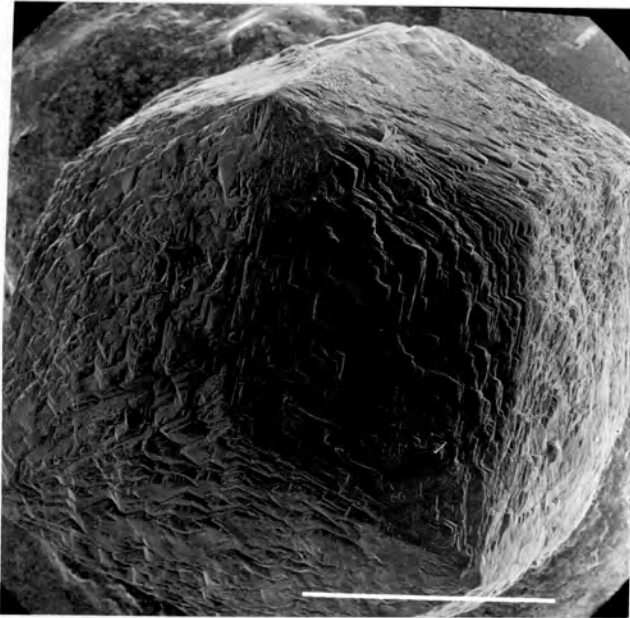


Figure 13. A curve-faced, rhombic dodecahedral crystal displaying rhombic serration (Article 6.4.15.). The scale bar is 1 mm.

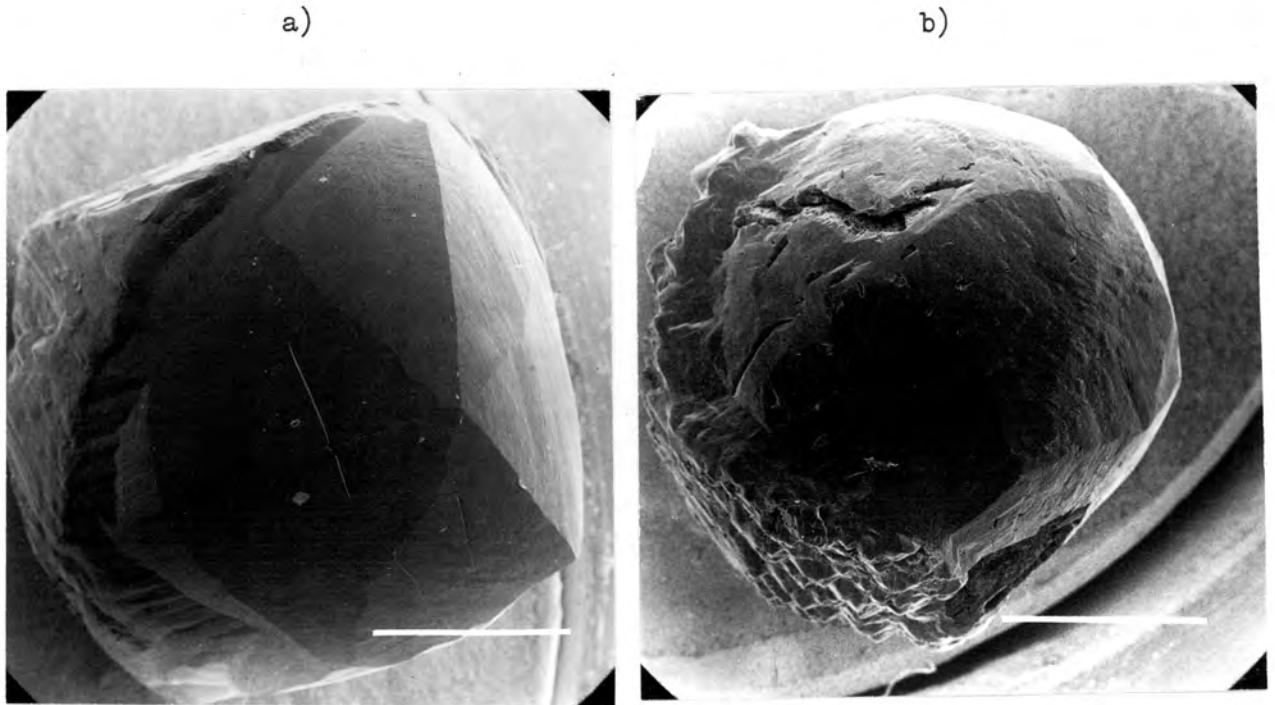


Figure 14. Paired pseudohemimorphic crystals.

The tetrahexahedroid form is always relatively strongly developed in the smaller portion of the crystal. It is clearly apparent in a) that both portions of the crystal share the same crystallographic axes. The scale bars are 1 mm.

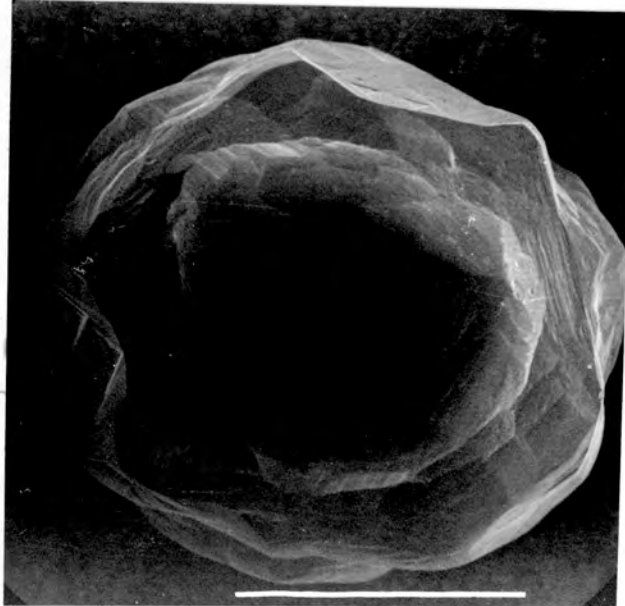
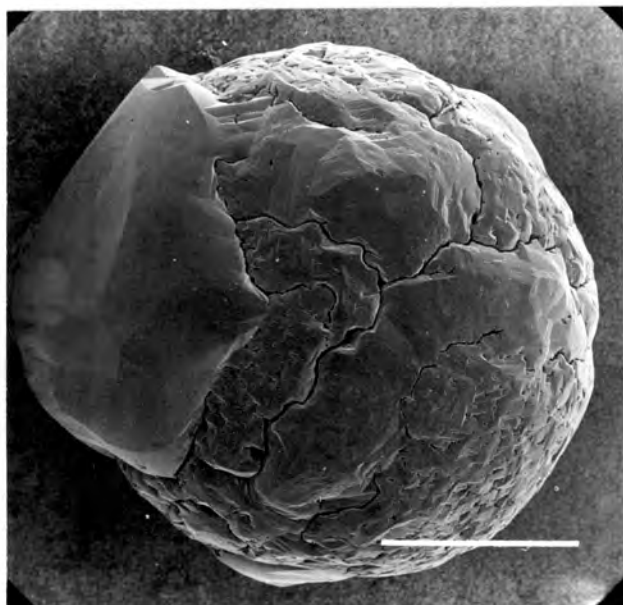


Figure 15. A combined form crystal exhibiting distinctly concave, tetrahexahedroid "A" edges. (The scale bar is 1 mm).

a)



b)

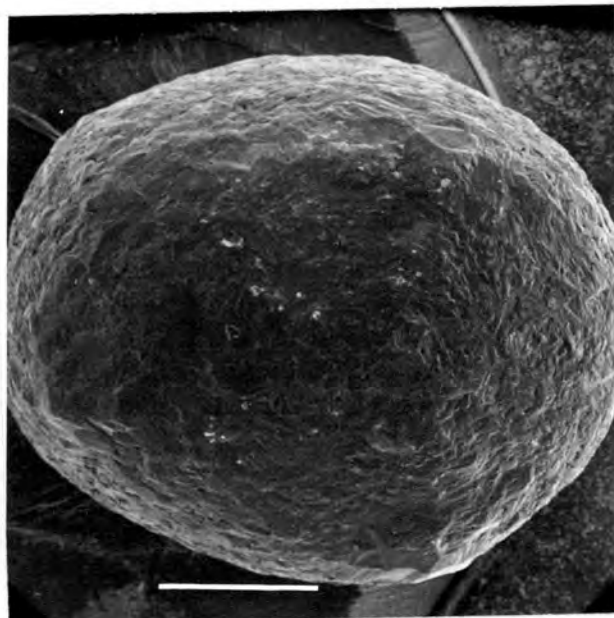
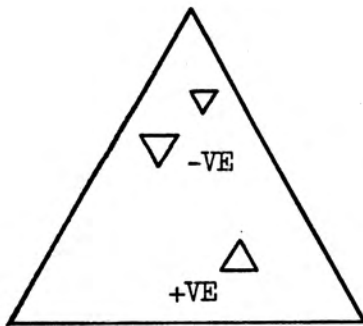


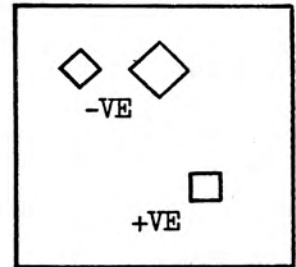
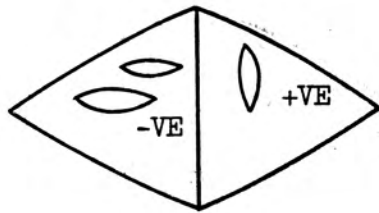
Figure 16. Nearly spherical crystals.

- a) A nearly spherical crystal intergrown with an octahedron. The nearly spherical crystal displays cuboid surfaces, which are marked by tetragonal etch pits (Article 6.3.1.), and tetrahexahedroid surfaces. Surfaces of these two forms join at ruts (Article 6.5.4.). Cuboid surfaces are distinctly convex.
  - b) A ballas diamond.
- The scale bars are 1 mm.

A PAIR OF  
TETRAHEDRAHEDROID FACES



OCTAHEDRON FACE



CUBE FACE

Figure 17. The "positive" and "negative" orientations of surface features on crystal faces of the three main forms of diamond. (Also see Figure 19).

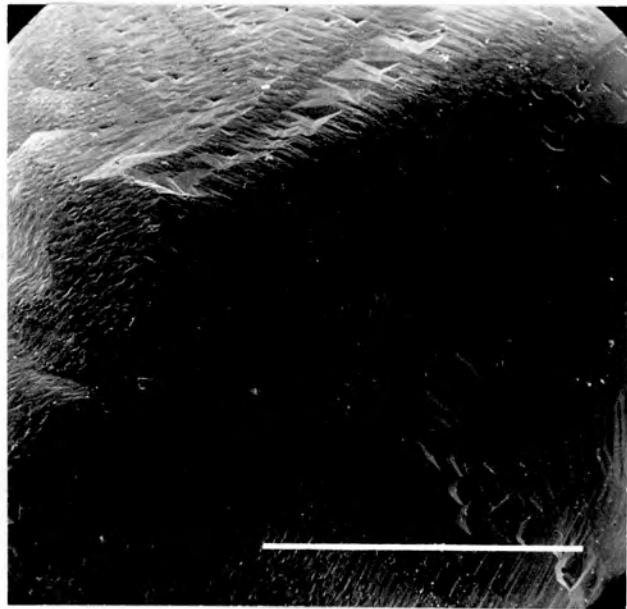


Figure 18. A diamond treated for 1 hr in fused sodium hydroxide at 720°C.

Positively-oriented trigonal pits are developed on octahedral surfaces and transverse hillocks are developed on tetrahexahedroid surfaces. The scale bar is 1 mm.

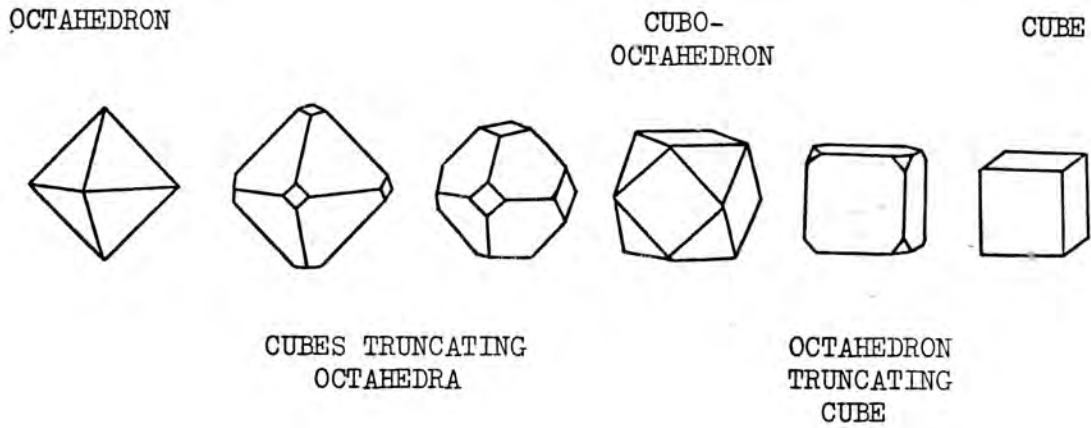


Figure 19. The disorientation of crystal edges in octahedron-cube combined forms.

Edges of cubic faces which truncate octahedral faces are disoriented by  $45^\circ$  with respect to the edges of the simple cube. Octahedral faces which truncate the cube have "inverted" outlines.

Negatively-oriented surface features have outlines parallel to the edges of these truncating surfaces and will be mistaken for positively-oriented features unless the disorientation of crystal edges is taken into account. Similarly, positively-oriented features may be mistaken for negatively-oriented features.

The edges of octahedral and cubic faces which truncate the tetrahexahedroid form are not disoriented.

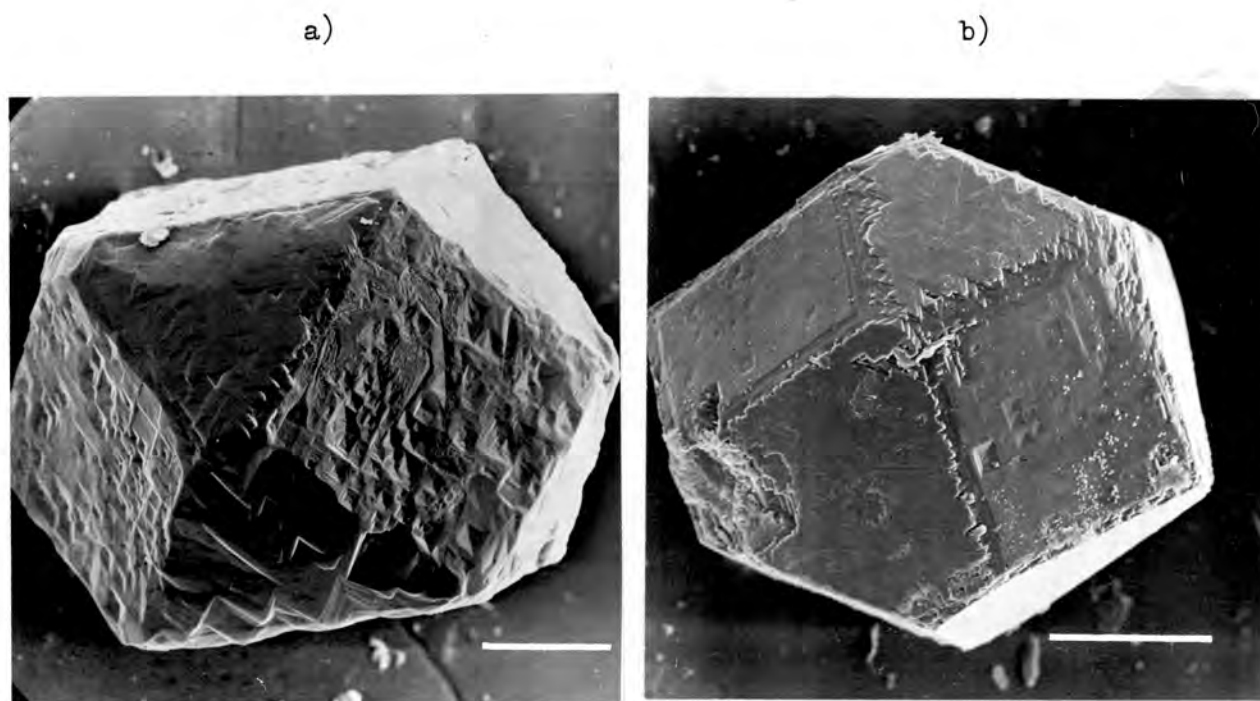


Figure 20. Synthetic, cubo-octahedral diamonds treated in "dry", fused kimberlitic materials in molybdenum capsules at 30 kb pressure.

a) run A 15; b) run A 17 (see Table 5). a) displays more pronounced etch features than b). Tetragonal and trigonal etch pits are developed on cubic and octahedral surfaces, respectively. These are in the negative orientation (considering Figure 19). Octahedral surface laminae also exhibit serrate edges, possibly due to the coalescence of concentrated, trigonal pits. The recession of octahedral laminae away from crystal edges demonstrates a mechanism by which the tetrahexahedroid form could develop. The scale bars are 0,1 mm.

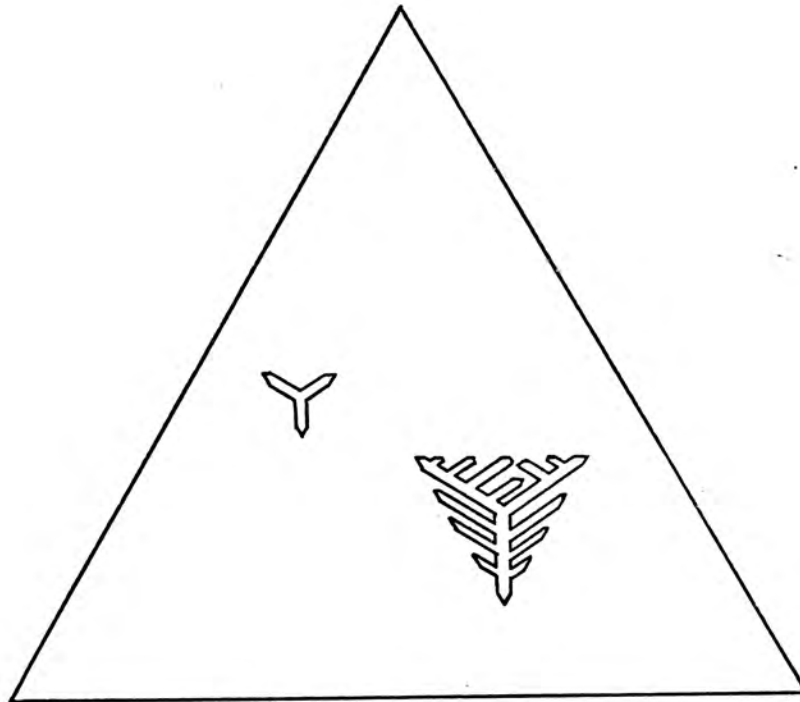


Figure 21. Graphitization etch pits on an octahedral crystal face (after Davies, 1972).

Incipient forms of the pits are referred to by Davies as "three-bladed propellers". With growth of the etch features, branches develop and produce "Christmas tree formations". "Propeller blades" and "Christmas tree branches" are aligned in  $\langle 112 \rangle$  directions on  $(111)$  planes. The gross outlines of "Christmas tree formations" correspond with those of trigons.

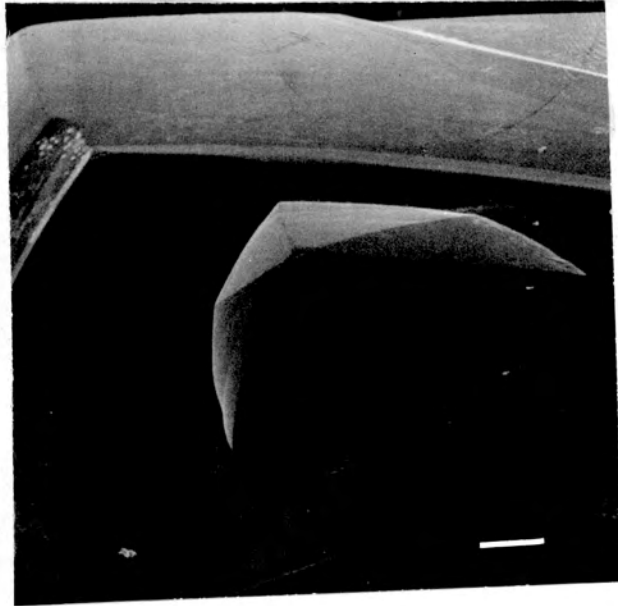


Figure 22. A triangular plate modified by resorption. (The scale bar is 0,1 mm. See also Figure 94).

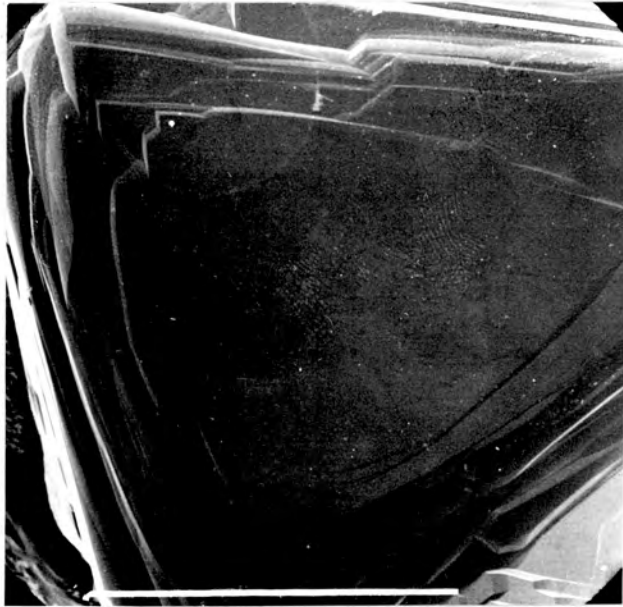


Figure 23. Shield-shaped laminae on an octahedral crystal face.  
(The scale bar is 1 mm).

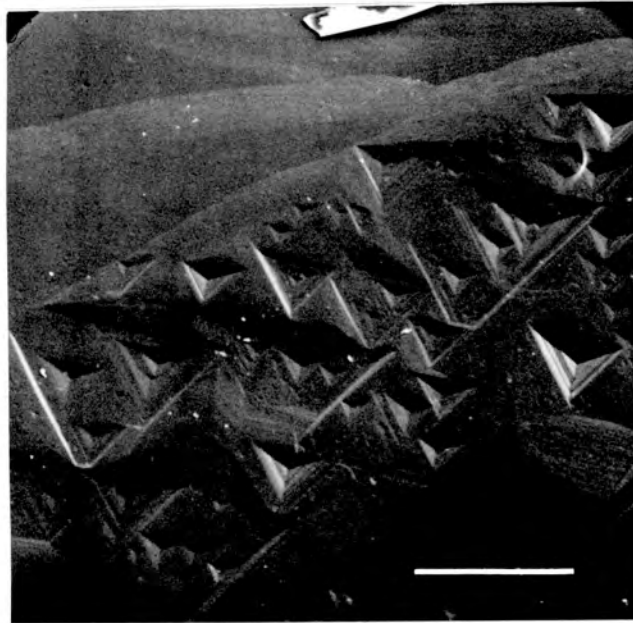


Figure 24. Flat-bottomed and point-bottomed, negatively-oriented trigonal pits (trigons). (The scale bar is 0,1 mm).

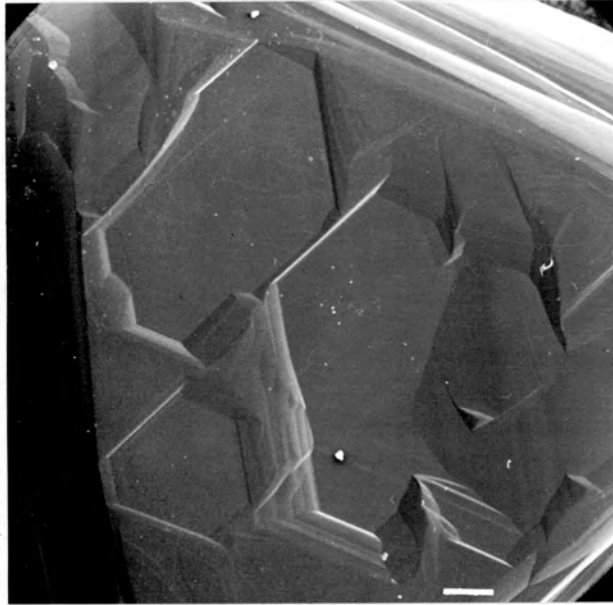


Figure 25. Hexagonal pits on an octahedral crystal face. (The scale bar is 0,1 mm).

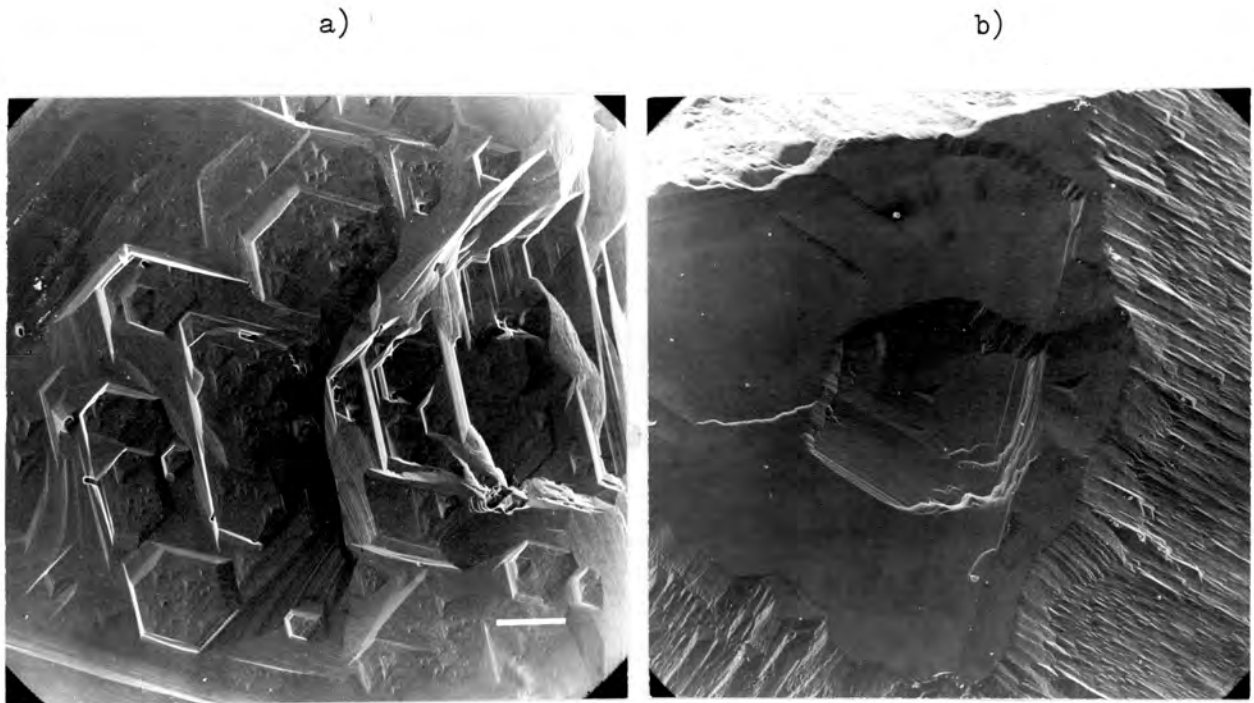


Figure 26. Hexagonal pits containing trigonal pits.

- a) Hexagonal pits containing point-bottomed trigons.
  - b) Hexagonal pit containing a point-bottomed, positively-oriented trigonal pit. Transverse hillocks (Article 6.4.13.) are developed on tetrahexahedroid surfaces.
- The scale bars (at the upper left in b)) are 0,1 mm.

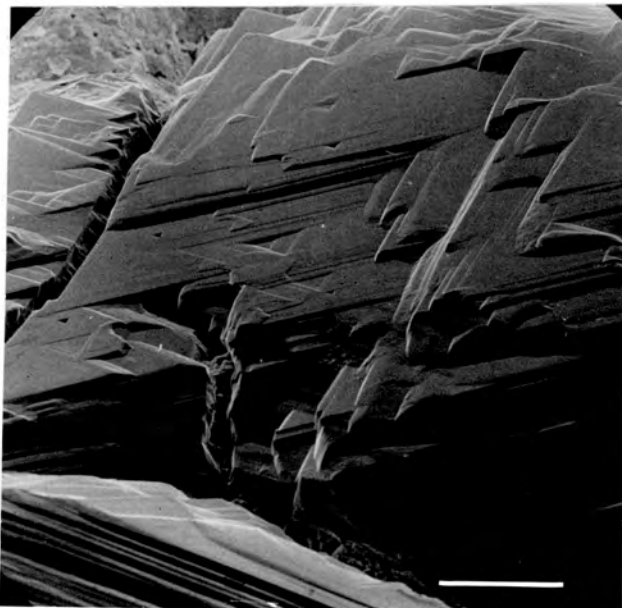


Figure 27. Serrate laminae on an octahedral crystal face. (The scale bar is 0,1 mm).

a)

b)

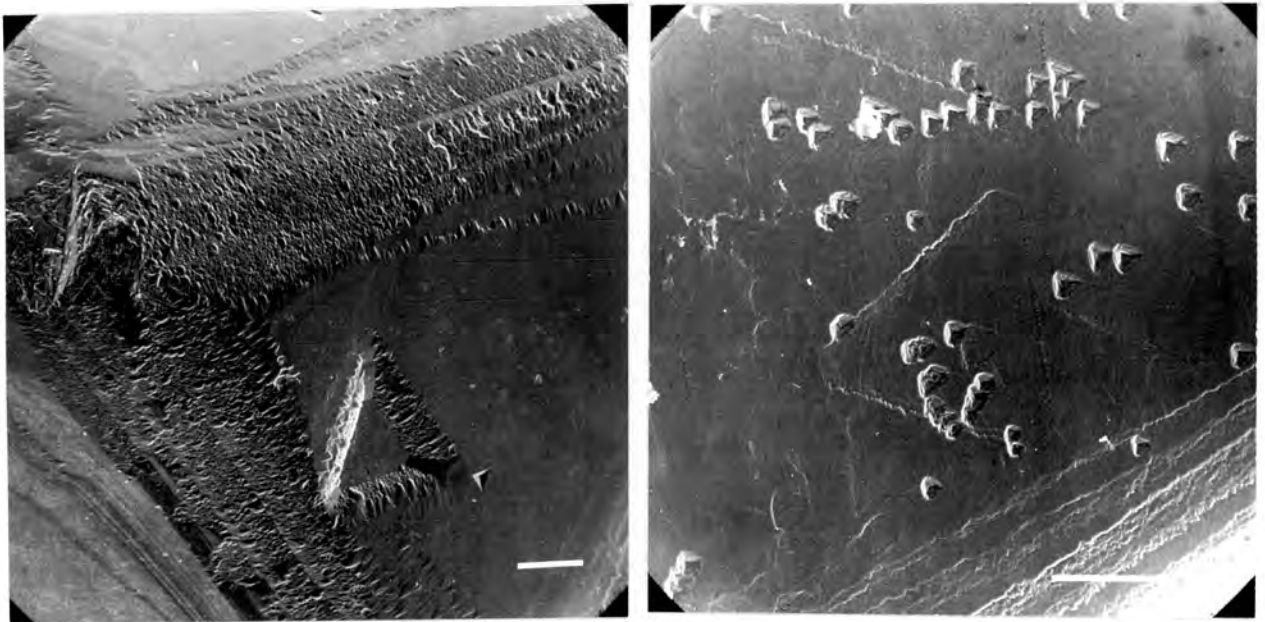


Figure 28. Positively-oriented trigonal pits.

- a) A positively-oriented trigonal pit next to a larger trigon. The edges of the positively-oriented pit are parallel to the edges of the octahedral face. Imbricate wedge-markings (Article 6.4.14.) are developed on the trigon sides and at tetrahexahedroid surfaces.
  - b) Terraced and point-bottomed, positively-oriented trigonal pits. Some occur within a shallow, flat-bottomed trigon with truncated corners.
- The scale bars are 0,1 mm.

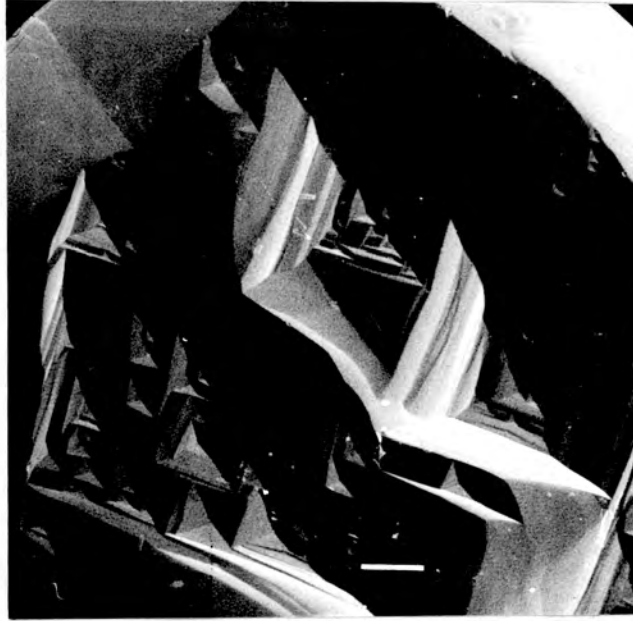


Figure 29. Negatively-oriented tetragonal pits (tetragons) on a cubic surface. (The scale bar is 0,1 mm).

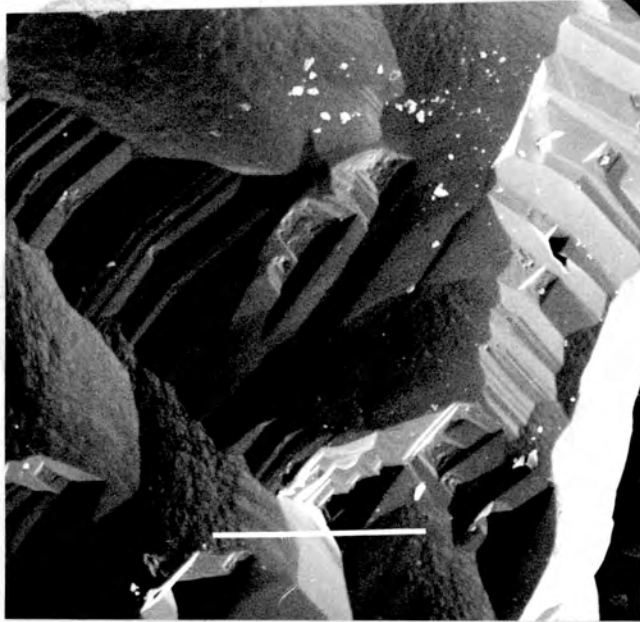


Figure 30. Crescentic steps on a cubic surface. (The scale bar is 0,1 mm).

a)

b)

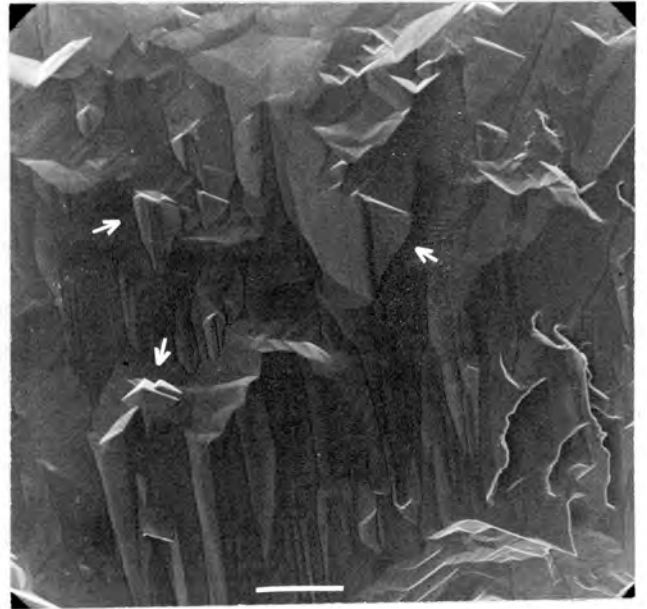
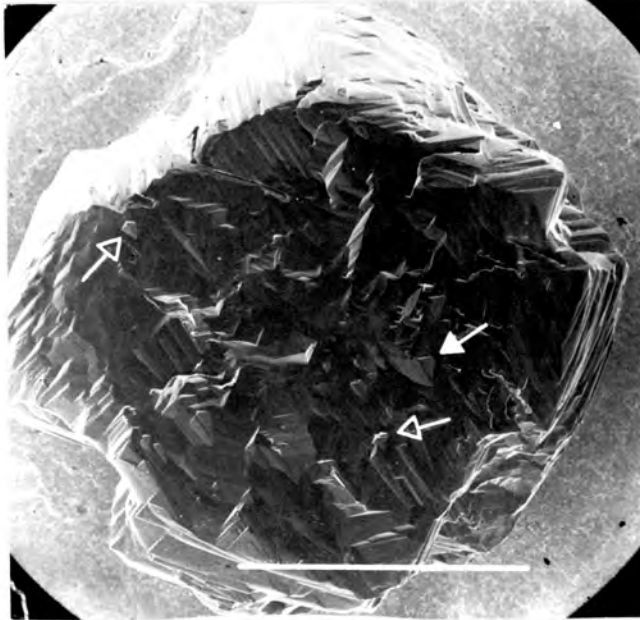


Figure 31. Pointed plates and octahedral crystallites.

- a) Pointed plates (e.g. full arrow) and octahedral crystallites (open arrows) on the indented cubic surface of a diamond from eclogite xenolith HRV 247.
- b) An enlarged view of some pointed plates surrounding an octahedral crystallite seen in a).
- The scale bars are 1 mm in a) and 0,1 mm in b).



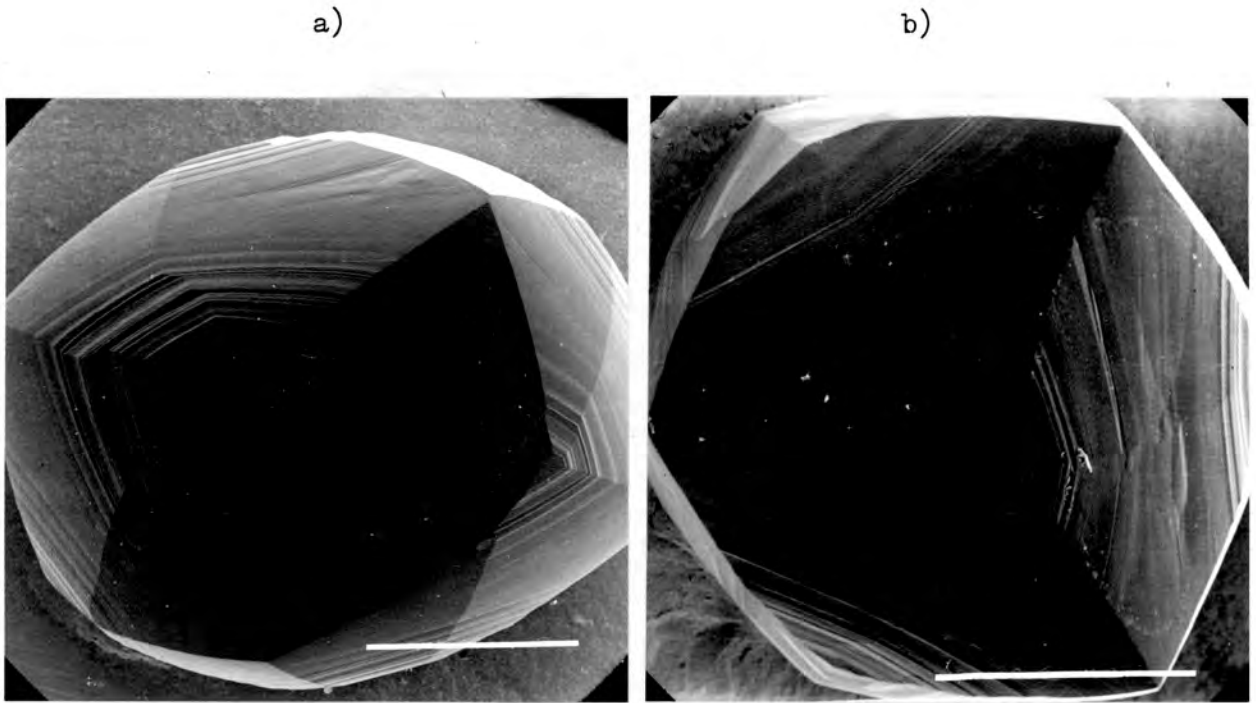


Figure 33. Terraces developed about six-fold axial corners of tetrahexahedroids.

The terraces are particularly prominent in a) in which the central plateau of each set is a remnant, octahedral surface and the successive two or three plateaus are nearly octahedral surfaces. Elongate hillocks (Article 6.4.2.) are apparent between terrace sets, particularly in b). The scale bars are 1 mm.

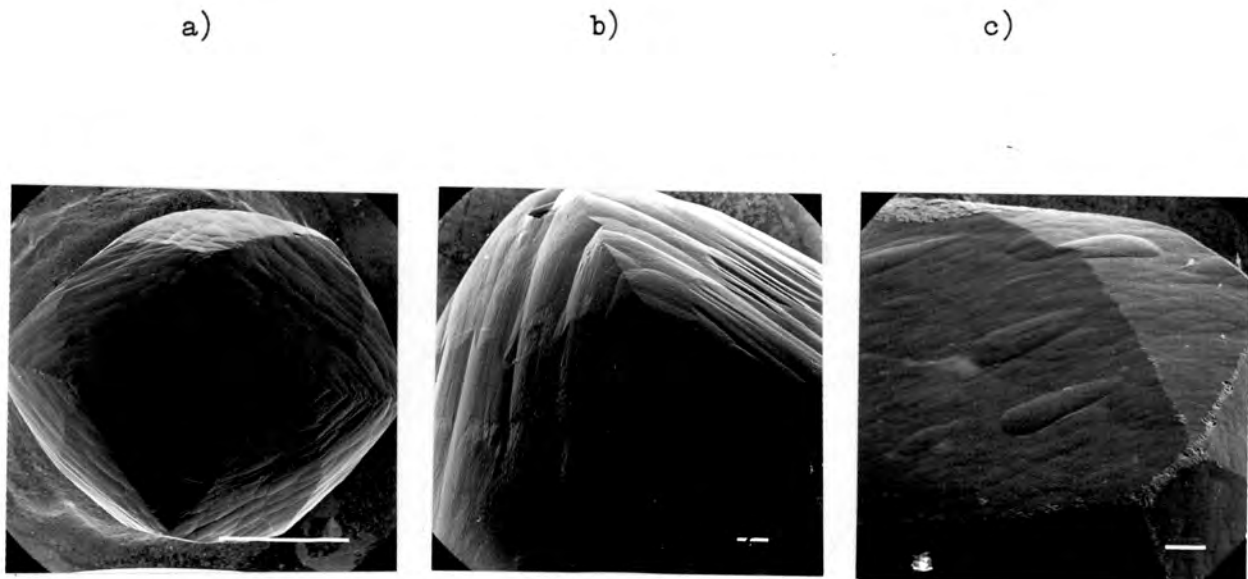


Figure 34. Elongate hillocks.

- a) Prominent elongate hillocks on a tetrahexahedroid.
  - b) Coarse, elongate hillocks on which relatively fine, elongate hillocks are superimposed. Shallow depressions (Article 6.4.9.) are also developed.
  - c) Short, large and small ellipsoidal hillocks.
- The scale bars are 1 mm in a) and 0,1 mm in b) and c).

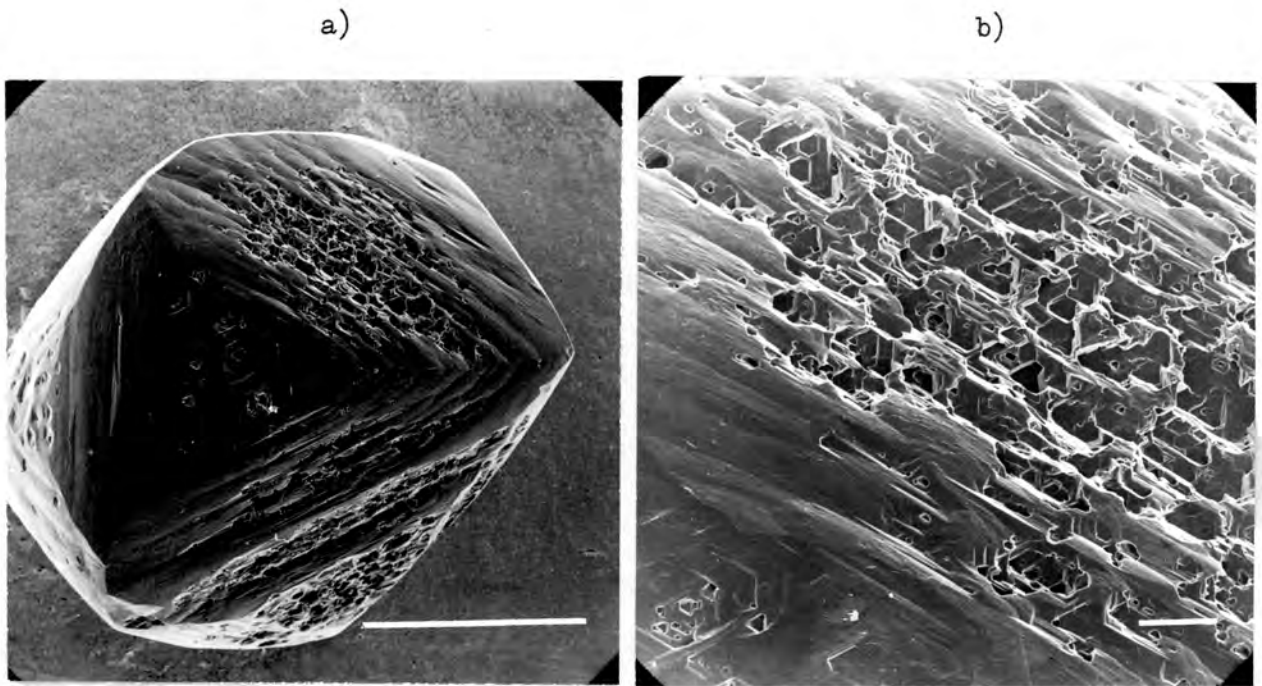


Figure 35. Hexagonal pits developed on the sides of large hillocks on tetrahexahedroid surfaces.

Hexagonal pits are also developed on the octahedral crystal faces of the crystal depicted. The scale bars are 1 mm in a) and 0,1 mm in b).

a)

b)

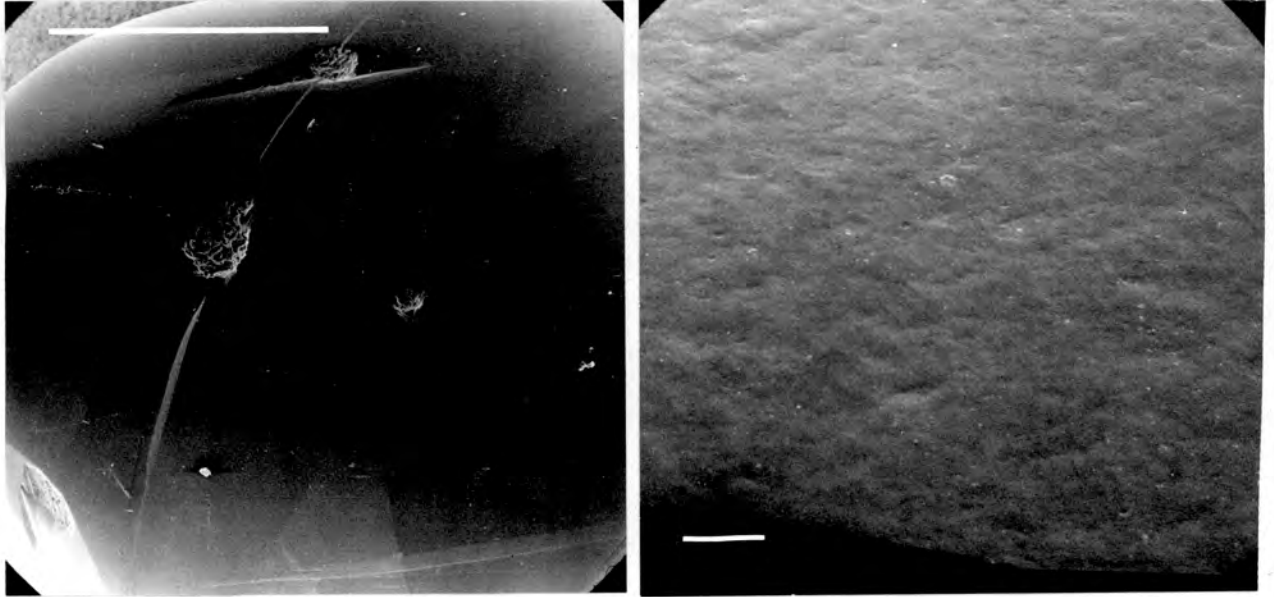


Figure 36. Low-relief surfaces.

- a) Tetrahexahedroid surfaces of very low relief. A single lamination line (Article 6.5.2.) and three, pitted hemispherical cavities (Article 6.5.7.) are also apparent.
  - b) An enlarged view of a low-relief surface. Shallow, circular micro-pits (Article 6.5.10.) provide most of the local relief of the surface.
- The scale bars are 1 mm in a) and 10  $\mu$ m in b).

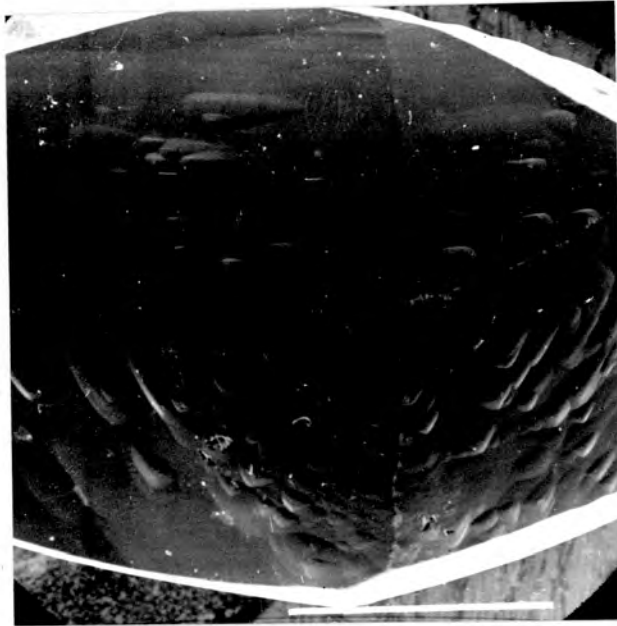
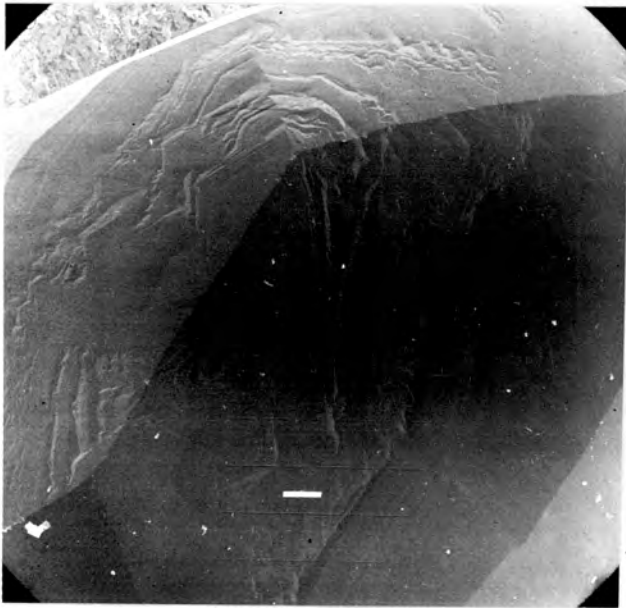


Figure 37. Pyramidal hillocks.

Hillock forms splay away from "C" edges. According to Orlov (1977, p. 95), the blunt ends of hillocks are cubic surfaces and the other two sides are octahedral surfaces. The crests of hillocks are parallel to dodechaedral surfaces. The scale bar is 1 mm.

a)



b)

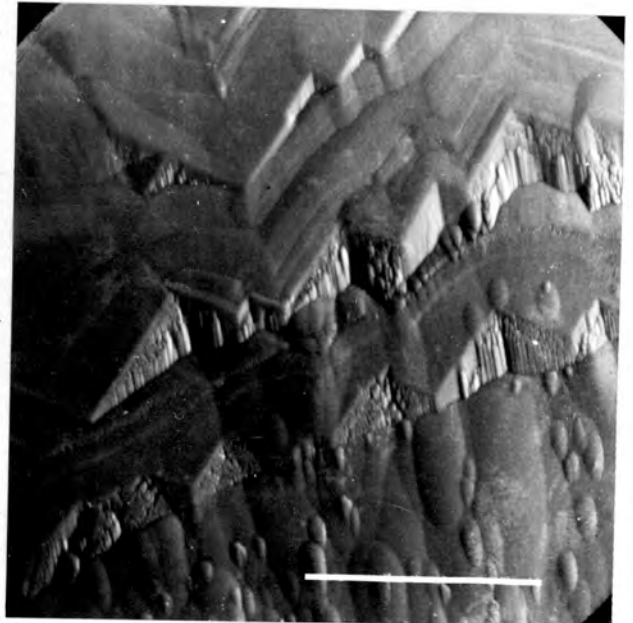


Figure 38. Zigzag texture.

Where completely developed these features encircle the points of emergence of four-fold axes (as in a) where the axial corner is distorted to an edge). b) is an enlarged view of a zigzag pattern. The scale bars are 0,1 mm.

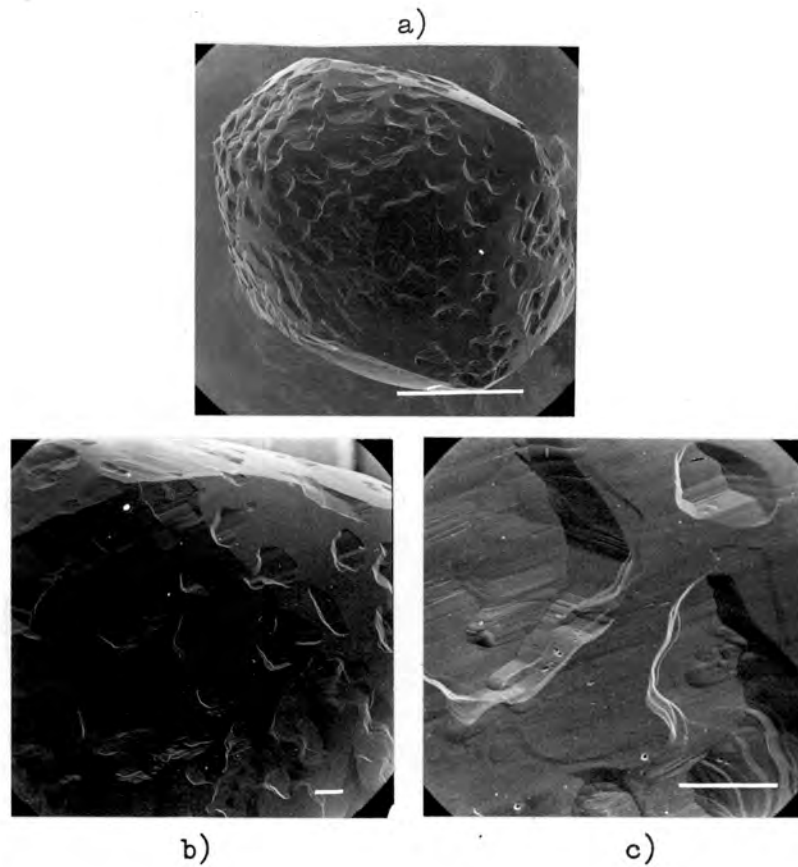


Figure 39. Corrosion sculpture.

- a) A corroded tetrahexahedroid.
  - b) The striated depressions of corrosion sculpture.
  - c) An enlarged view of a part of b). The striations are the edges of octahedral planar surfaces. Small trigons are developed on the octahedral surface within the depression at the upper right. Microdisk patterns (Article 6.4.10.) are associated with the depressions.
- The scale bars are 1 mm in a) and 0,1 mm in b) and c).

a)

b)

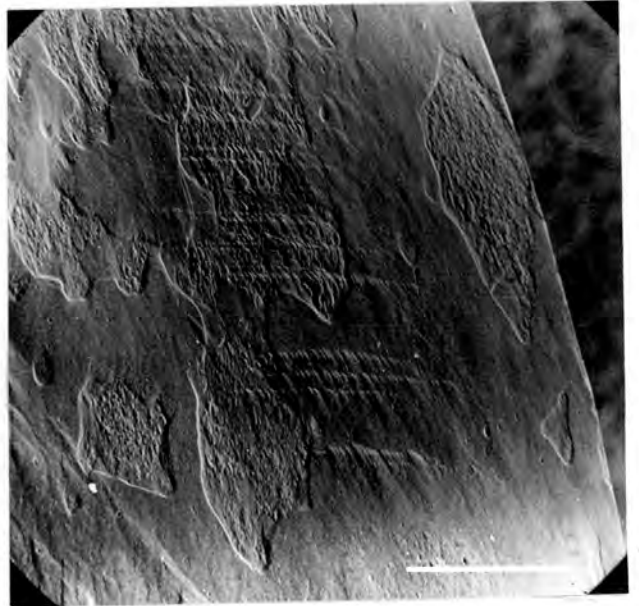
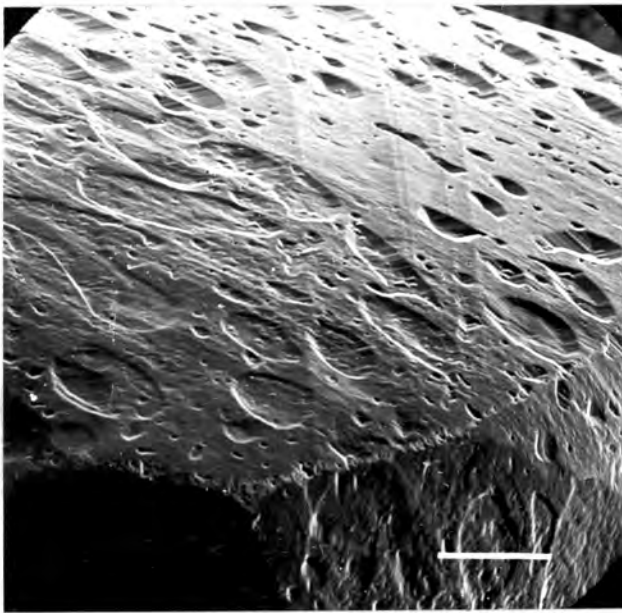


Figure 40. Shallow depressions.

- a) Extensive, shallow depressions of oval to curvilinear outline in the foreground grading into smaller, deeper depressions of corrosion sculpture in the background.
  - b) Shallow depressions which are rough-bottomed on account of shagreen texture (Article 6.4.5.).
- The scale bars are 0,1 mm.

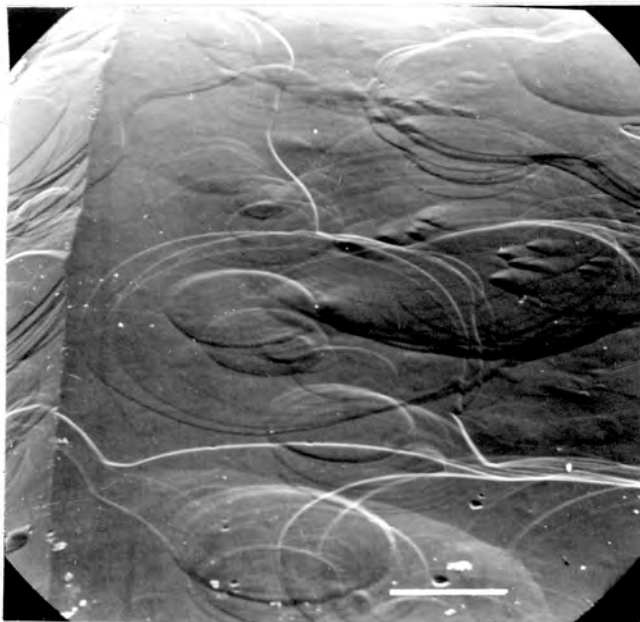


Figure 41. Microdisk patterns.

Note the concentricity of superimposed disks, the overlap between adjacent disks, the extension of disks across the crystal edge and the complex, curvilinear outline of some disks. The scale bar is 0,1 mm.

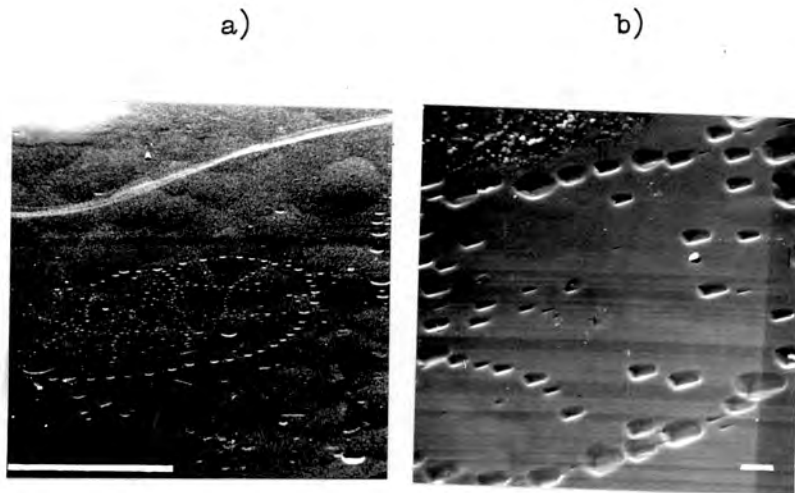


Figure 42. Patterns of micro-pits.

- a) An oval pattern and intersecting, curved arrays of micro-pits developed upon a microdisk (the edge of which passes out of the field depicted at the upper right corner). The individual micro-pits have oval outlines.
- b) Micro-pits with nearly rectangular outlines.  
The scale bars are 0,1 mm in a) and 10  $\mu\text{m}$  in b).

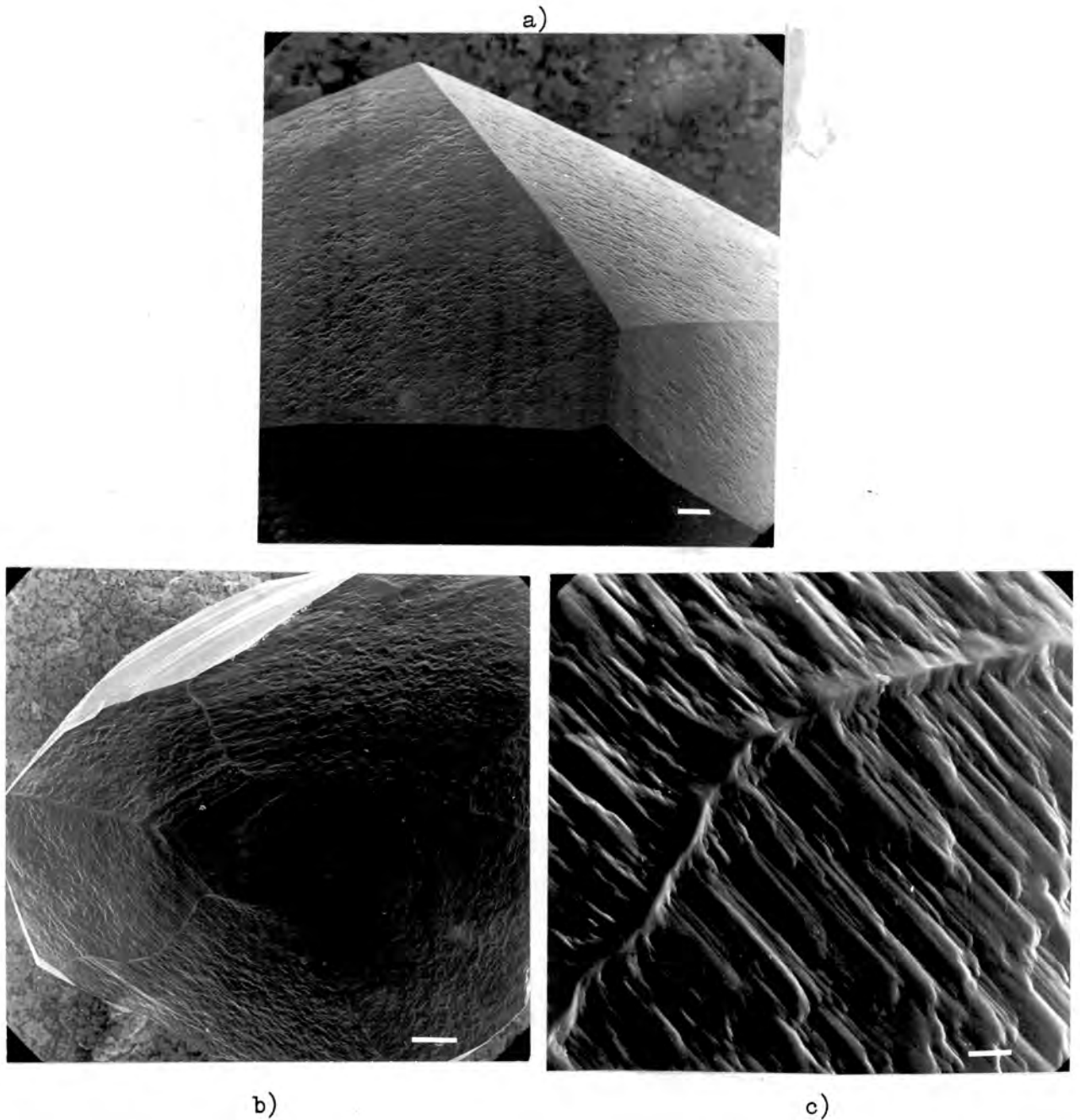
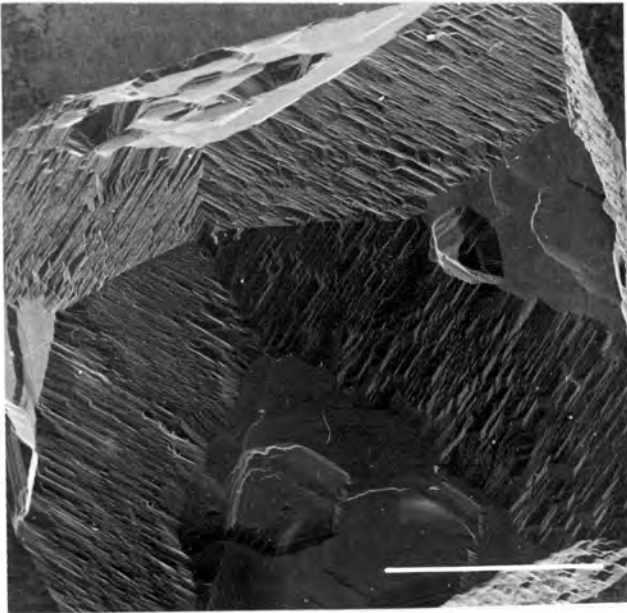


Figure 43. Fine striation with edge enhancement.

- a) A variety of frosting which appears to be an incipient stage in the development of fine striation with edge enhancement. Note the lack of frosting in the vicinity of crystal edges.
- b) A combined form crystal with conspicuous crystal edges. Tetrahedral surfaces display striations arranged in the direction of the rhombic major diagonals. These are truncated by steps roughly parallel to the rhombic minor diagonals (or "C" edges). The octahedral crystal face in the foreground displays only shield-shaped laminae and trigons.
- c) An enlarged view of the fine striation and an enhanced "C" edge. The scale bars are 0,1 mm in a) and b) and 10  $\mu$ m in c).

a)



b)

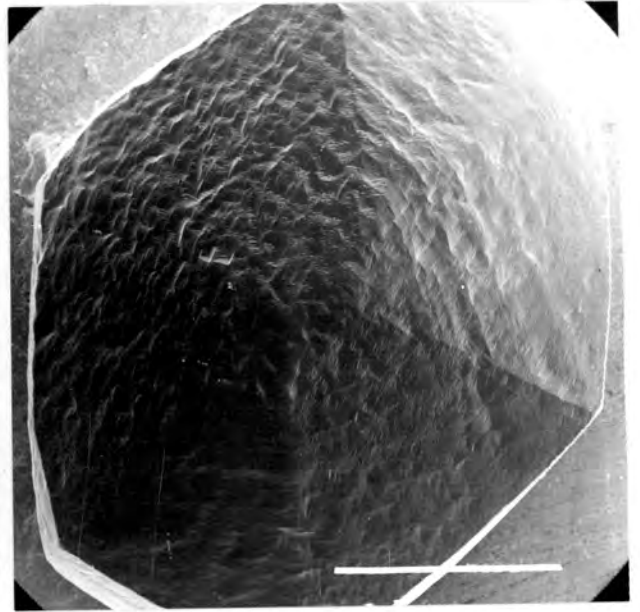
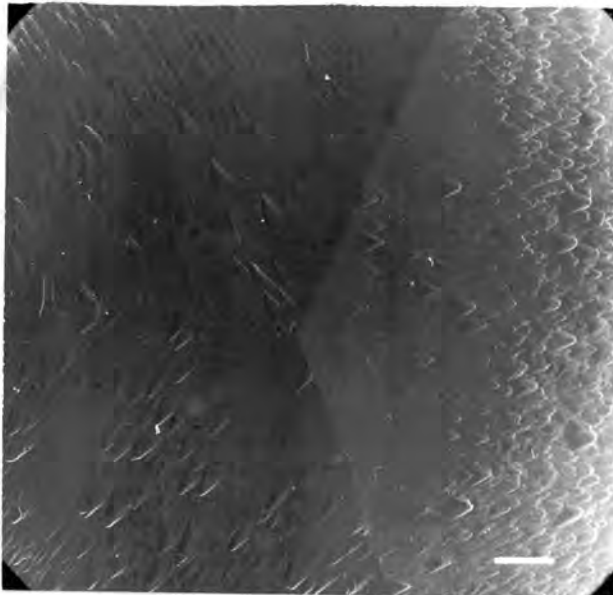
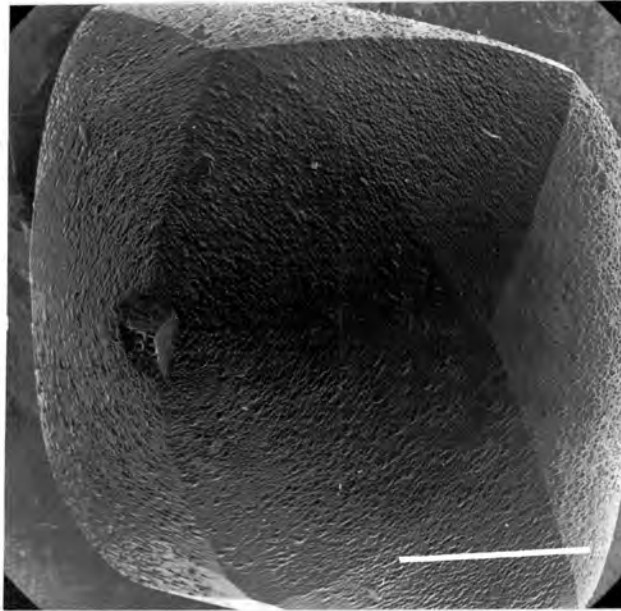


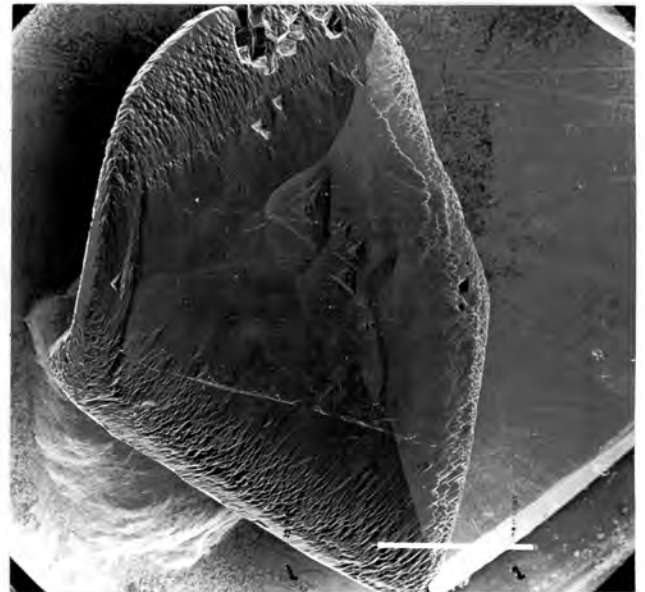
Figure 44. Transverse hillocks.

- a) A coarse, cylindrical variety of transverse hillocks. Positively-oriented trigonal pits occur with hexagonal pits on the associated octahedral crystal faces.
  - b) An interference texture caused by very fine, transverse hillocks superimposed on subdued terraces.
- The scale bars are 1 mm.

a)



b)



c)

Figure 45. Imbricate wedge-forms.

- a) A tetrahexahedroid with a surface consisting entirely of imbricate wedge-forms. The wedge-markings are best developed about six-fold axial corners. The wedges point toward rhombic major diagonals where they assume a mammillary form. Tetragonal pits within the minor, indented cubic surface are positively-oriented.
- b) An enlarged view of wedge-forms about a six-fold axial corner ("C" edges are not prominent so that the corner appears to be one of a three-fold axis).
- c) Prominent wedge-forms on a flat crystal. Positively-oriented trigonal pits are developed on the octahedral crystal face. The scale bars are 1 mm in a), 0,1 mm in b) and 1 mm in c).

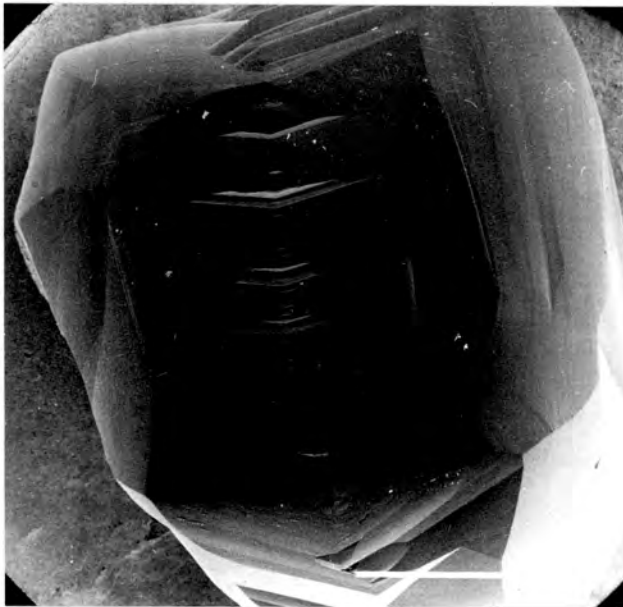


Figure 46. A macle line on a combined form crystal.

A herringbone pattern is developed at the macle line on tetrahexahedroid portions of the crystal (at the extreme top and the extreme bottom). At the octahedral portion of the crystal (in the foreground), the macle line is marked by rhombic pits. The scale bar is 1 mm.

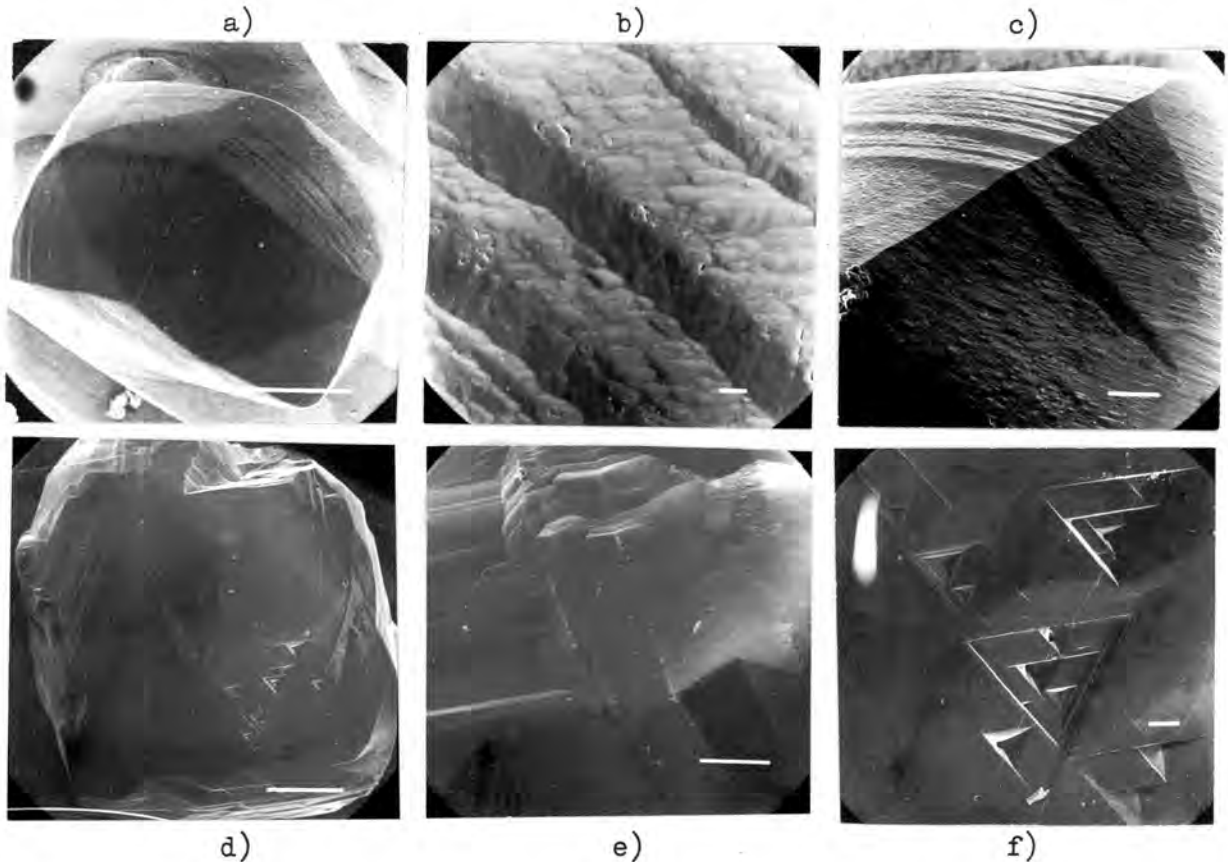


Figure 47. Lamination lines and shagreen texture.

- a) A tetrahexahedroid with prominent, closely-spaced lamination lines tracing octahedral planes. On some crystal faces a weak set of lamination lines can be seen which transects a more strongly-developed set. At low magnifications the associated shagreen texture is better seen under light.
  - b) An enlarged view of a part of a). Lamination lines mark the positions of apparent micro-fault scarps. The tiny hillocks responsible for shagreen texture are clearly evident.
  - c) Closely-spaced lamination lines and shagreen texture on tetrahexahedroid surfaces. Some lamination lines mark the crests of micro-ridges, rather than apparent fault scarps.
  - d) A combined-form crystal with widely-spaced lamination lines evident on both tetrahexahedroid and octahedral surfaces. (In general, lamination lines which are clearly apparent on tetrahexahedroid surfaces cannot be seen on octahedral surfaces).
  - e) An enlarged view of the lamination lines seen on the tetrahexahedroid surface in d). The lines mark the crests of ridges. The orientation of the hillocks appears to change across the lines, thereby producing a texture which is easily mistaken for a macle line.
  - f) An enlarged view of the lamination lines crossing the octahedral crystal face seen in d). Trigons are localized against the lines which otherwise appear as very small displacements.
- The scale bars are 1 mm in a), 10  $\mu$ m in b), 0,1 mm in c), 1 mm in d), 0,1 mm in e) and f).

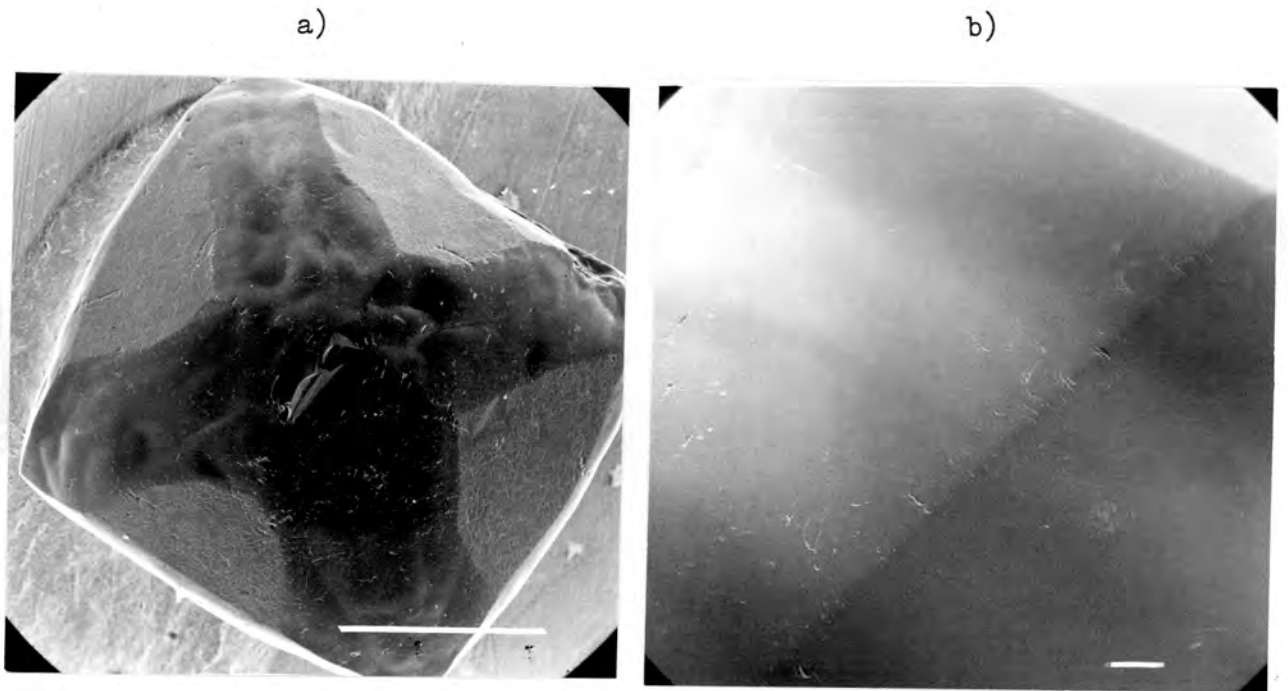


Figure 48. Chemically-polished surfaces.

- a) Chemical polishing has subdued the hillocks on tetrahexahedroid surfaces. Crystal edges and the edges to the trigon (at the top left of the lower right, octahedral crystal face) are distinctly blunted. Shallow network patterns (Article 6.5.5.) are evident on the octahedral crystal surfaces. The crystal also displays percussion figures and spall scars (see Section 8.2.).
- b) The smoothly-polished surfaces of a tetrahexahedroid with blunted edges. Percussion figures and spall scars are also evident. The scale bars are 1 mm in a) and 0,1 mm in b).

a)

b)

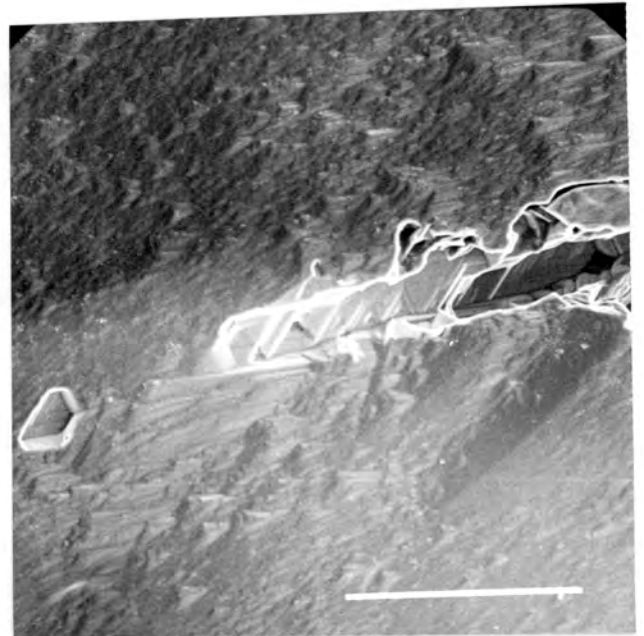
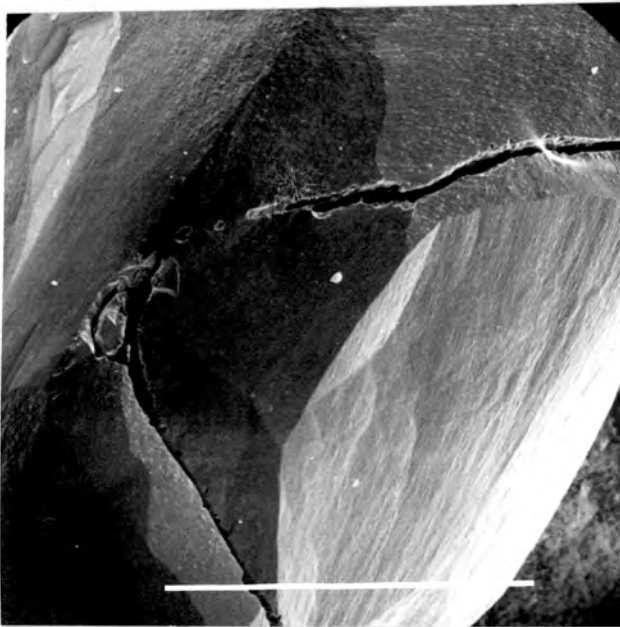


Figure 49. Ruts.

The role of etching in the formation of ruts is clearly demonstrated in the enlarged view b). The scale bars are 1 mm in a) and 0,1 mm in b).

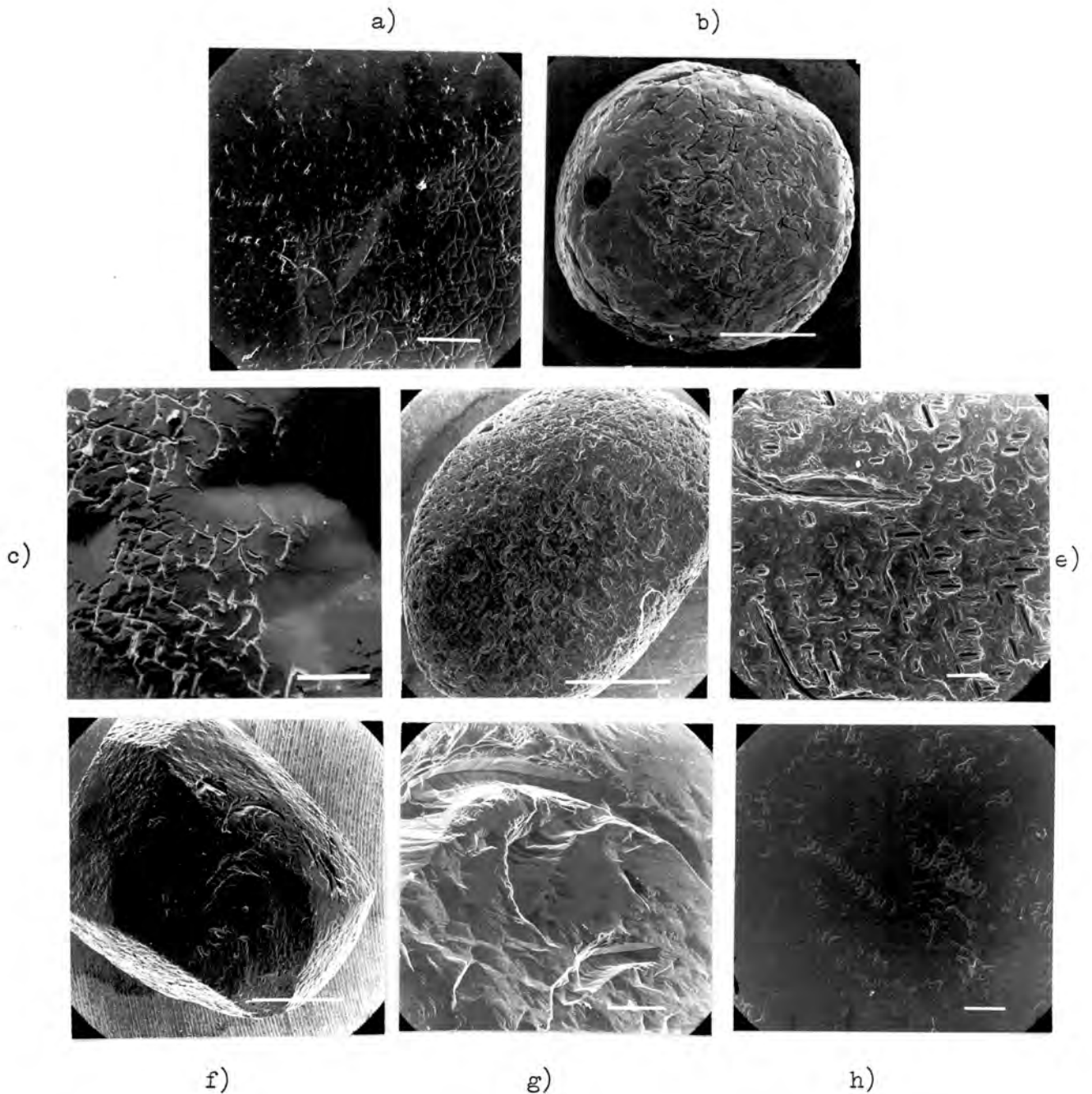


Figure 50. Network patterns.

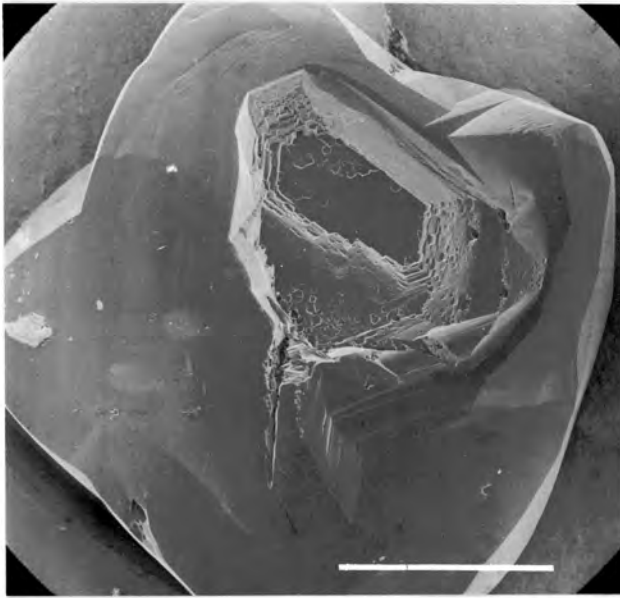
- a) A fine network pattern developed on a chemically-polished octahedral crystal face at the lower right. The constituent grooves trace octahedral planes but are curved at most intersections. The pattern extends only slightly onto the adjacent tetrahexahedroid surfaces (where the "bright" features are percussion cracks).
- b) A network pattern on a convex cubic surface. The grooves trend in various directions but preferentially trace octahedral planes. Few grooves extend onto the adjacent, tetrahexahedroid surfaces.
- c) A network pattern developed on a tetrahexahedroid surface but extending only a short distance into an indented cubic surface at the right.
- d) A network pattern of deep grooves on a tetrahexahedroid. The grooves

(Continued overleaf)

trace the two sets of octahedral planes which transect octahedral growth stratification. Strong curvature is developed at groove intersections. No correlation is evident between groove depth and the local thickness of diamond which must have been removed by resorption.

- e) An enlarged view of part of d) (in a different orientation), showing incipient grooves which are not evident in d).
- f) A tetrahexahedroid displaying arcuate grooves which resemble large percussion figures (see Section 8.2.).
- g) An enlarged view of some of the arcuate features seen in f). Symmetrical sculptures on the sides and bottoms of the arcuate features attest to their widths being the result of etching, rather than a purely mechanical process.
- h) A tetrahexahedroid surface exhibiting arcuate features which include aligned groups resembling chattermark trails.  
The scale bars are 0,1 mm in a), 1 mm in b) 0,1 mm in c), 1 mm in d), 0,1 mm in e), 1 mm in f), 0,1 mm in g) and 0,1 mm in h).

a)



b)

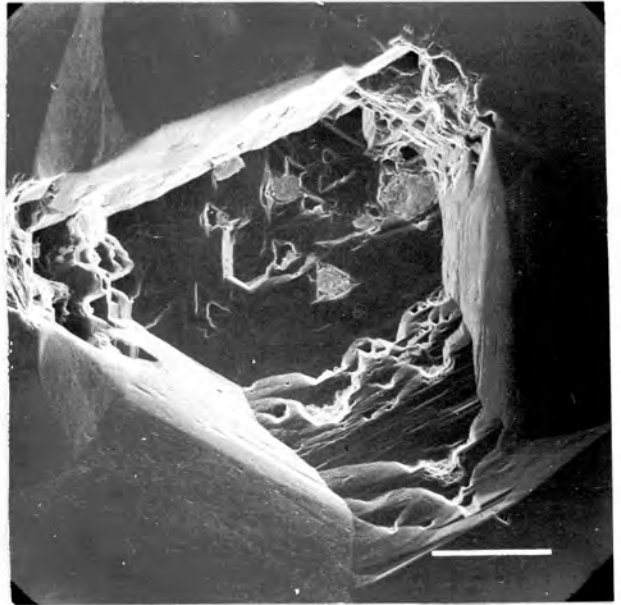


Figure 51. Inclusion cavities.

Both examples are in tetrahexahedroid crystals. Trigonal etch pits denote the octahedral, cavity-wall surfaces. Edges between the cavity walls and tetrahexahedroid crystal surfaces are rounded (by resorption). A crack radiates from the cavity in example a). The scale bars are 1 mm in a) and 0,1 mm in b).

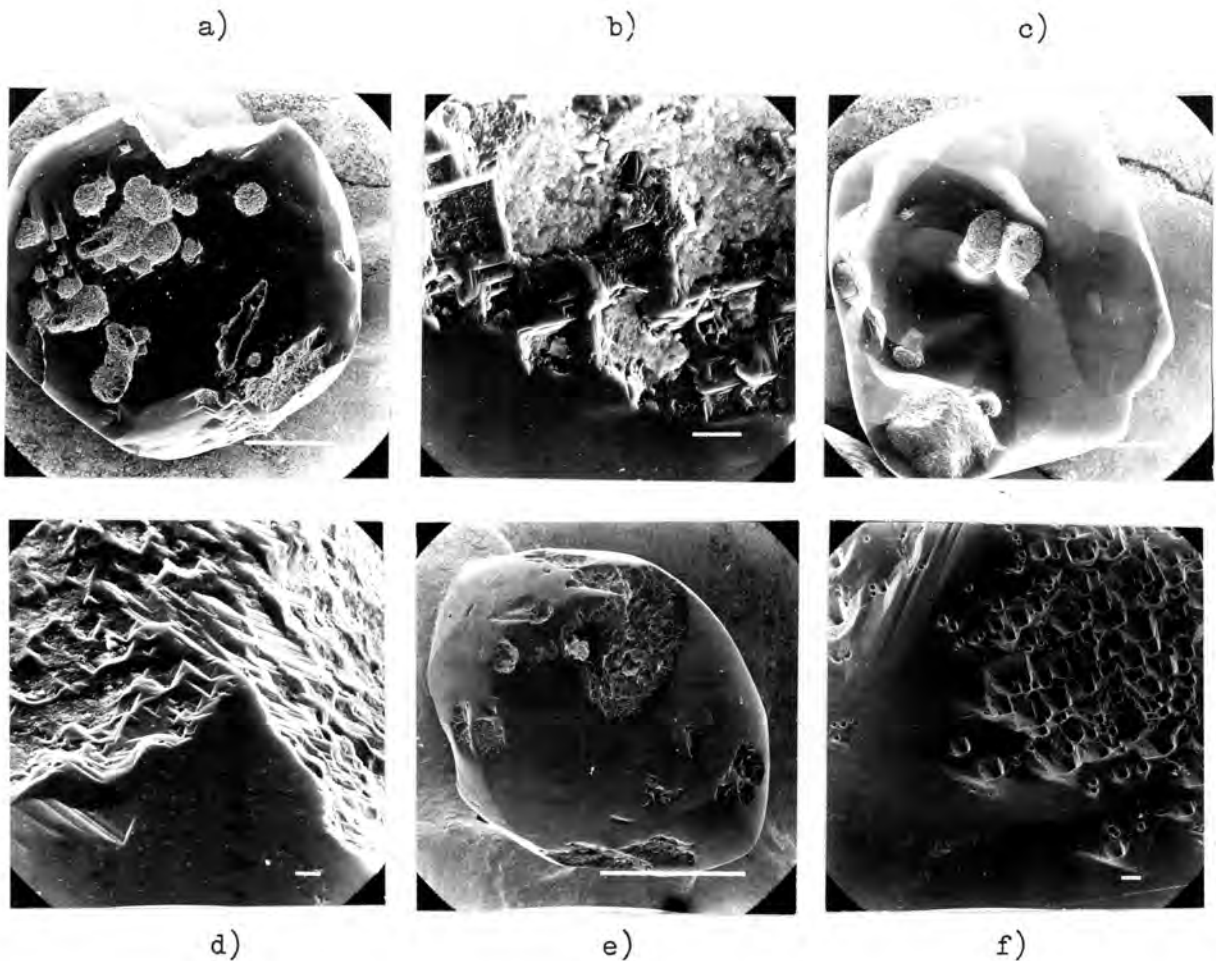


Figure 52. Pitted hemispherical depressions.

- a) Pitted (and coated), circular to rectangular depressions on an undulating, approximately cubic surface. A wide rut is also present.
- b) An enlarged view of part of a coated depression depicted in a). Tetragonal pits identify the depressed surface as cubic. The fine-grained deposit was not removed by ultrasonic cleaning.
- c) Pitted (and coated) depressions of oval outline developed on the undulating, low-relief surface of a tetrahexahedroid.
- d) An enlarged view of the coalescing depressions seen in c). Trigonal pits identify the depressed surface as octahedral, which is not obvious in c).
- e) A tetrahexahedroid with low-relief surfaces displaying depressions of various outlines. An etched breakage surface is also present.
- f) An enlarged view of some depressions seen in e). Tetragonal pits identify the depressed surface as cubic, which is not obvious in e). Scale bars are 1 mm in a), 10  $\mu$ m in b), 1 mm in c), 10  $\mu$ m in d), 1 mm in e) and 10  $\mu$ m in f).

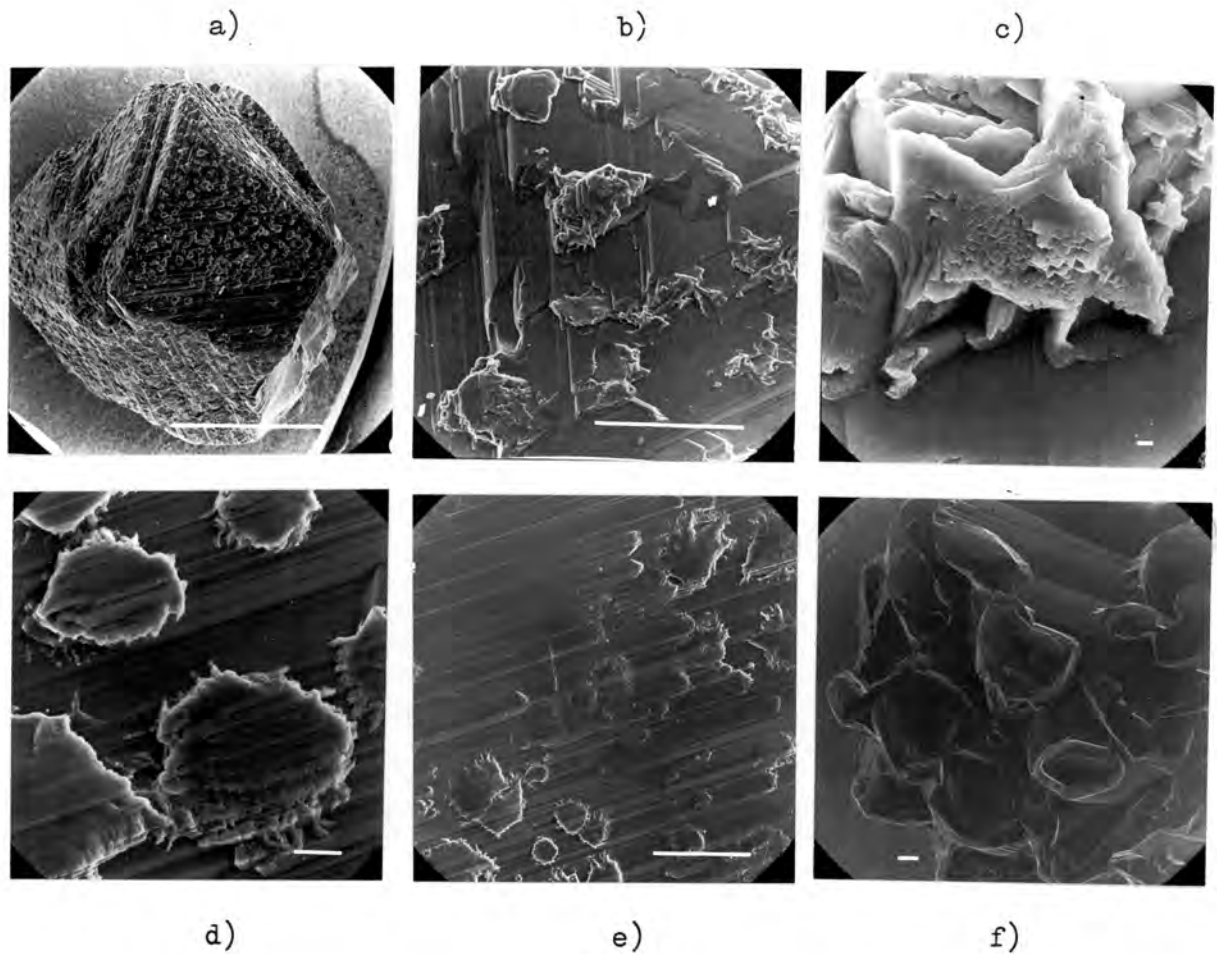


Figure 53. Knob-like asperities and ribbed dodecahedral surfaces.

- a) Knob-like asperities on ribbed dodecahedral surfaces and upon minor, octahedral surfaces.
- b) An enlarged view of part of the field depicted in a). The knob-like asperities occur upon serrate laminae on the octahedral surface at the right.
- c) A typical knob-like asperity with finely-pitted sides.
- d) Flat, knob-like asperities through which ribbing is projected.
- e) Flat, knob-like asperities and ribs with pointed terminations which resemble pointed plates (Article 6.3.3.). The pointed, rib terminations are thought to represent a stage in the development of knob-like asperities upon ribs.
- f) Very coarse knob-like asperities which may have been rounded by resorption.

The scale bars are 1 mm in a), 0,1 mm in b), 1  $\mu$ m in c), 10  $\mu$ m in d) and 0,1 mm in e) and f).

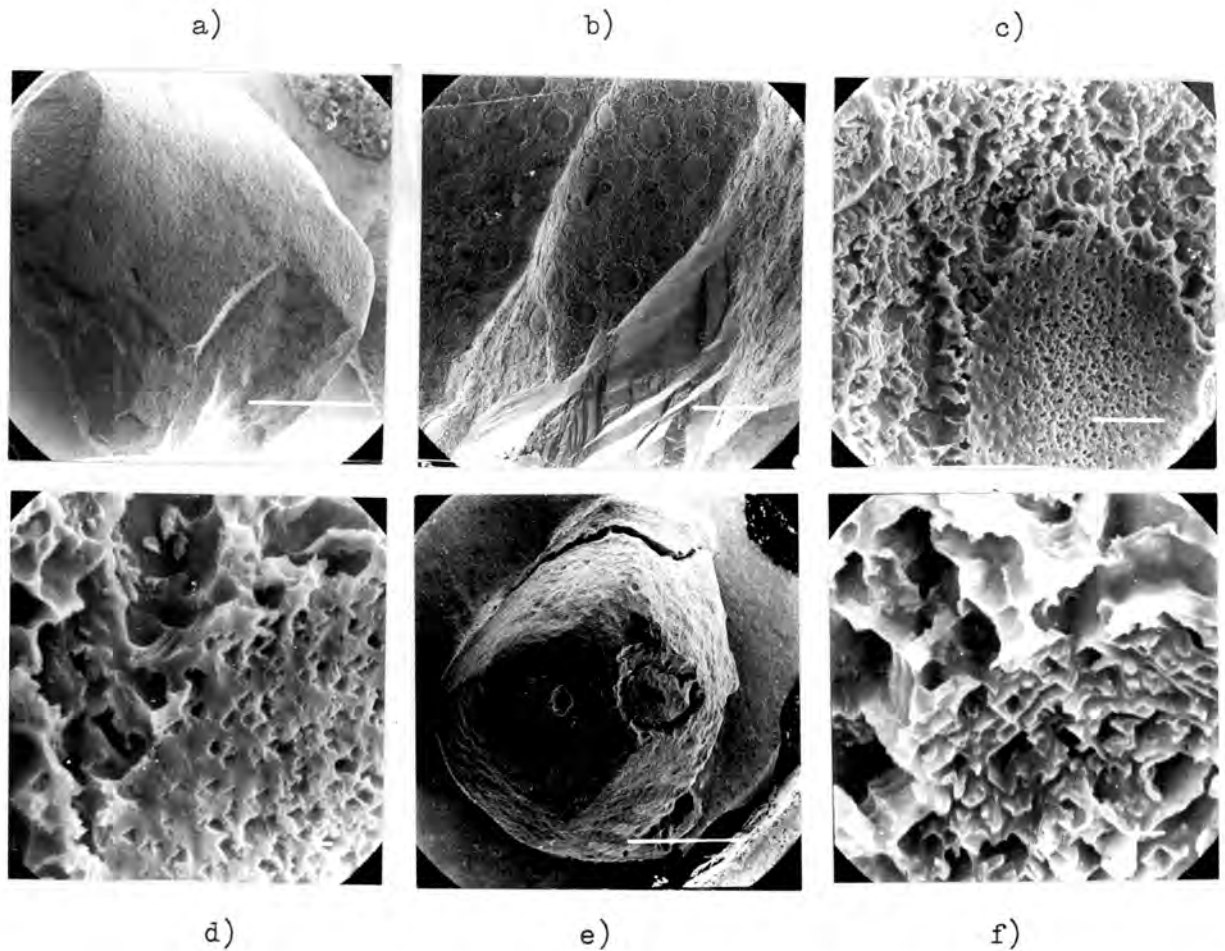


Figure 54. Pitted disks.

- a) A crystal of indeterminate form displaying a rough surface due to pitted disks. The only recognizable surfaces are the stepped, octahedral cleavage surfaces left of the scale bar.
- b) An enlarged view of the octahedral cleavage surfaces apparent in a). Disk-like features are clearly evident. (Breakage surfaces without disks are relatively young).
- c) An enlarged view of part of b). Disks are finely pitted and are raised relative to a very rough, intervening surface.
- d) An enlarged view of part of c). The fine pits in the disk surface are seen to be trigonal. Their orientation could not be determined on account of the irregular form of the host crystal.
- e) A tetrahexahedroid with rough surface caused by pitted disks. Ruts are also apparent. One rut surrounds a small, interpenetrant twin.
- f) An enlarged view of a part of e). A part of a pitted disk (at the lower right) and the relatively coarsely pitted, intervening surface are shown. Symmetrical etch pits have rectangular outlines. Scale bars are 1 mm in a), 0,1 mm in b), 10  $\mu\text{m}$  in c), 1  $\mu\text{m}$  in d), 1 mm in e) and 1  $\mu\text{m}$  in f).

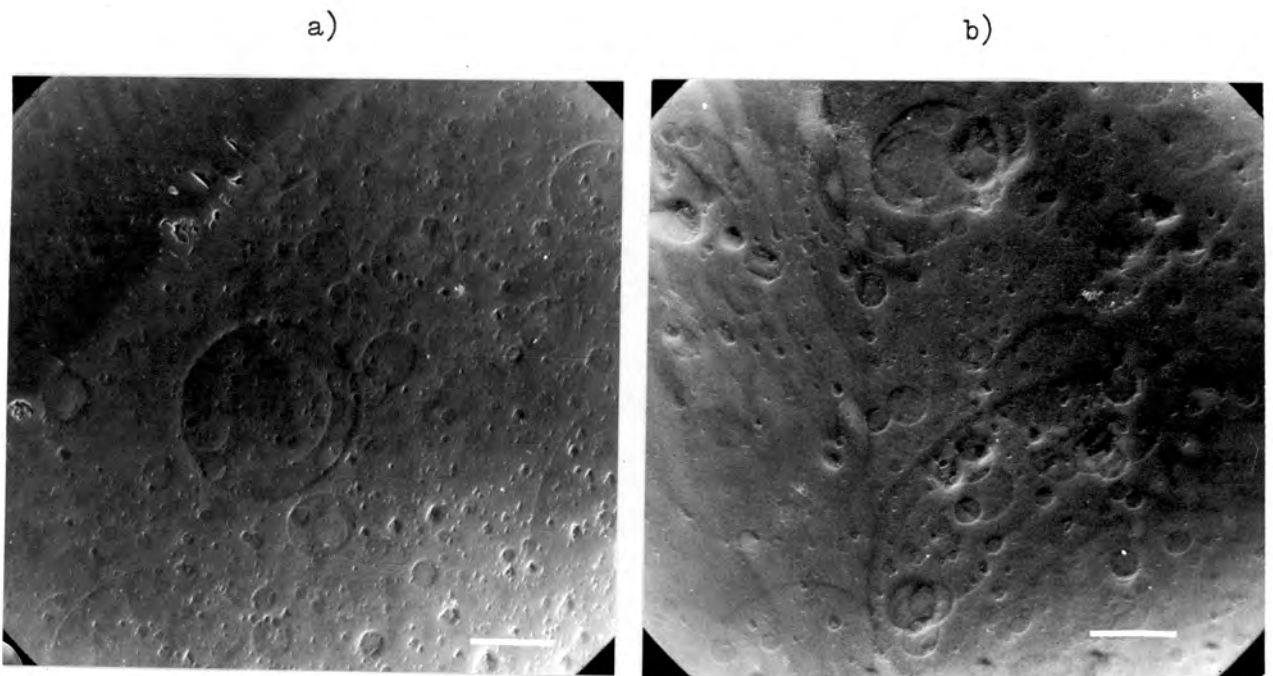


Figure 55. Circular micro-pits on low-relief surfaces.

- a) Circular micro-pits, including concentric examples, and tiny, square pits which may be incipient forms.
  - b) Circular micro-pits, including overlapping examples and some that are fairly large in diameter.
- The scale bars are 0,1 mm.

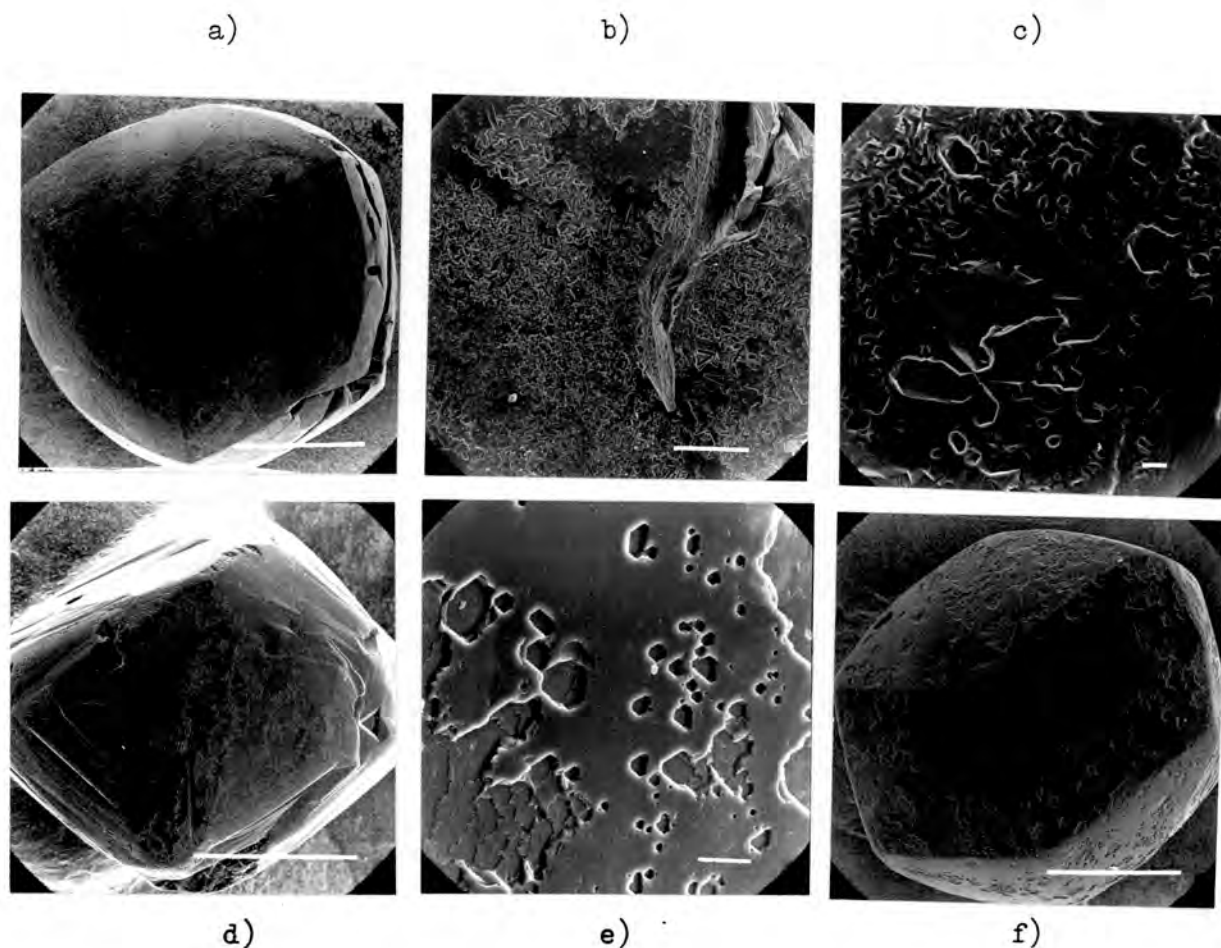


Figure 56. Coarse frosting.

- a) A tetrahexahedroid with coarsely frosted patches.
  - b) Coarse frosting extending into a rut on a tetrahexahedroid surface. Prismatic pits in various orientations are just discernible.
  - c) Hexagonal to prismatic, constituent pits of coarse frosting on a tetrahexahedroid surface.
  - d) A combined form with coarse frosting on both octahedral and tetrahexahedroid surfaces.
  - e) Flat-bottomed, small trigons with truncated corners and larger, hexagonal pits of a coarsely frosted octahedral surface.
  - f) Patches of coarse frosting with depths approaching those of shallow depressions.
- Scale bars are 1 mm in a), 0,1 mm in b), 10  $\mu$ m in c), 1 mm in d), 10  $\mu$ m in e) and 1 mm in f).

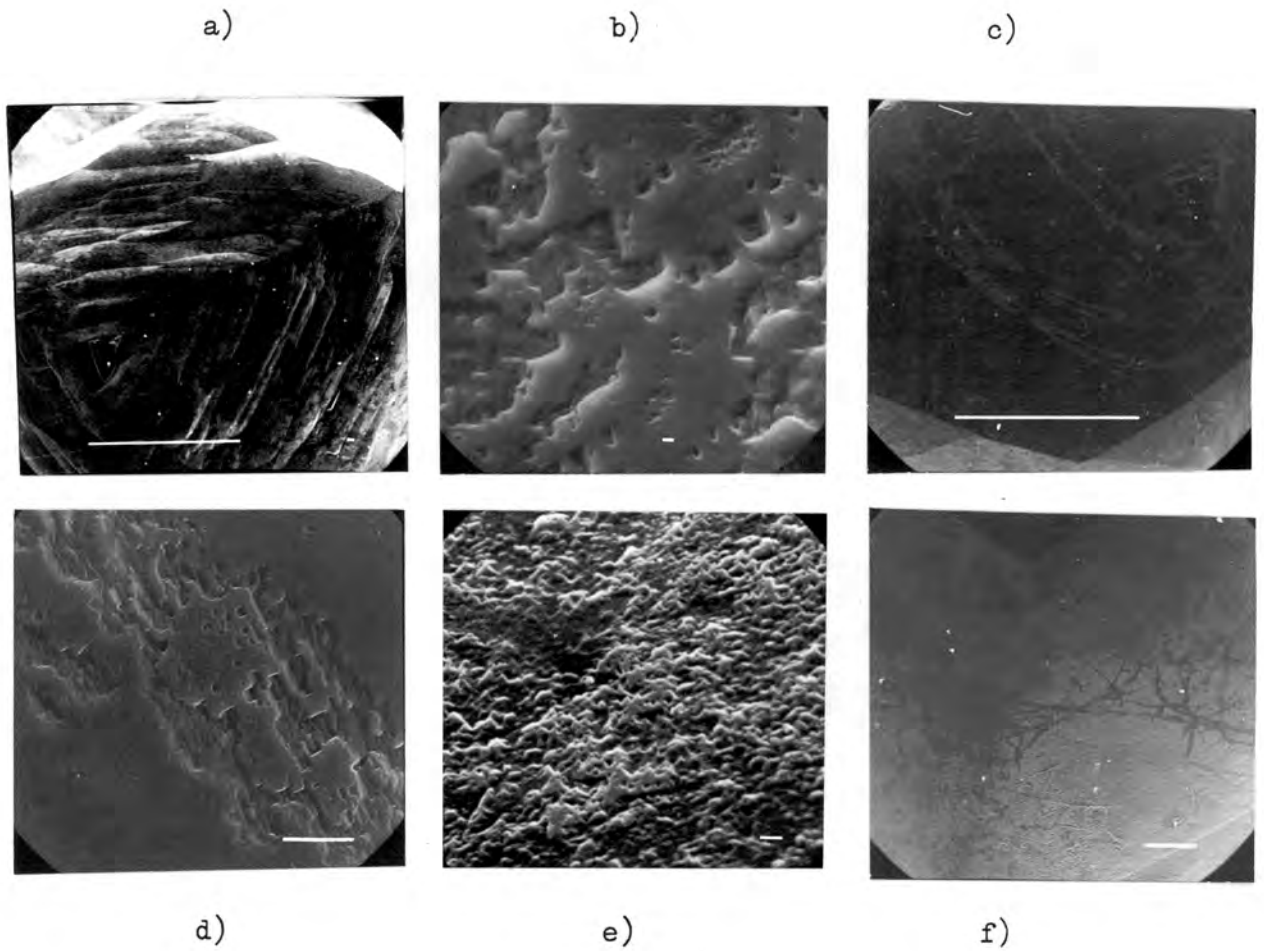


Figure 57. Fine frosting.

- a) A tetrahexahedroid with patches of fine frosting upon coarse hillocks.
  - b) The rectangular pits responsible for fine frosting.
  - c) Curved lines of fine frosting on a tetrahexahedroid.
  - d) An enlarged view of a line of frosting shown in c).
  - e) The very small, positively-oriented trigonal pits responsible for fine frosting on an octahedral crystal surface.
  - f) Upstanding, linear features on an otherwise finely frosted tetrahexahedroid surface.
- The scale bars are 1 mm in a), 1  $\mu$ m in b), 1 mm in c), 10  $\mu$ m in d), 1  $\mu$ m in e) and 0,1 mm in f).

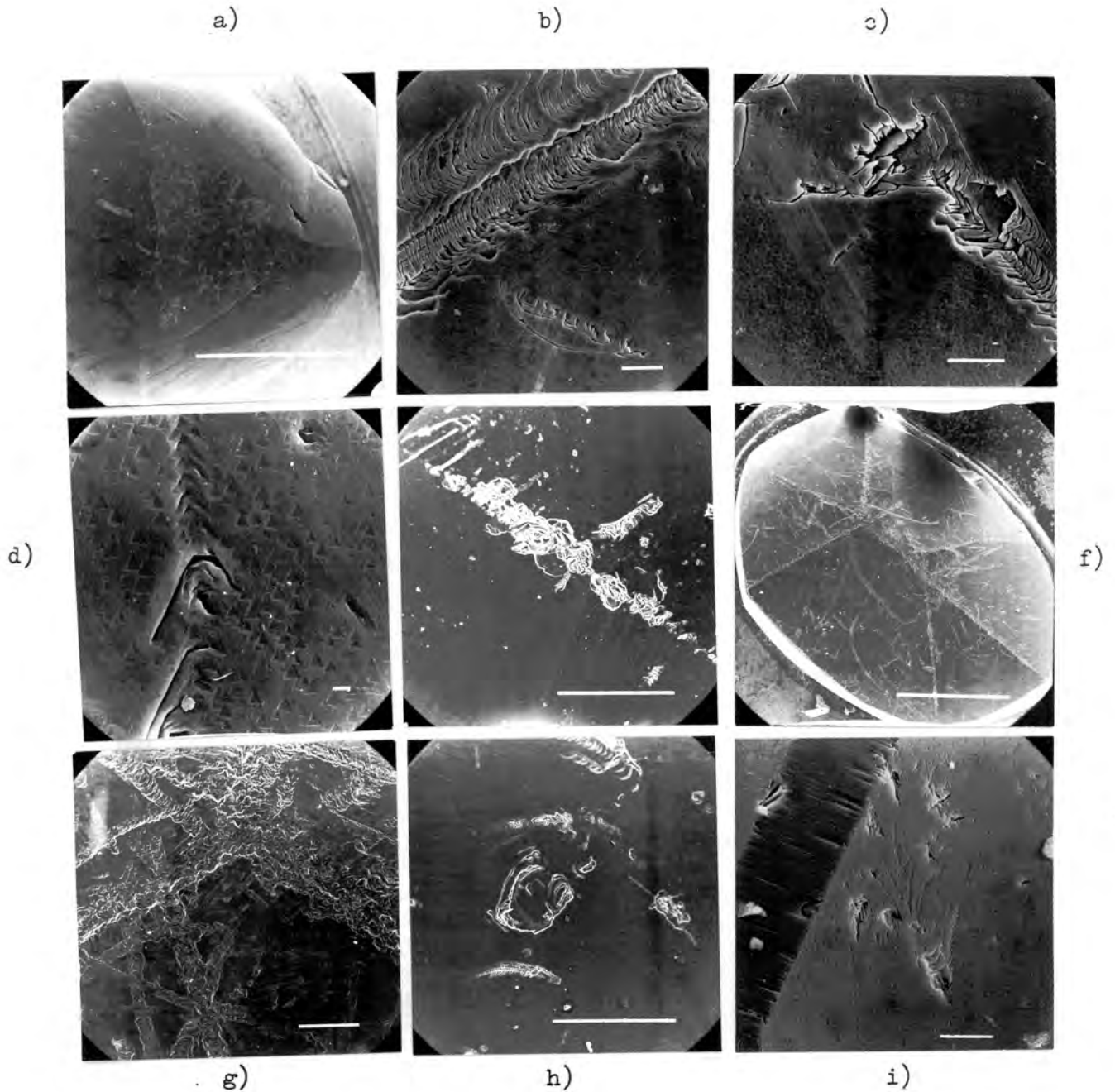


Figure 58. Scratch-like markings.

- a) A Premier Mine (Brown Kimberlite) tetrahedroid with scratch-like markings concentrated near a six-fold axial corner. No strongly preferred orientation of scratch-like markings is apparent although some markings are nearly parallel to others.
- b) An enlarged view of a group of scratch-like markings on an octahedral face. Each feature consists of a series of parallel, crescentic grooves. Note the small displacements of grooves in the large example at the upper left. A small, concentric, semi-circular feature is evident in the lower right quadrant. Three scratch-like markings are parallel to one another while less conspicuous examples are inclined at various angles to their trend. The wide and extremely short example is possibly a composite feature consisting of a

(Continued overleaf)

- number of minor, parallel markings which attain maximum development and terminate abruptly at a common front.
- c) A scratch-like marking entering a point-bottomed trigon. The arms of the constituent, crescentic grooves are parallel to the edges of the trigon. Just evident at this magnification is a myriad of tiny, positively-oriented trigonal pits occurring outside of the trigon.
  - d) A high magnification view demonstrating the localization of positively-oriented trigonal pits at incipient scratch-like markings.
  - e) Scratch-like markings concentrated at a crystal edge.
  - f) A detrital (C.D.M.) tetrahexahedroid displaying variously-oriented, scratch-like markings which include curved examples. Note also the frosted crystal edges.
  - g) An enlarged view of part of f). The frosting at crystal edges which is apparent in f) is seen to be due to localized, scratch-like markings, not abrasion.
  - h) Scratch-like markings, including some which closely resemble small percussion figures (Section 8.2 ).
  - i) Scratch-like markings developed on a cubic surface of a synthetic diamond which was very lightly etched in an experiment conducted at 30 kb pressure (Run AW/20 of Table 5).
- Scale bars are 1 mm in a), 10  $\mu$ m in b) and c), 1  $\mu$ m in d), 0,1 mm in e), 1 mm in f) and 0,1 mm in g), h) and i).

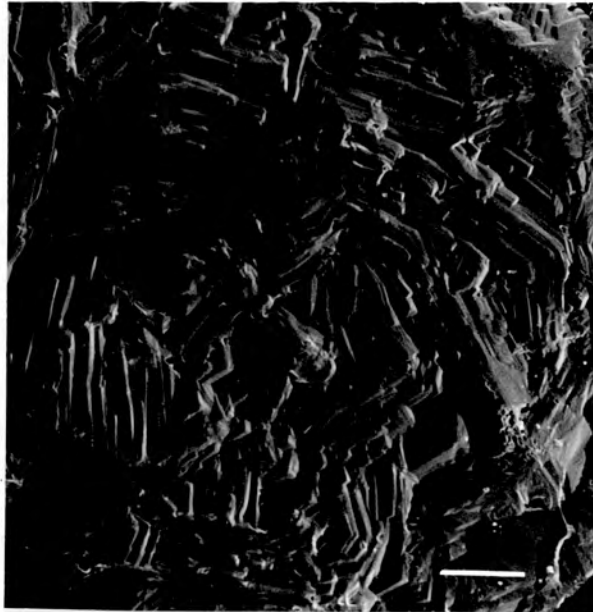


Figure 59. The concentric features developed at a ballas surface.  
(The scale bar is 0,1 mm).

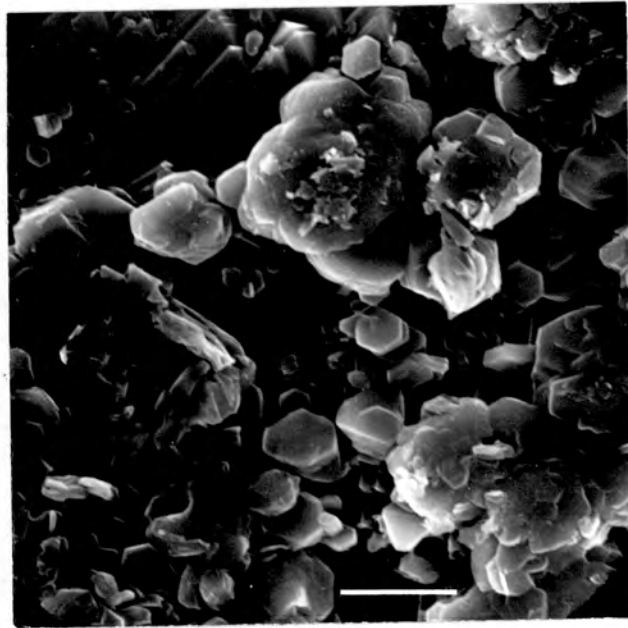


Figure 60. Graphite crystallites on the surface of a diamond from eclogite xenolith PJL 18. (The scale bar is 10  $\mu\text{m}$ ).

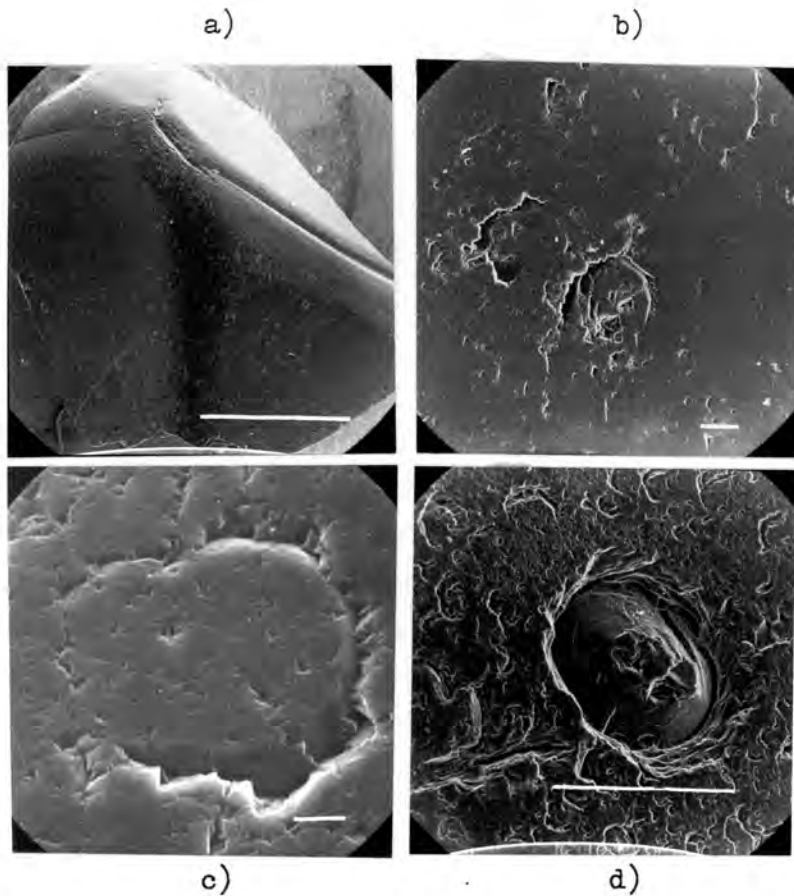


Figure 61. Percussion figures and spall scars.

- a) Prolific, small percussion figures on the surfaces of a broken octahedron with minor tetrahexahedroid surfaces.
  - b) Crescentic percussion figures on a chemically-polished, tetrahexahedroid surface. The larger figures are open grooves, probably on account of spalling between adjacent concentric cracks. Some crescentic cracks are preserved within the lower left of the largest percussion figure. Trigonal spall scars are also apparent.
  - c) Curved cracks and a nearly closed percussion figure. Trigonal spall scars are associated with the cracks and some spall scars occur alone.
  - d) A fairly large, closed percussion figure with a moat-like depression due to spalling between concentric cracks. A conchoidal fracture surface is present at the plateau summit. The much smaller, crescentic to rectangular grooves on the plateau summit and on the general diamond surface are network patterns (Article 6.5.5.), not small percussion figures.
- The scale bars are 1 mm in a), 10  $\mu$ m in b) and c) and 0,1 mm in d).

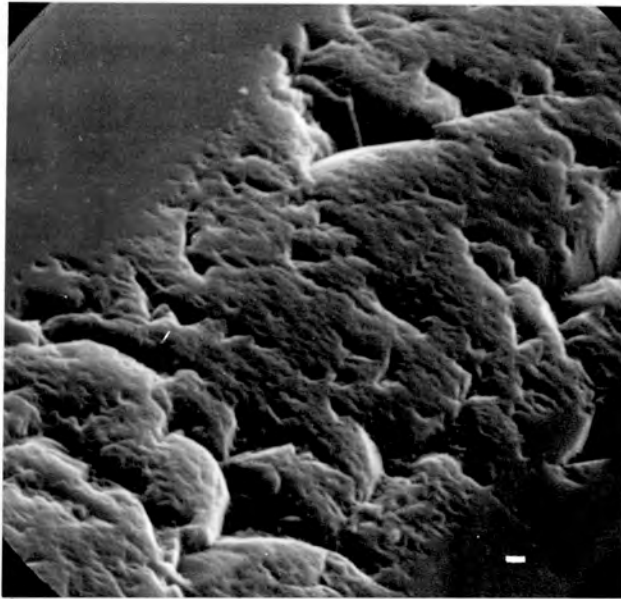


Figure 62. An abraded crystal edge.

The surface consists of areas of very low relief and curved percussion cracks and V-shaped spall scars. The scale bar is 1  $\mu\text{m}$ .

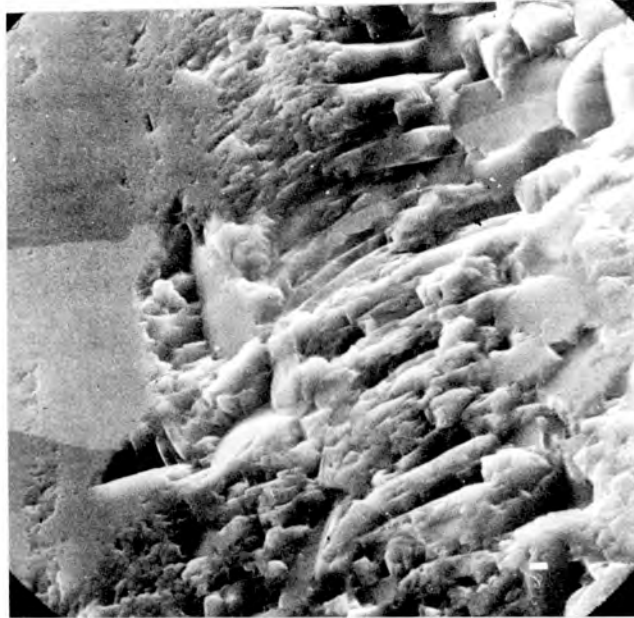


Figure 63. Ground scratch-like markings.

The appearance of the ground surface at the crystal edge is largely determined by the spalling of arcuate slices of material from between the adjacent grooves of scratch-like markings. The scale bar is 1  $\mu\text{m}$ .

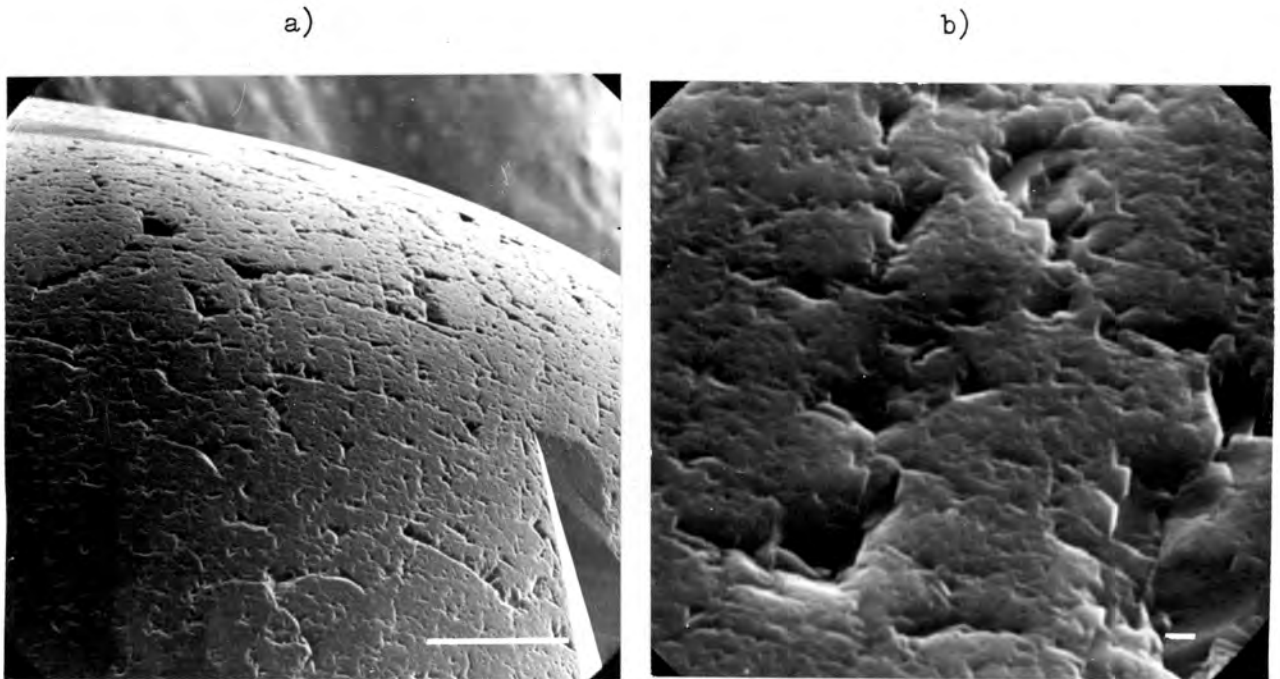


Figure 64. Mechanically-polished surfaces.

- a) A well-rounded diamond surface with percussion figures and spall scars. At this magnification (X 180), intervening areas appear to be smooth.
  - b) An enlarged view of an area between percussion figures and spall scars apparent in a). Fine cracks and very small, trigonal spall scars can be discerned.
- Scale bars are 0,1 mm in a) and 1 μm in b).

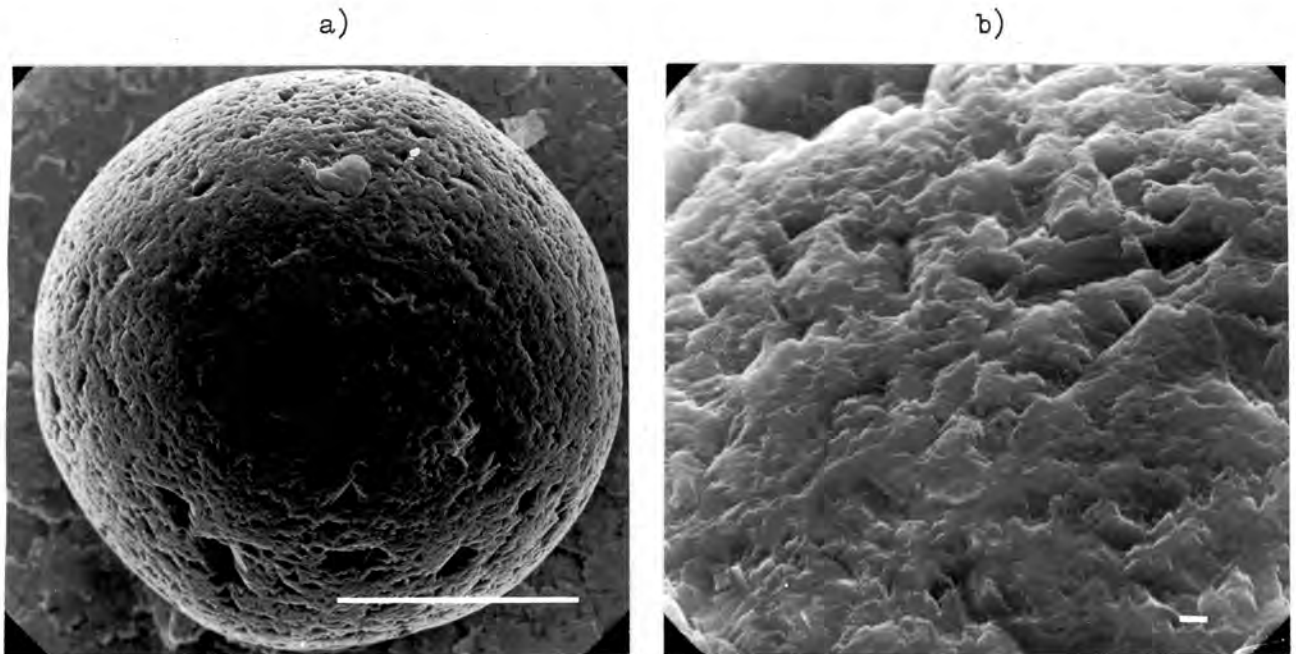


Figure 65. A diamond rounded artificially by 4 days of treatment with other diamonds in a wind-circuit attrition cell. (C.M. Levitt, personal communication).

- a) The rounded diamond displaying short, straight cracks and trigonal spall scars which attain 0,1 mm in edge length. Discontinuous scarplets, which encircle the middle of the diamond surface as viewed, are also apparent. These scarplets resemble the upturned plates which are diagnostic features of wind-abraded quartz grains.
- b) An enlarged view of part of the ground surface. Straight cracks and trigonal spall scars are conspicuous. Relatively fine features resembling upturned plates can also be discerned. These trend mainly from the lower left to the upper right. Scale bars are 1 mm in a) and 1  $\mu$ m in b).

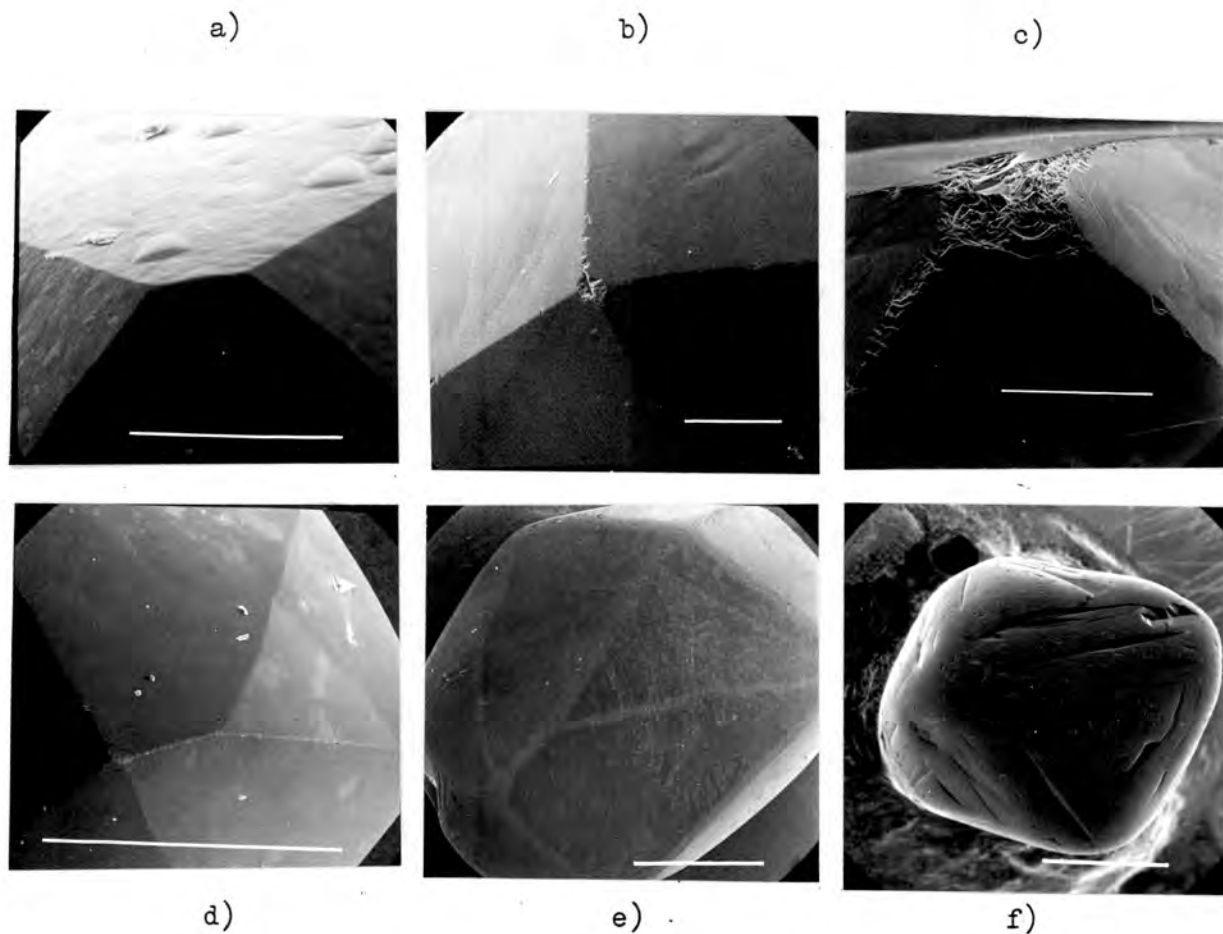


Figure 66. The degrees of abrasion distinguished among tetrahexahedroida.

- a) A diamond from Hlane with its distorted, four-fold axial corner still intact.
  - b) Abrasion localized at a four-fold axial corner where spall scars are mainly subconchoidal fracture surfaces.
  - c) Abrasion at a four-fold axial corner and at the sharpest parts of "A" edges.
  - d) A tetrahexahedroid with continuously-abraded "A" edges but with "C" edges intact.
  - e) A tetrahexahedroid which is abraded at "A" and "C" edges (and at hillock summits).
  - f) A conspicuously rounded tetrahexahedroid.
- The scale bars are 0,1 mm in a), b) and c) and 1 mm in d), e) and f).

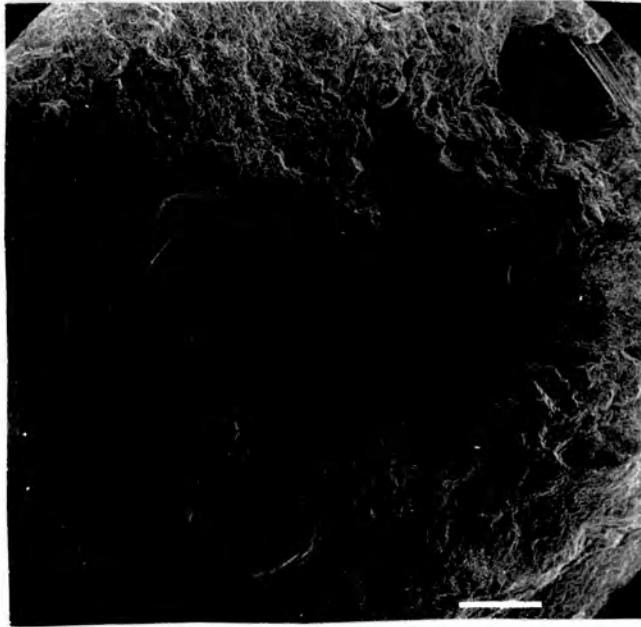


Figure 67. Three diamonds exposed at the surface of xenolith AK 1/9.

The diamond at the upper right is an octahedron with ribbed, dodecahedral surfaces. The central example is an octahedron with concave, tetrahexahedroid surfaces. The lower example is a tetrahexahedroid with minor octahedral surfaces. The scale bar is 1 mm.

a)

b)

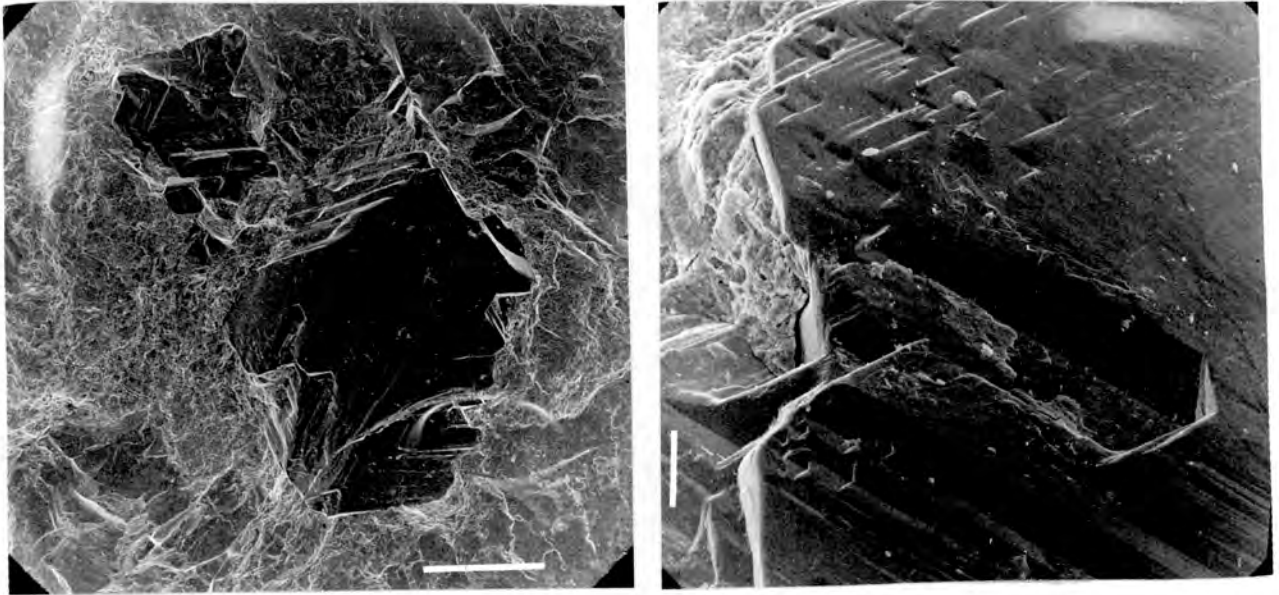


Figure 68. Two diamonds exposed at the surface of xenolith AK 1/10.

The diamonds are broken octahedra with ribbed, dodecahedral surfaces. b) shows the serrate laminae and ribs developed on one of the diamond surfaces. The scale bars are 1 mm in a) and 0,1 mm in b).

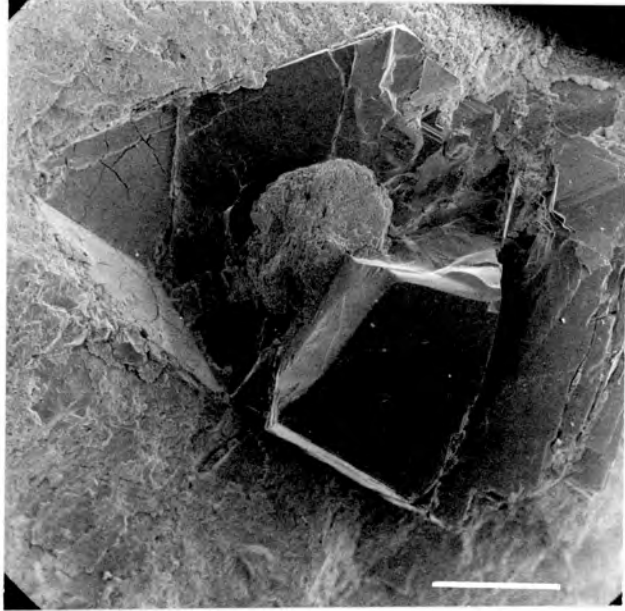


Figure 69. A broken diamond exposed upon xenolith AK 1/111 being broken.

The diamond is an octahedron with nearly sharp edges and contains an inclusion which is altered to clay material. The scale bar is 1 mm.

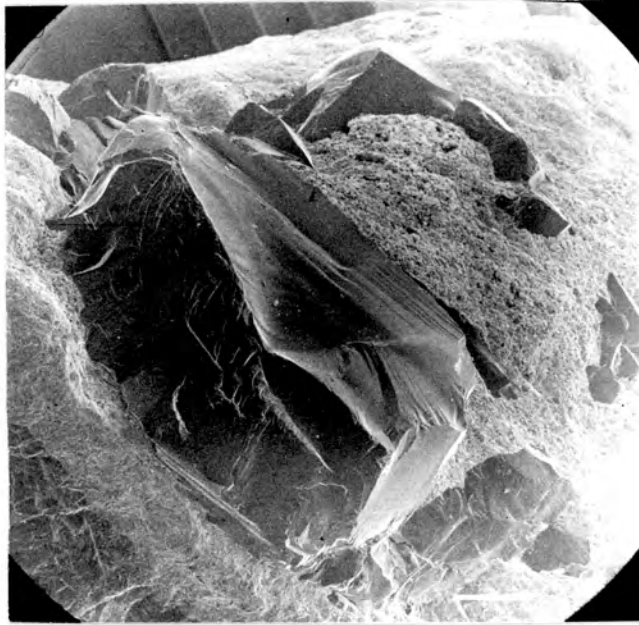


Figure 70. Freshly broken surfaces of diamond exposed as a nearly continuous ring at the surface of xenolith DB 1. (The scale bar is 1 mm).

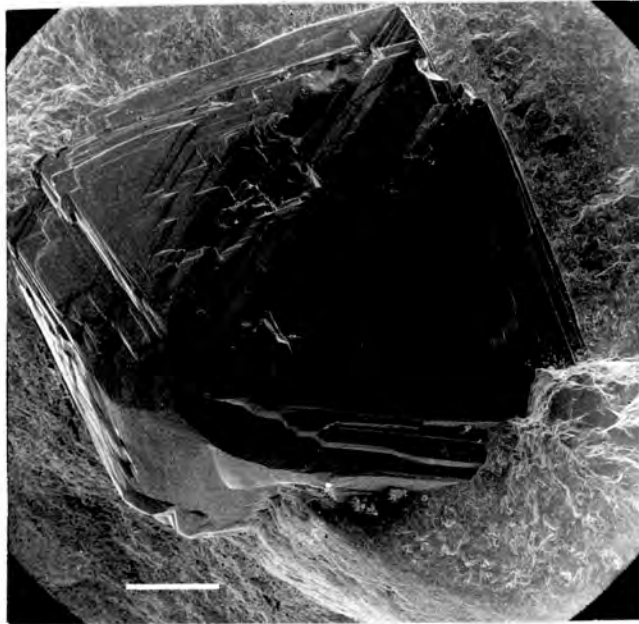


Figure 71. A diamond exposed at the surface of xenolith DB 2.

The diamond is an octahedron with compound edges which may be dodecahedral ribs. Serrate laminae and flat-bottomed trigons are evident. Tetrahexahedroid surfaces are developed only about the four-fold axial corner (at the lower left) which protrudes furthest from the present surface of the eclogite. The scale bar is 1 mm.

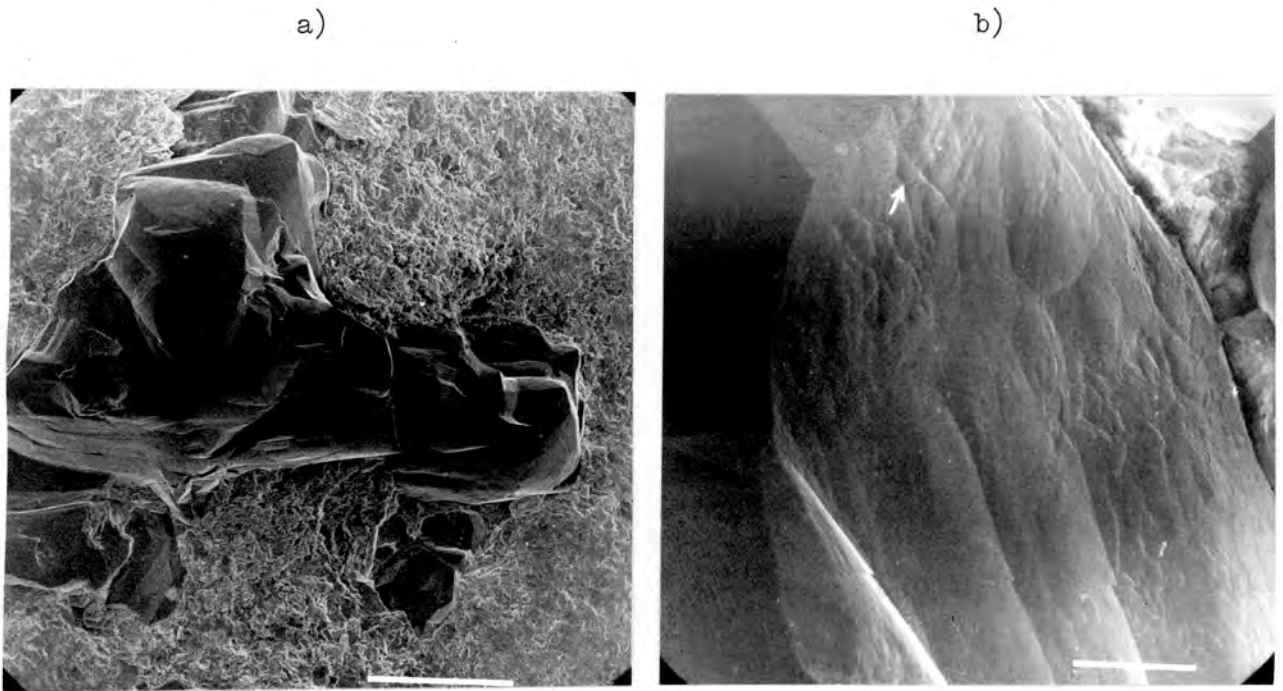


Figure 72. Diamond exposed at the surface of xenolith DB 3.

The diamond is a complex aggregate of irregular tetrahedra. Features which are possible lamination lines are just discernible (arrowed) in the enlarged view b). The scale bars are 1 mm in a) and 0,1 mm in b).

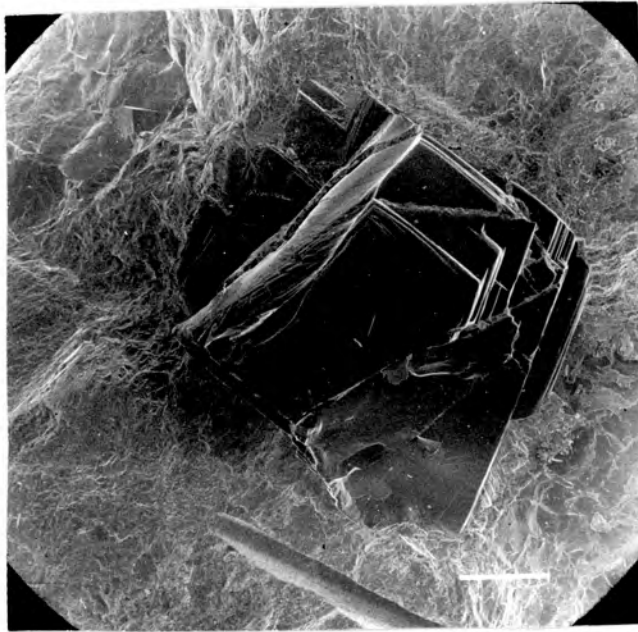


Figure 73. A broken octahedron exposed at the surface of xenolith DB 4. (The scale bar is 1 mm).

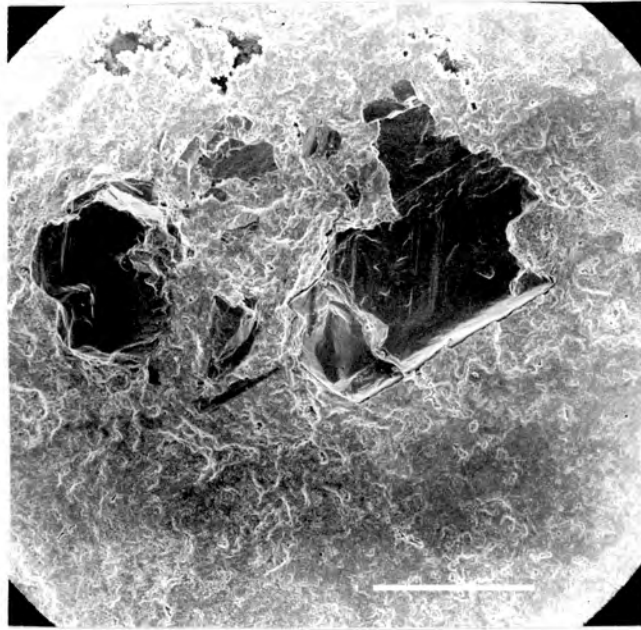


Figure 74. Five pieces of diamond exposed at the surface of xenolith DB 5. (The scale bar is 1 mm ).

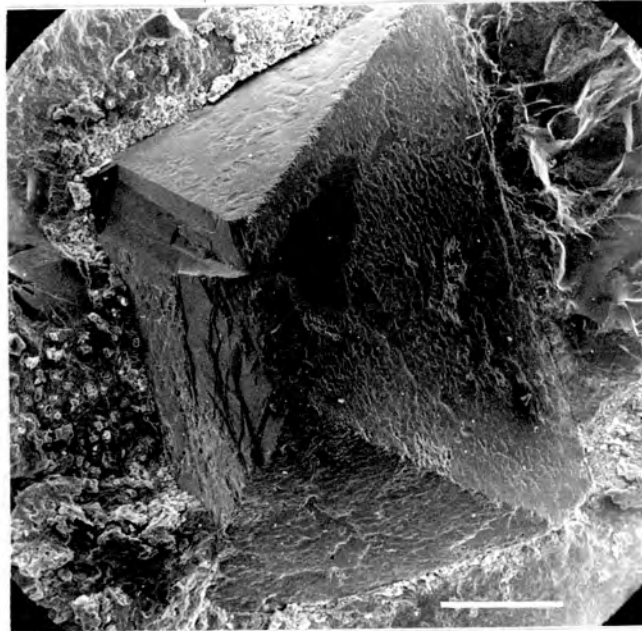


Figure 75. A chipped, sharp-edged octahedron exposed at the surface of xenolith DB 6. (The scale bar is 1 mm).

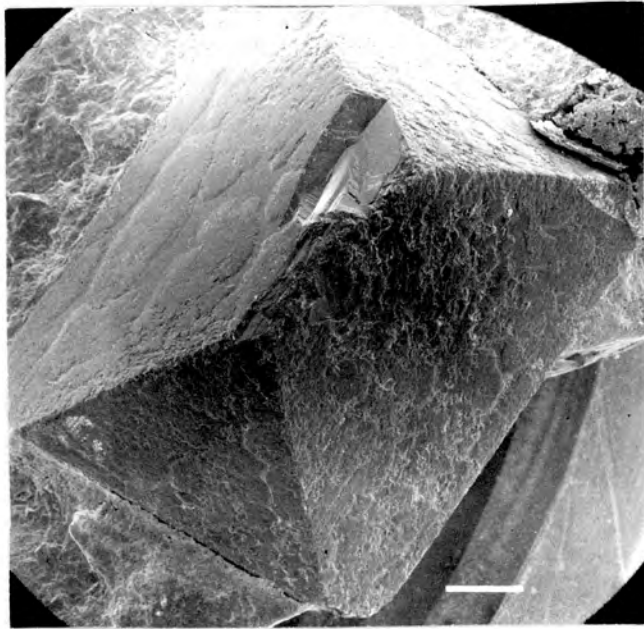


Figure 76. A chipped, sharp-edged octahedron exposed at the surface of xenolith DB 7. (The scale bar is 1 mm).

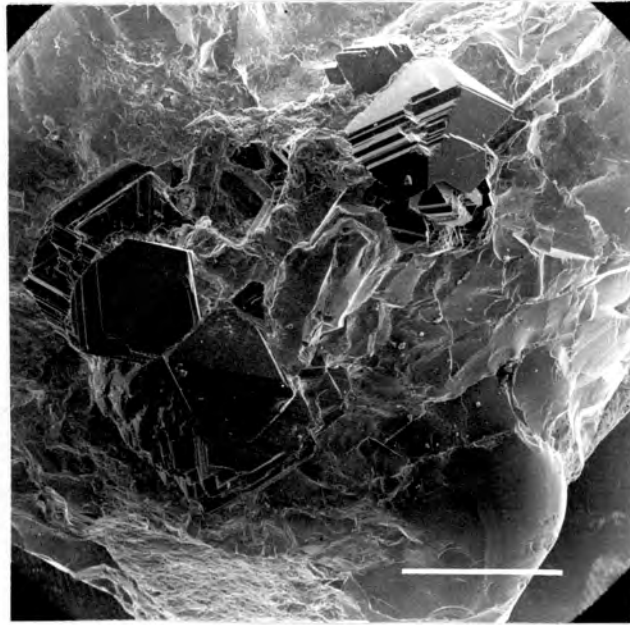


Figure 77. A group of octahedral crystals, devoid of the effects of any resorption or etching, exposed at the surface of the garnet grain DB 8. (The scale bar is 1 mm).

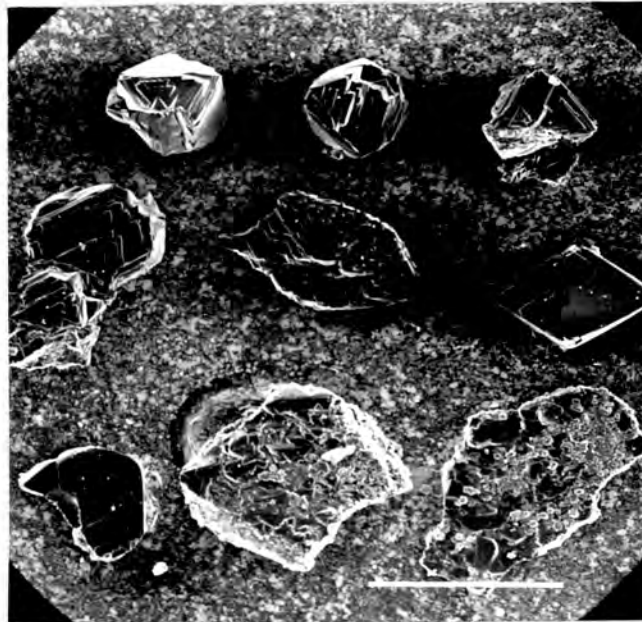


Figure 78. Diamonds recovered from xenolith PJL 18.

The diamonds are octahedra which are either sharp-edged or display minor, ribbed dodecahedral surfaces. Serrate laminae are prominent features of some of the crystals while graphite coats the two crystals at the lower right. The scale bar is 1 mm.

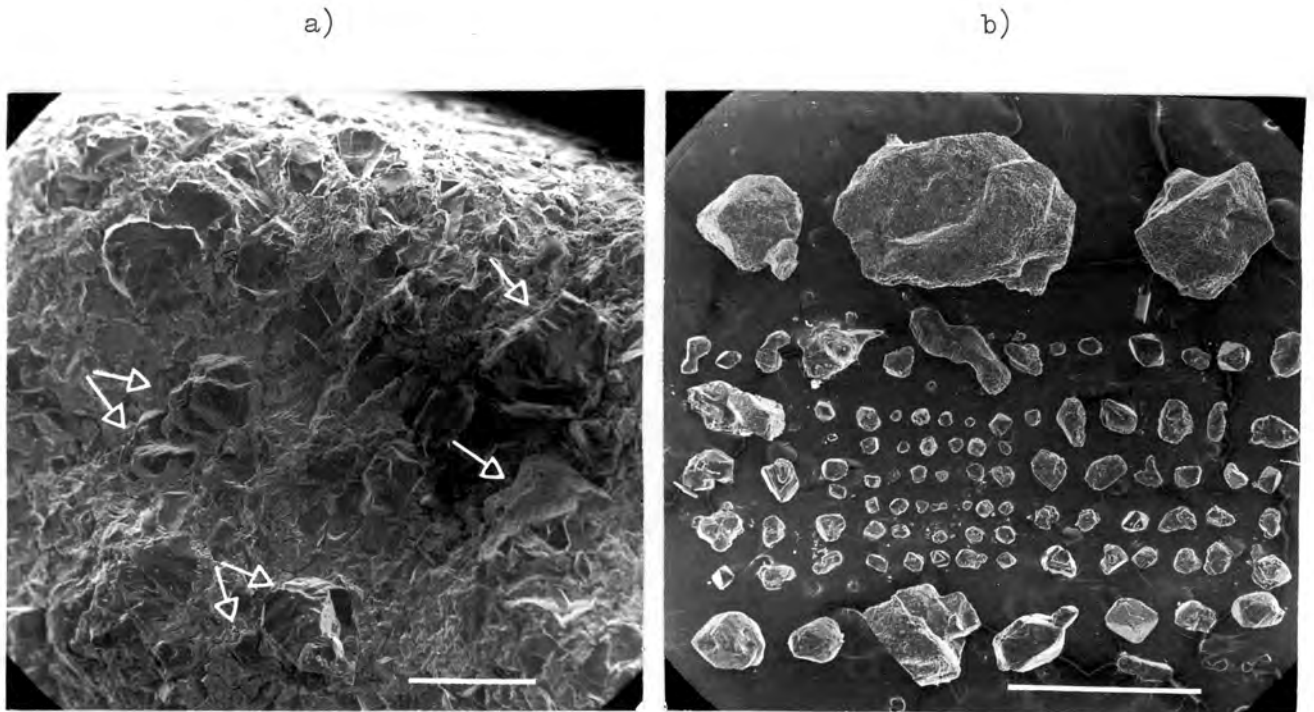


Figure 79. The diamonds of xenolith AK 1/110.

- a) The arrows indicate a number of diamonds exposed at the xenolith surface.
- b) Some of the diamonds recovered from the xenolith. The diamonds are octahedra with finely pitted surfaces. The scale bars are 1 mm in a) and b).

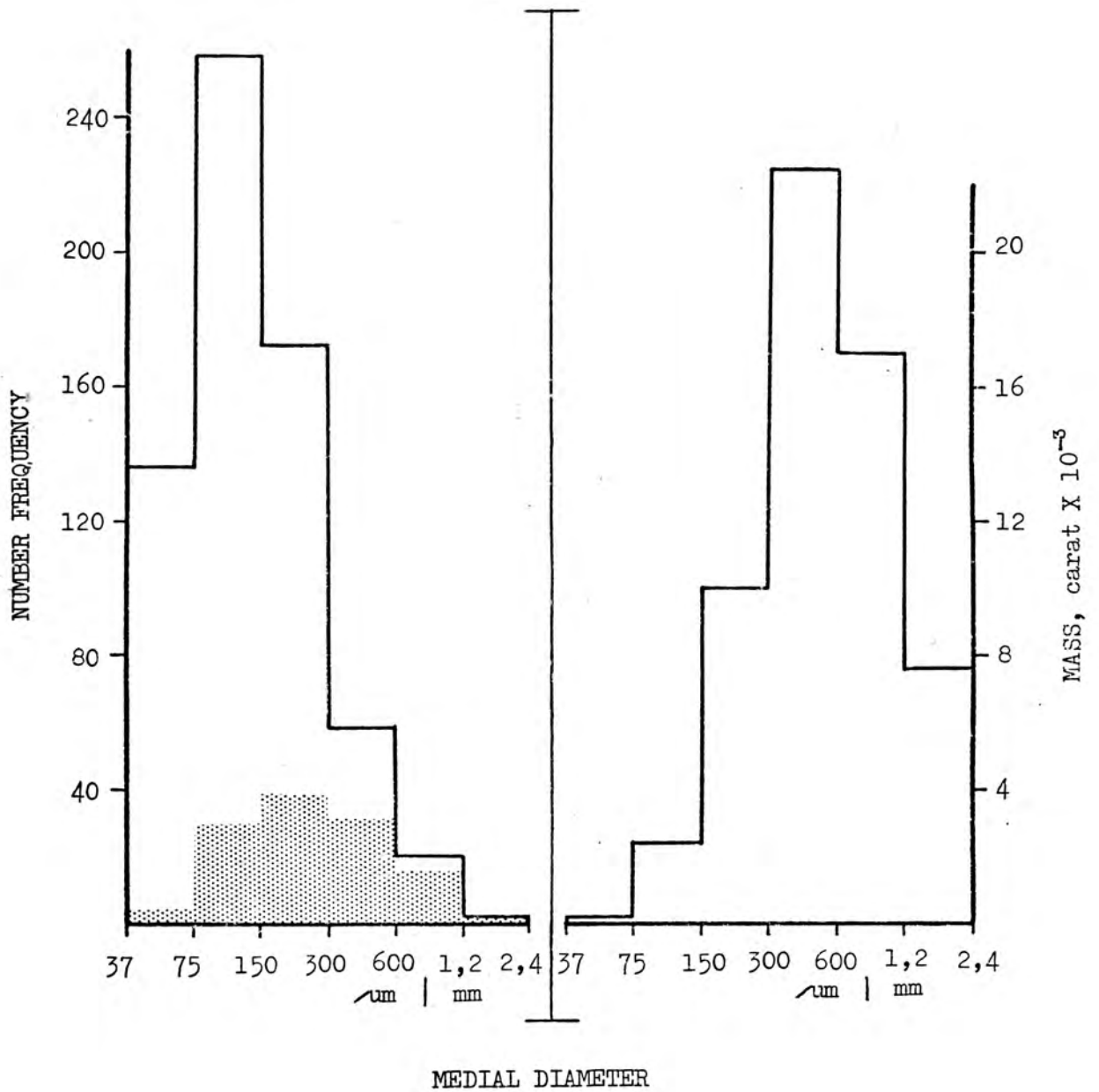


Figure 80. Size frequency distribution of diamond crystals (aggregates shaded) recovered from specimen AK 1/110.

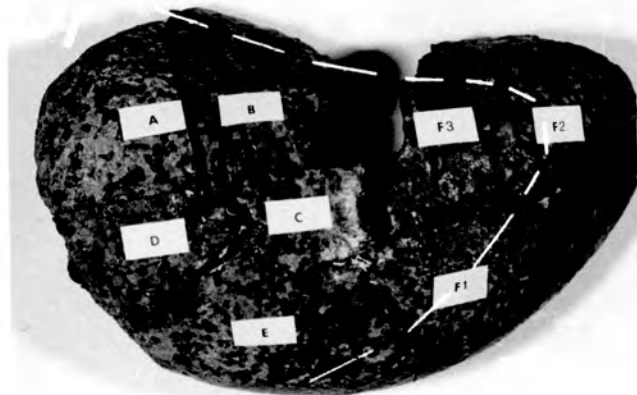


Figure 81. The re-assembled xenolith HRV 247. The approximate boundary between graphite-rich and diamond-rich portions is shown.

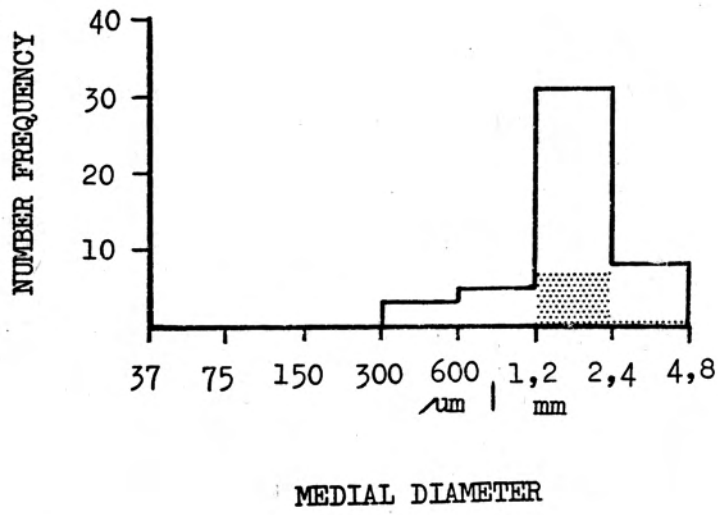


Figure 82. Size frequency distribution of diamond crystals (aggregates shaded) recovered from specimen HRV 247.

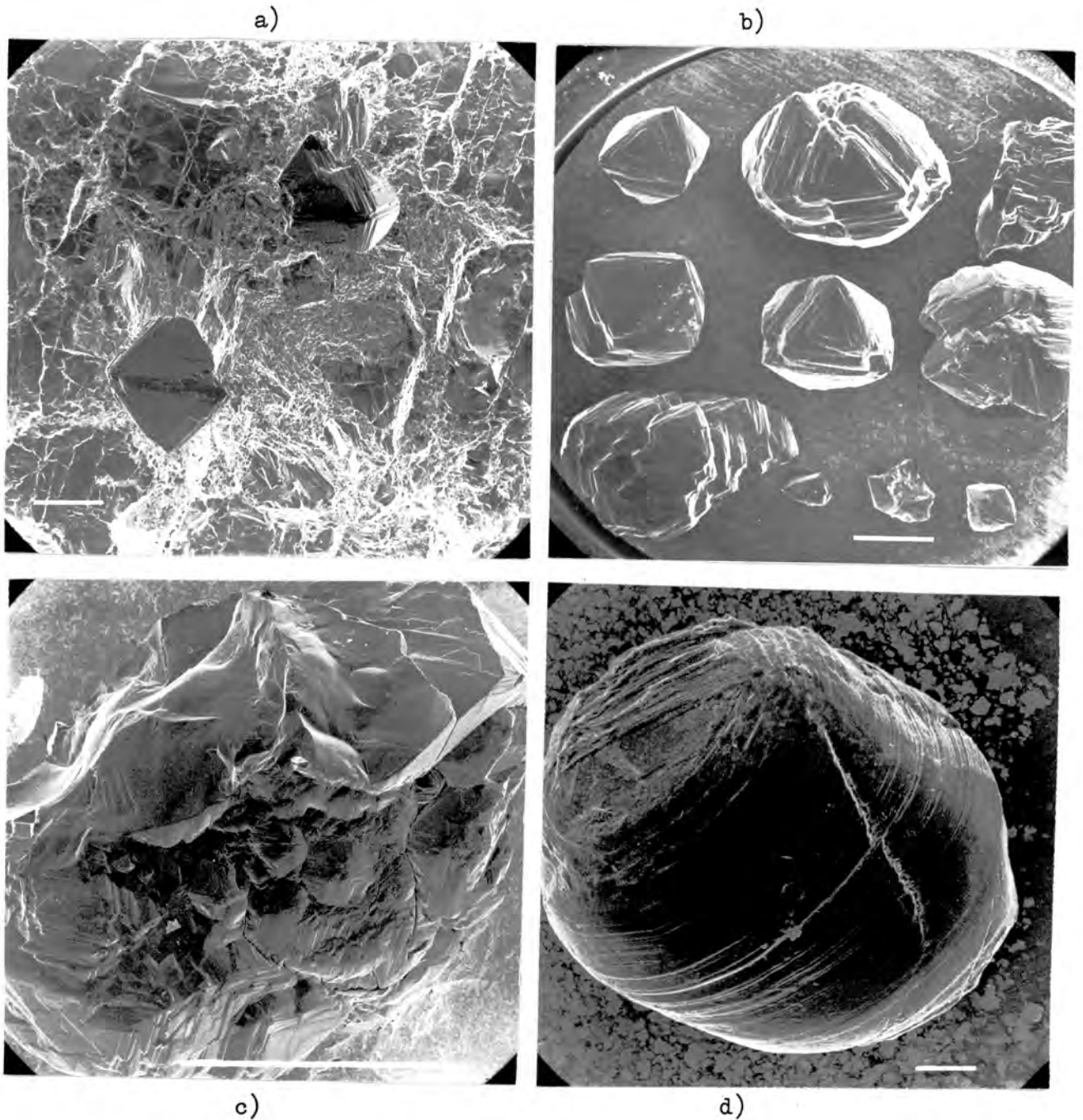


Figure 83. Diamond and graphite crystals of xenolith HRV 247.

- a) Two octahedra with minor, ribbed dodecahedral surfaces which were exposed when the xenolith was broken.
  - b) Some of the diamonds recovered from the xenolith. Most are octahedra with minor tetrahexahedroid or ribbed, dodecahedral surfaces. Two of the small diamonds are fragments.
  - c) A broken octahedron with ribbed dodecahedral surfaces in which possible inclusions of diamond are exposed at an indented cubic surface.
  - d) A barrel-shaped crystal of graphite.
- The scale bars are 1 mm in a) b) and c) and 0,1 mm in d).

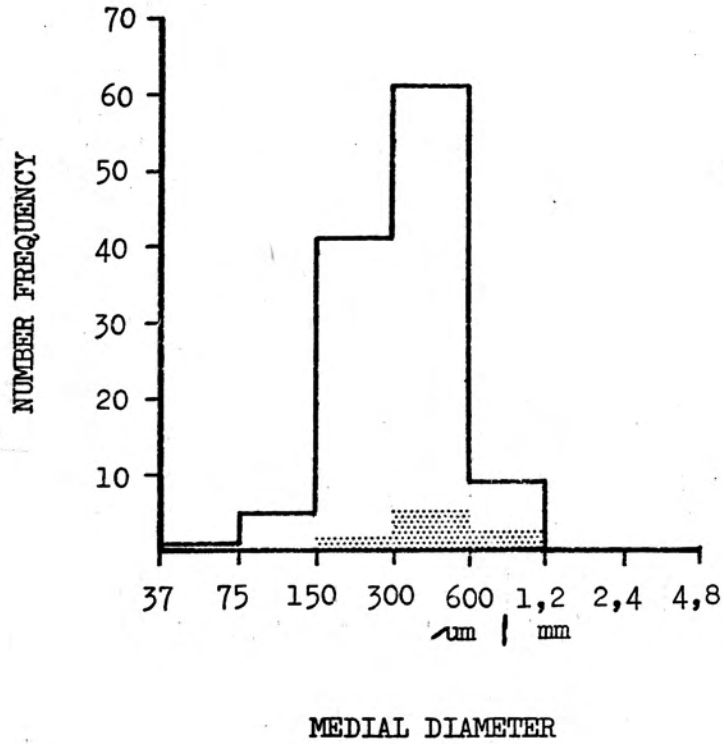


Figure 84. Size frequency distribution of diamond crystals (aggregates shaded) recovered from specimen XRV 22.

a)

b)

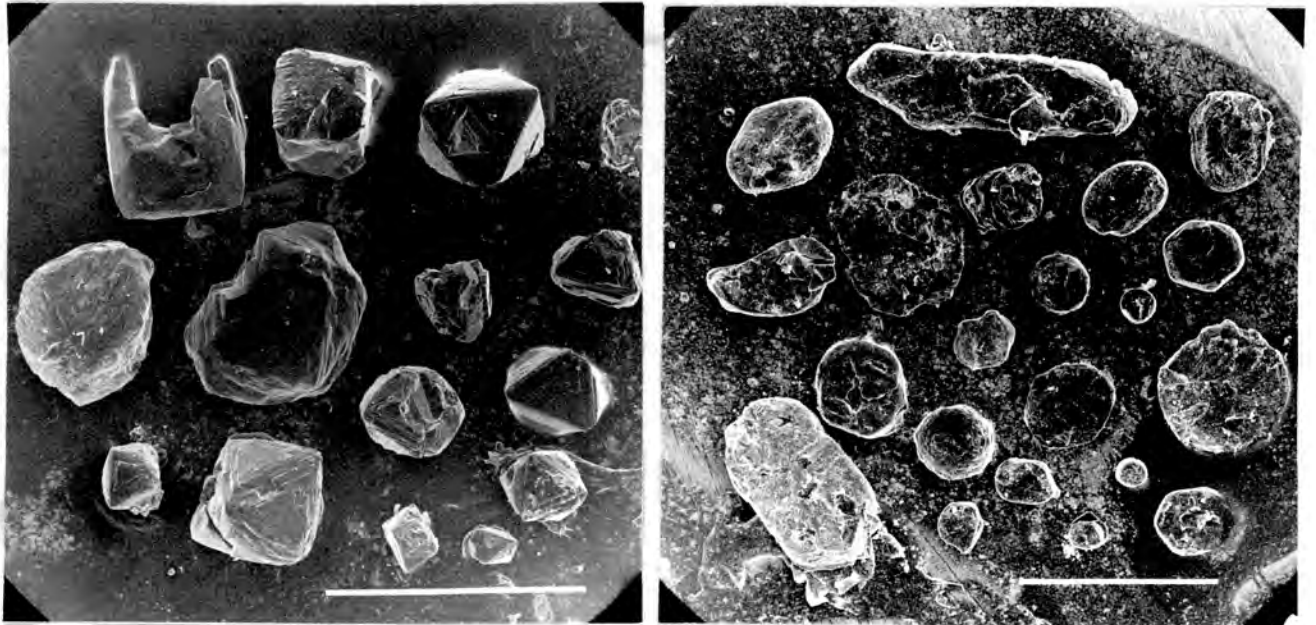


Figure 85. Diamond and graphite crystals from xenolith XRV 22.

- a) A selection of the diamonds recovered. Most are octahedra with slightly rounded edges or minor, ribbed dodecahedral surfaces. The horn-shaped example and the two largest diamonds are tetrahedra. The crystal second from the left at the top is a cube.
- b) A selection of the graphite crystals recovered. These are tabular, euhedral crystals with slightly rounded outlines. The scale bars are 1 mm.

a)

b)

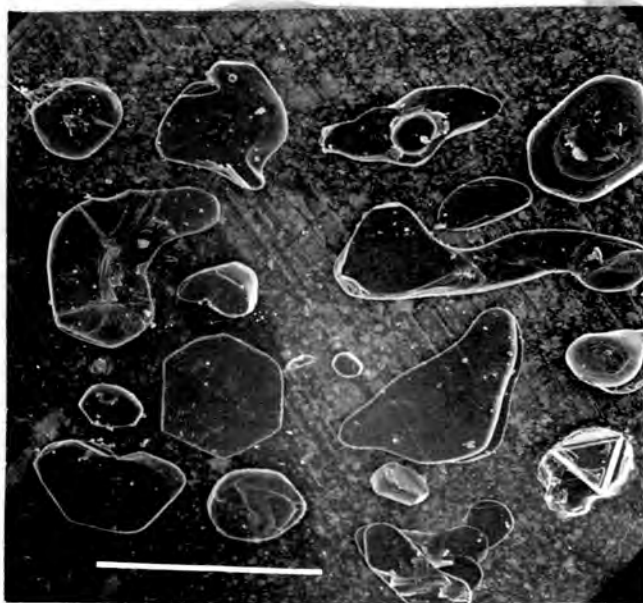
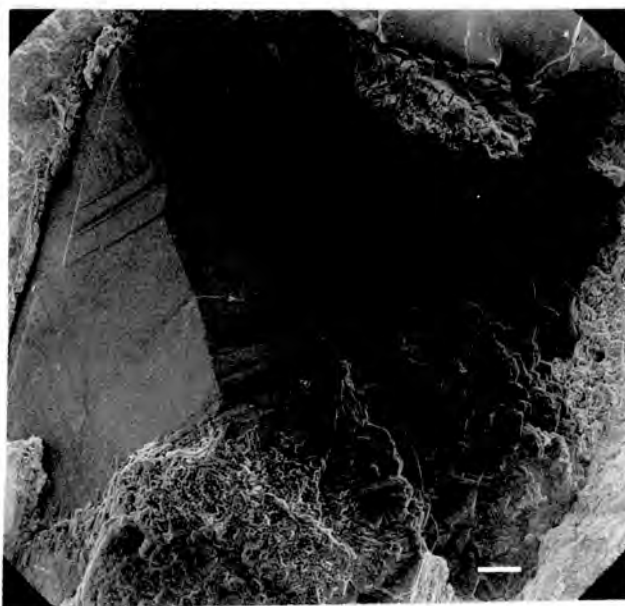


Figure 86. Features of the diamond and graphite crystals in xenolith JJG 531.

- a) An octahedral diamond exposed at the surface of the xenolith. Triangular to serrated laminae are present on most of the exposed surfaces but dodecahedral ribs and knob-like asperities are developed at the lower right.
  - b) A selection of the euohedral, rounded and embayed graphite crystals, and a small, octahedral diamond (at the lower right) recovered from the xenolith.
- The scale bars are 0,1 mm in a) and 1 mm in b).

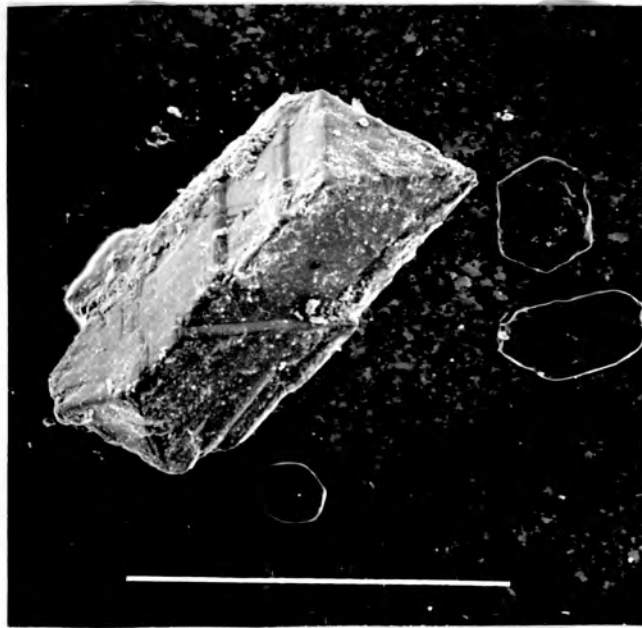


Figure 87. A sharp-edged octahedral diamond and some euhedral to slightly rounded graphite crystals recovered from xenolith AK 1/25. (The scale bar is 1 mm).

a)

b)

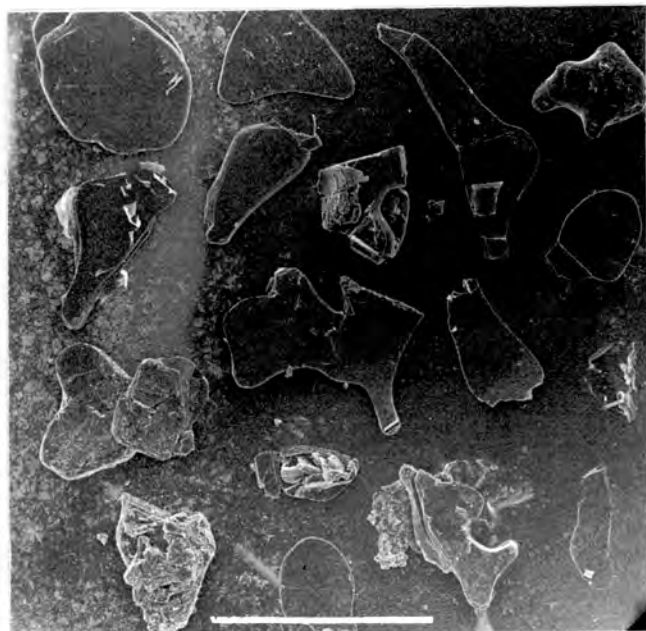
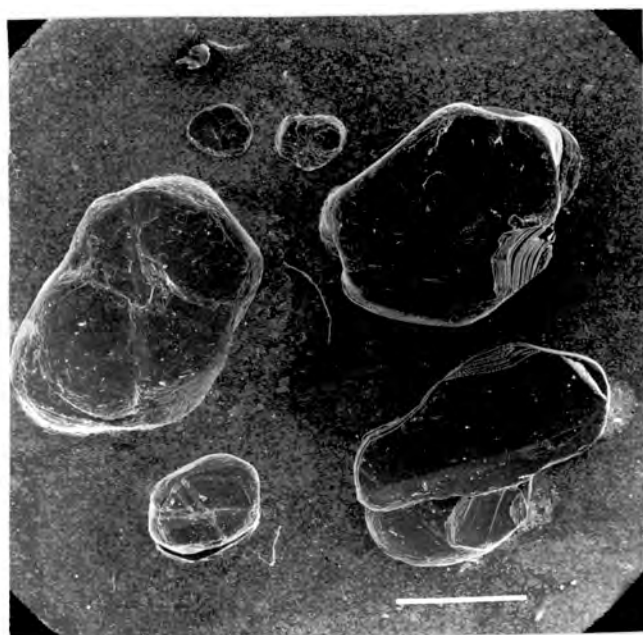
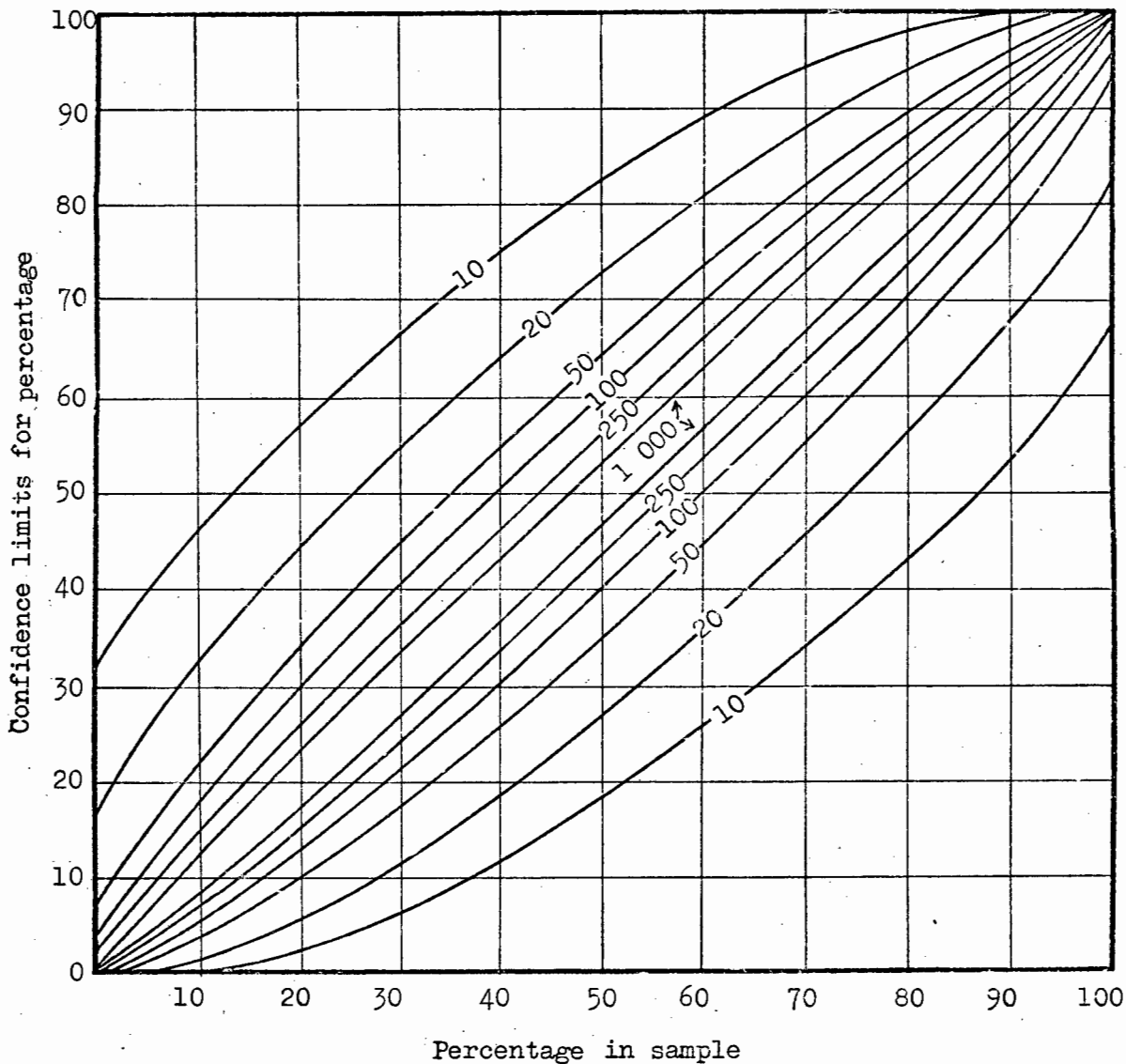


Figure 88. Examples of the graphite crystals in graphite eclogite xenoliths.

- a) Rounded, euhedral crystals from xenolith AK 1/28.
  - b) Rounded and markedly embayed crystals from xenolith AK 1/24.
- The scale bars are 1 mm.



**Figure 89.** Graph for determining the 95 per cent confidence limits for a percentage, according to the number of items involved in the determination (after Dixon and Massey, 1969).

The confidence limits are read off from the intersection with each of the two curves appropriate to the number of items involved in the sample percentage determination.

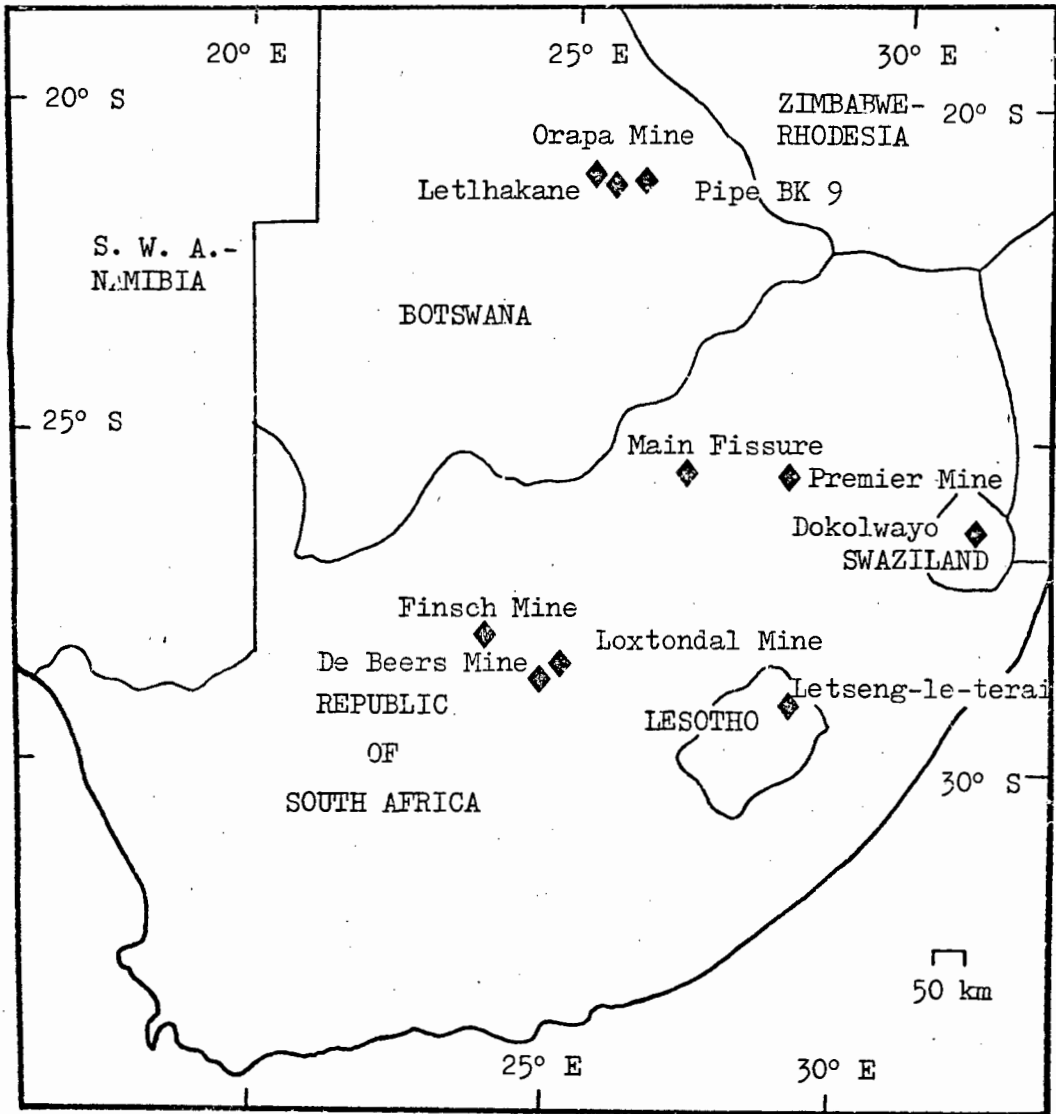


Figure 90. Southern African kimberlitic localities (◆) included in the present study.

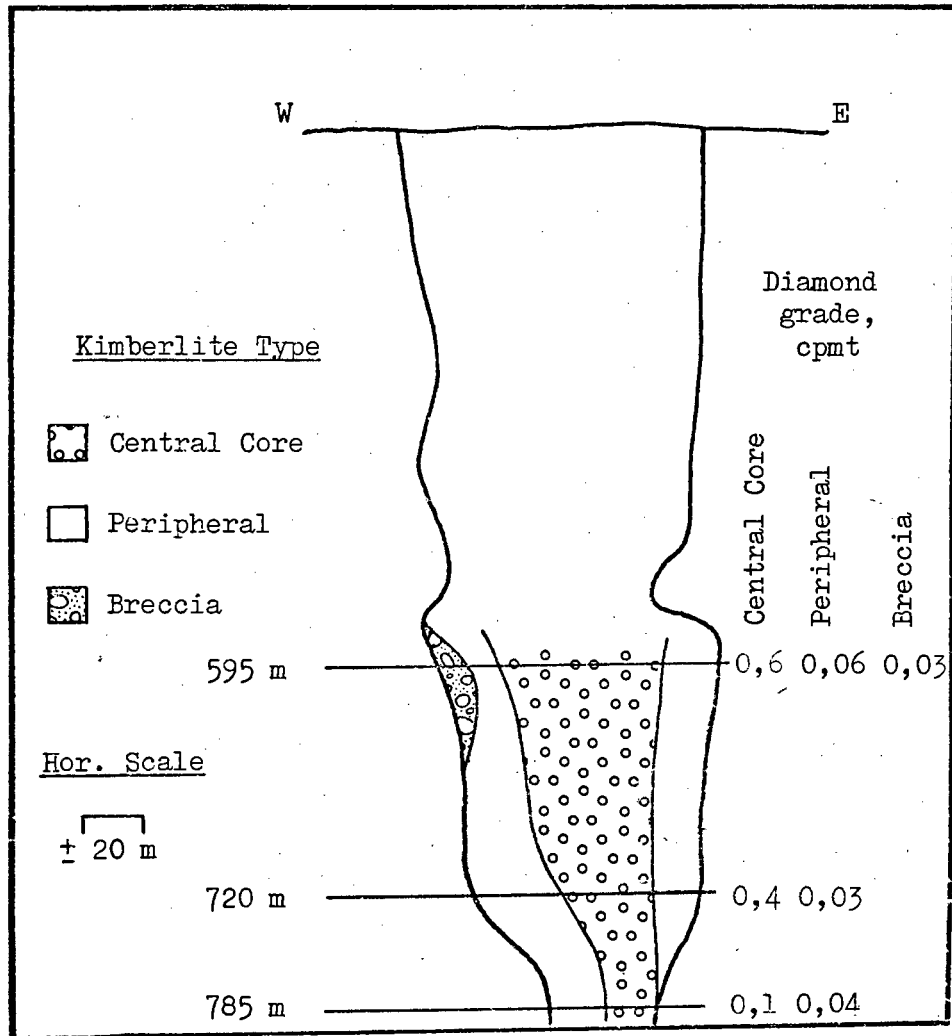


Figure 91. Generalized geological section of the De Beers Mine.  
(After the Geological Department, De Beers Consolidated Mines Limited).

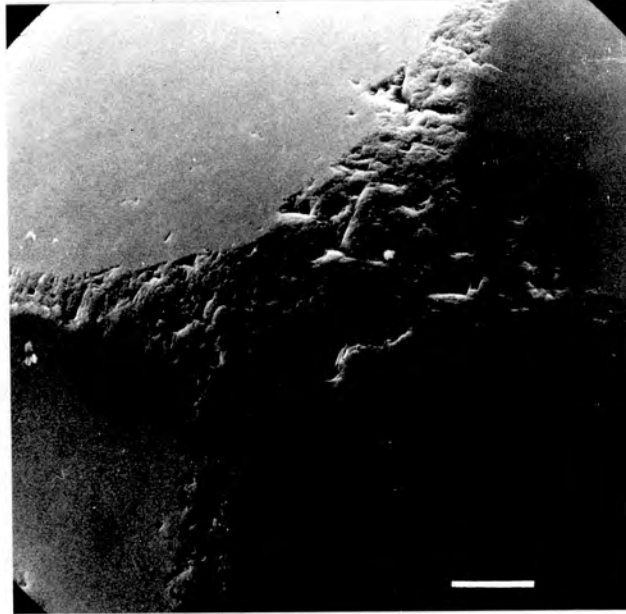


Figure 92. The abraded four-fold axial corner and "A" edges of a Finsch Mine tetrahexahedroid. (The scale bar is 10  $\mu\text{m}$ ).

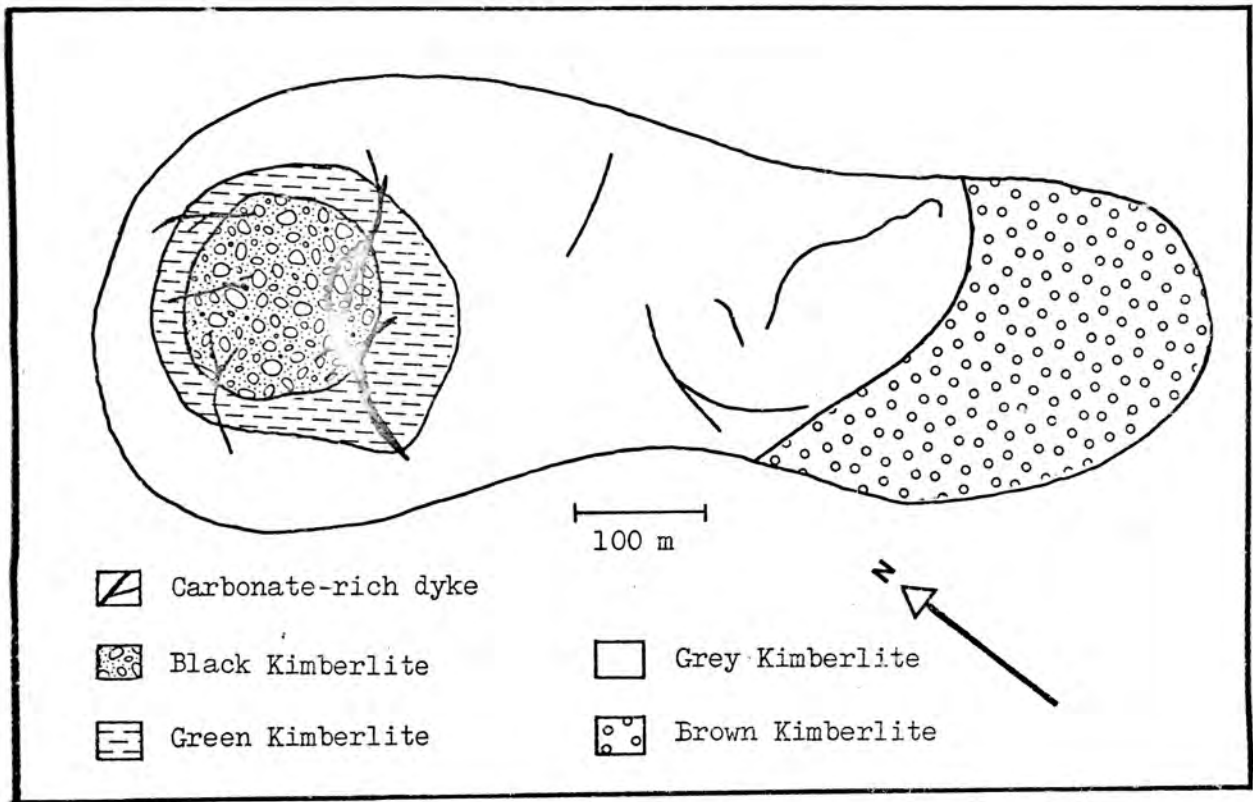
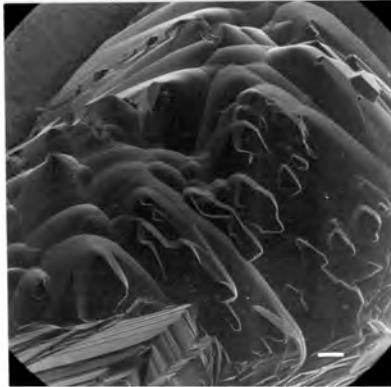
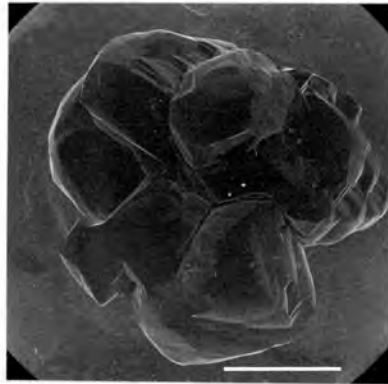
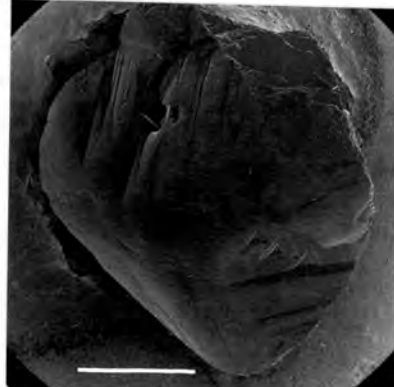


Figure 93. Generalized geology of the Premier Mine at the 538 m level.  
(After the Geological Department, De Beers Consolidated  
Mines Limited).

a)



b)



c)

Figure 94. Some peculiarities among Orapa diamonds.

- a) A complex aggregate of tetrahexahedroida.
  - b) Triangular plates with octahedral surfaces and very coarse hillocks which probably represent large triangular plates and edges rounded by resorption.
  - c) A very abraded, subsequently broken, diamond. (This example also displays some scratch-like markings which may partly account for the advanced state of the abrasion).
- The scale bars are 1 mm in a), 0,1 mm in b) and 1 mm in c).

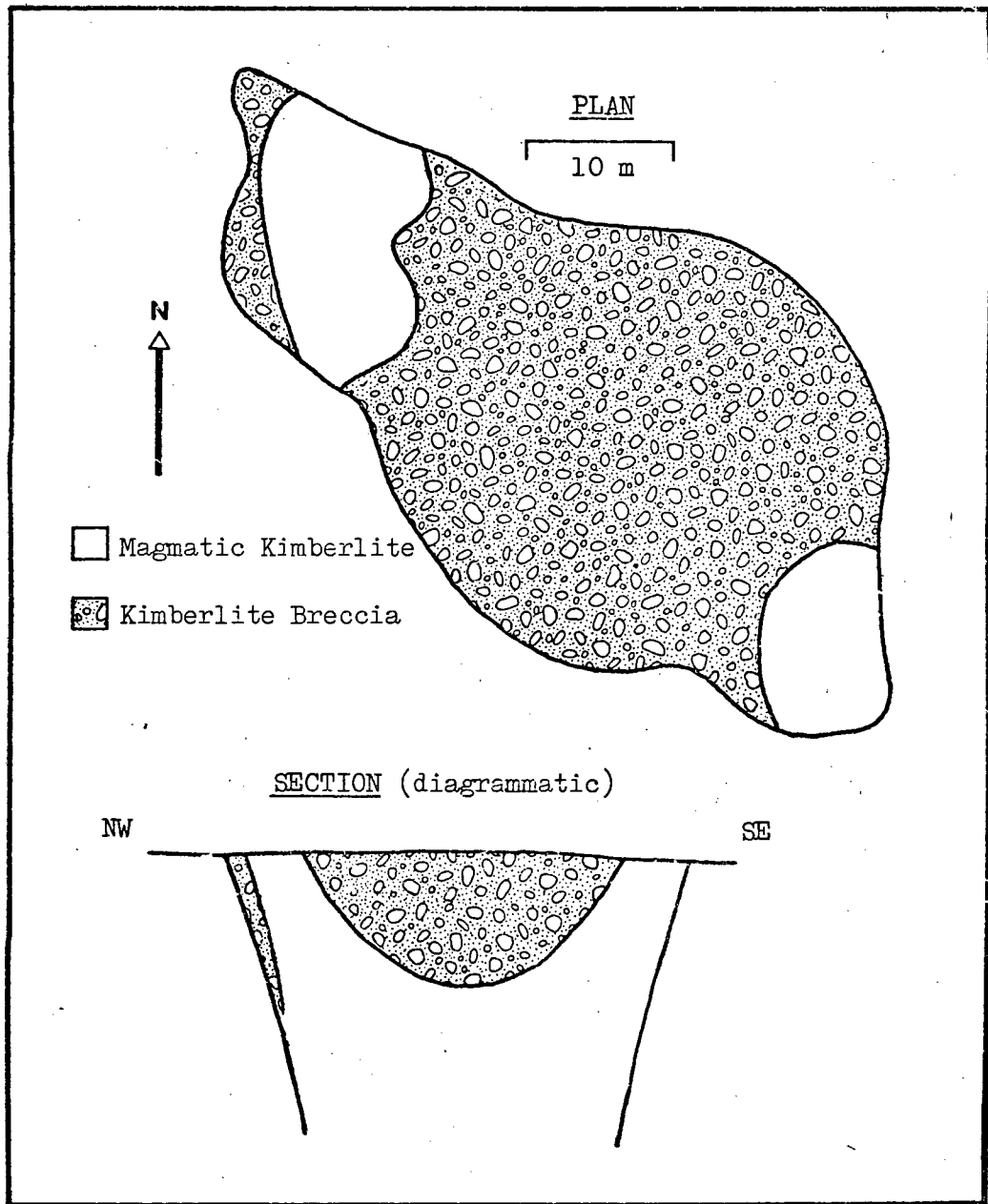


Figure 95. The generalized geology of Pipe BK 9.

Note that the section is not drawn to scale. (After the Geological Department, De Beers Consolidated Mines).

1, 2, 3 = Letseng-le-terai K6, Remainder and Satellite Kimberlites; 4 = DK 1; 5 = DK 2;  
 6 = Dokolwayo; 7 = BK 9; 8, 9, 10 = Premier Grey, Black and Brown Kimberlites; 11 = De  
 Beers Central Core Kimberlite at 595 m; 12 = Finsch; 13 = Loxtondal; 14 = Orapa; 15 = Helam.

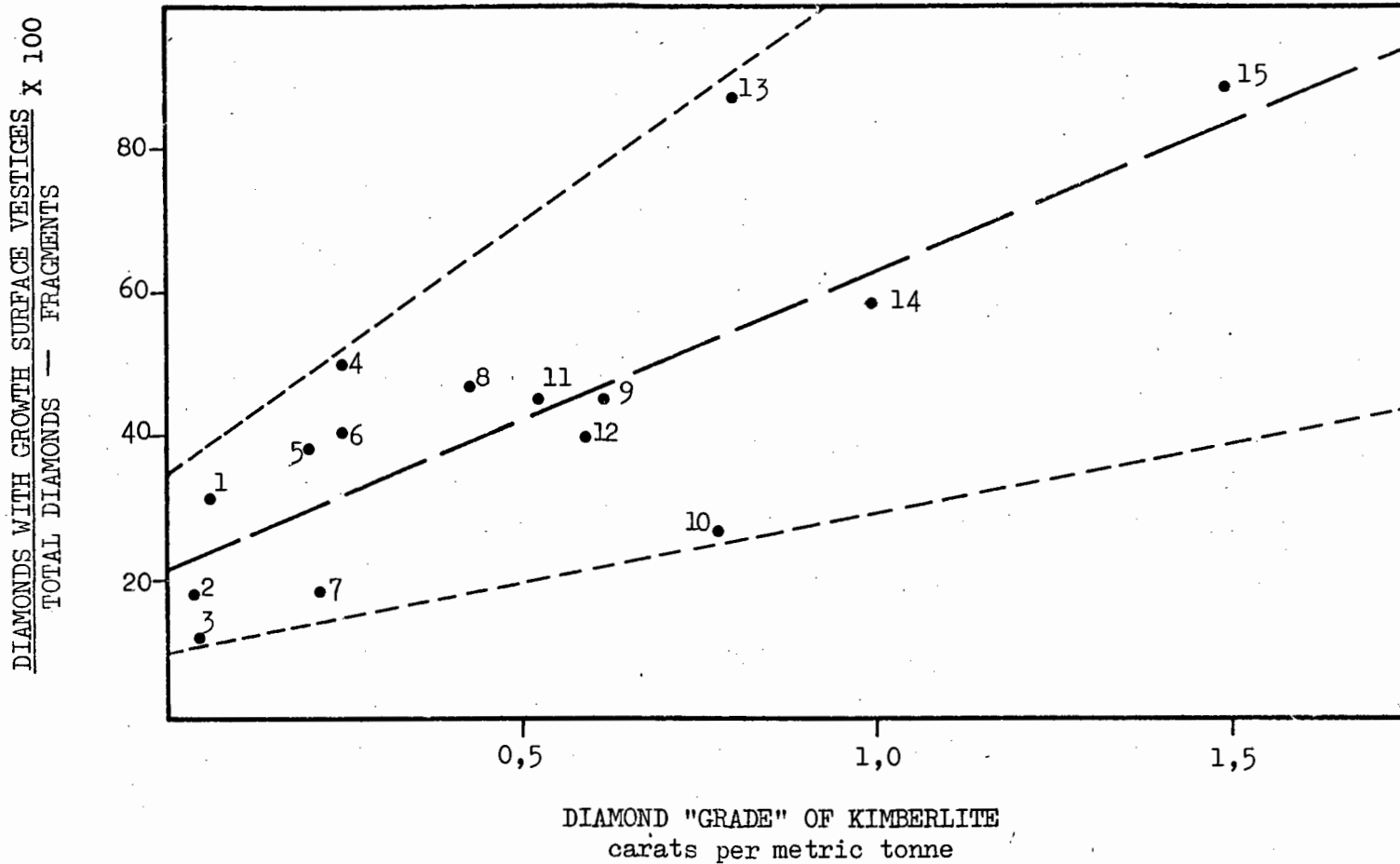


Figure 96. Plot of the percentages of minus 11 plus 9 diamonds (excluding fragments) which exhibit vestiges of octahedral or cubic crystal surfaces, against the approximate, recoverable diamond grades of host kimberlites.

1, 2, 3 = Letseng-le-terai K6, Remainder and Satellite Kimberlites;  
 4 = DK 1; 5 = DK 2; 6 = Dokolwayo; 7 = BK 9; 8, 9, 10 = Premier Grey,  
 Black and Brown Kimberlites; 11 = De Beers Central Core Kimberlite  
 at 595 m; 12 = Finsch; 13 = Loxtondal; 14 = Orapa; 15 = Helam.

DIAMONDS WITH GROWTH FORM PREDOMINATING  
 TOTAL DIAMONDS - FRAGMENTS X 100

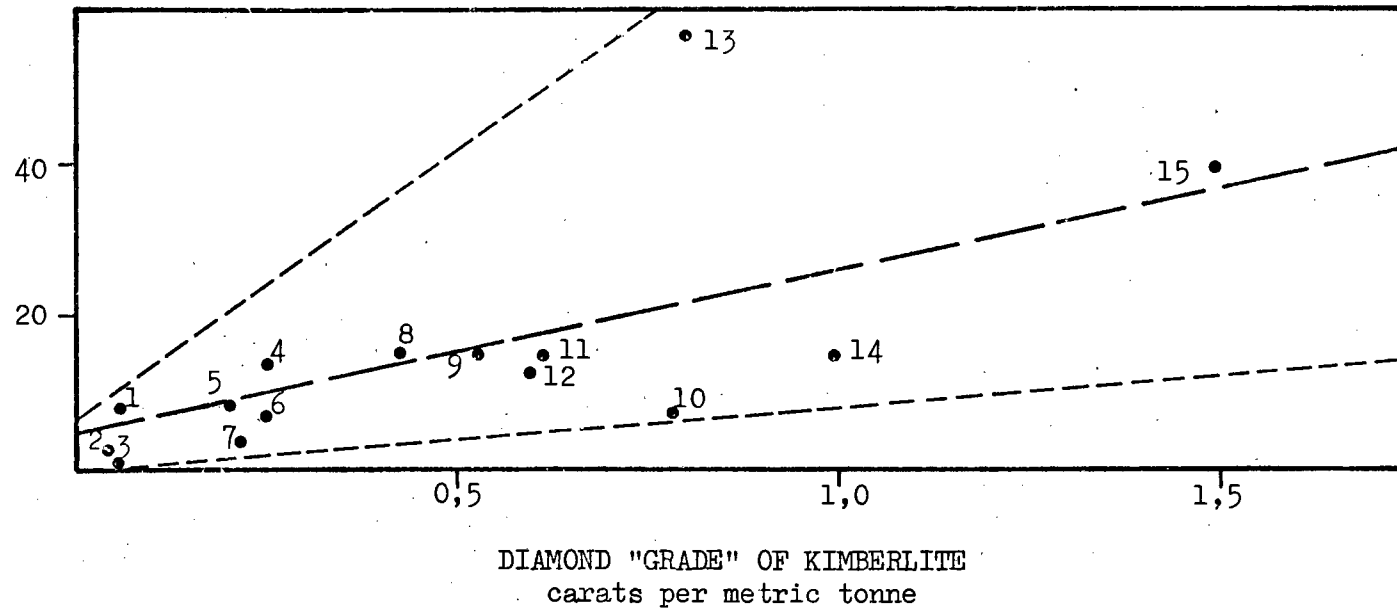


Figure 97. Plot of the percentages of minus 11 plus 9 diamonds (excluding fragments) classified as either octahedra or cubes, against the approximate, recoverable diamond grades of host kimberlites.

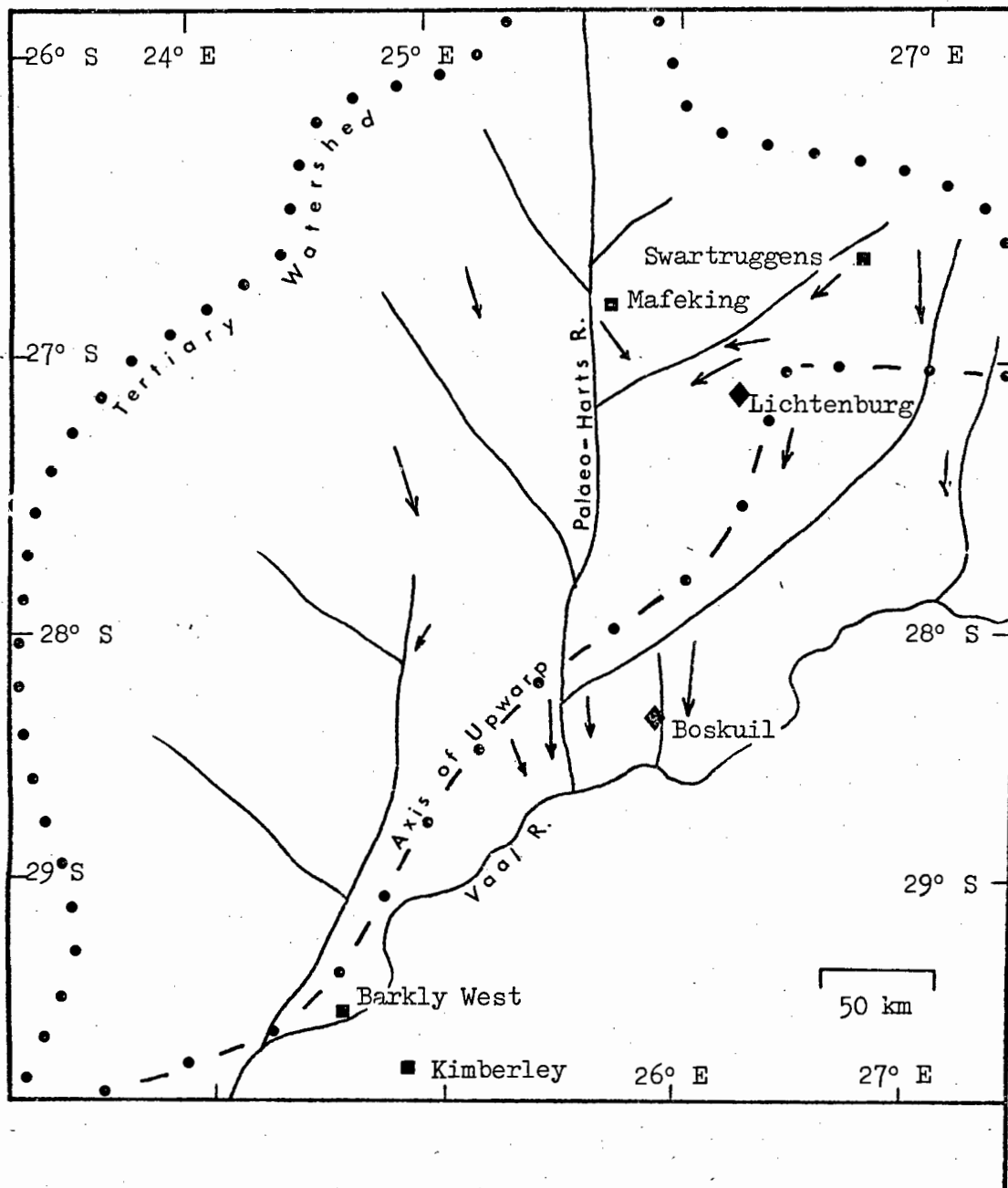


Figure 98. Locality map and palaeo-drainage for the Western Transvaal.

The arrows denote generalized palaeocurrent directions in diamond-bearing gravels (after Stratten, 1979). Other features of the palaeo-drainage during the Tertiary Period (after Mayer, 1973) are also shown.

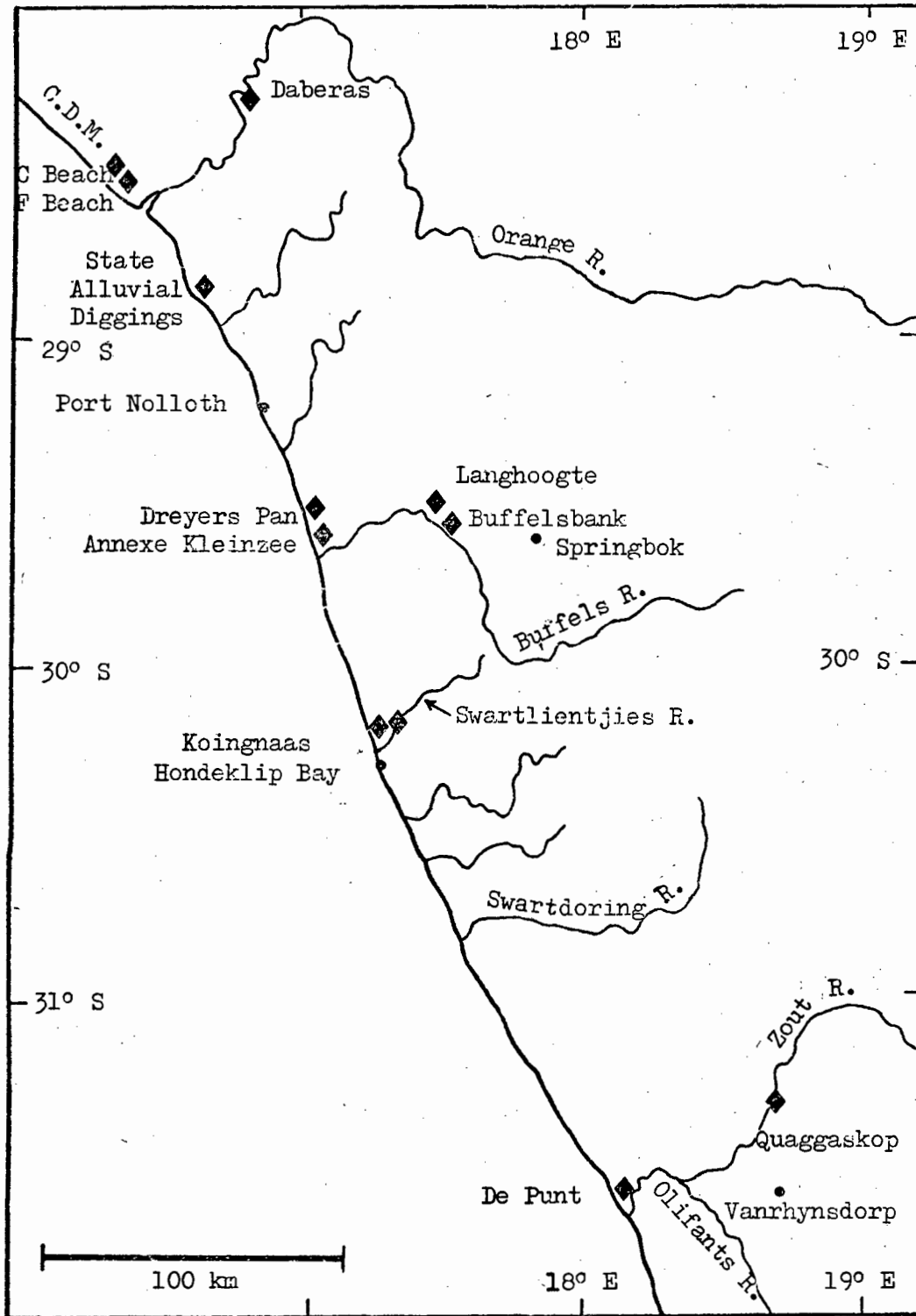


Figure 99. Locality map for Namaqualand and neighbouring areas.

(◆ Sample localities).

(Note: Buffelsbank is located on the southern bank of the Buffels River, Figures 99 to 103).

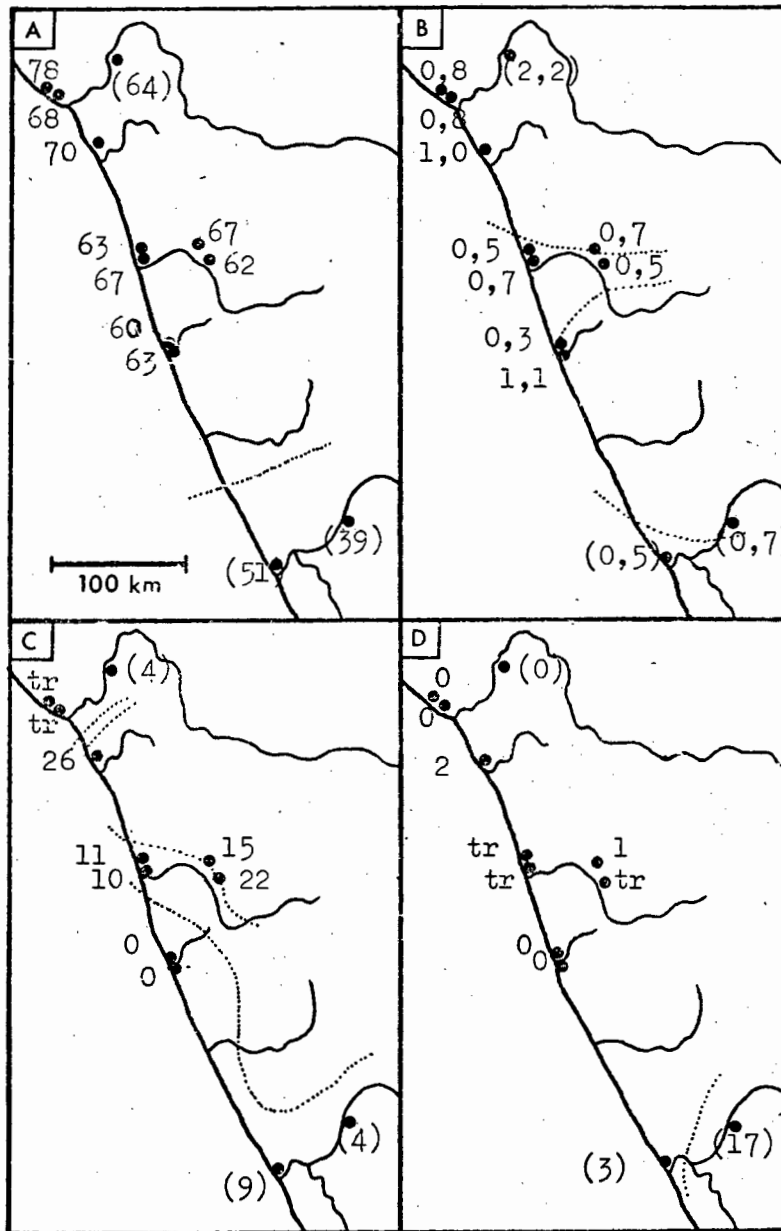


Figure 100. Plots of some of the colour characteristics of the diamond samples from Namaqualand and neighbouring areas. (Bracketed data refer to samples of less than 100 diamonds).

- A. The percentage of colourless diamonds.
- B. The ratio of yellow to brown (including light brown) diamonds.
- C. The percentage of diamonds displaying green surface staining.
- D. The percentage of diamonds displaying brown surface staining.

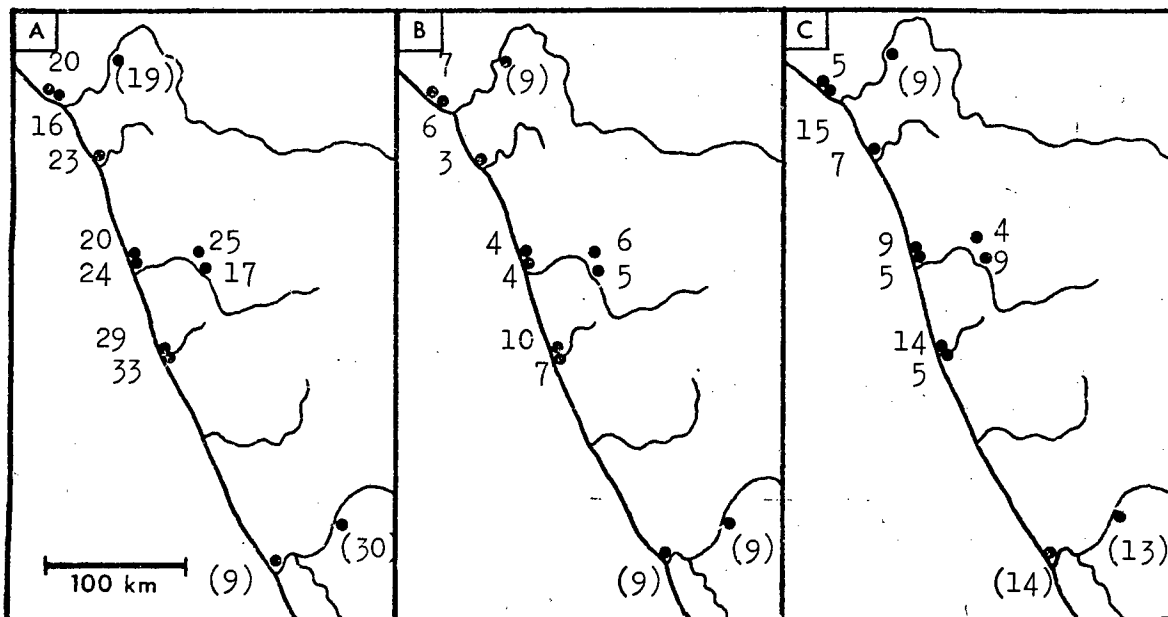


Figure 101. Plots of the percentages of the diamonds in samples from Namaqualand and neighbouring areas, which display particular, morphological features. (Bracketed data refer to samples of less than 100 diamonds).

- A. With octahedral crystal faces.
- B. With cubic crystal surfaces.
- C. With breakage surfaces.

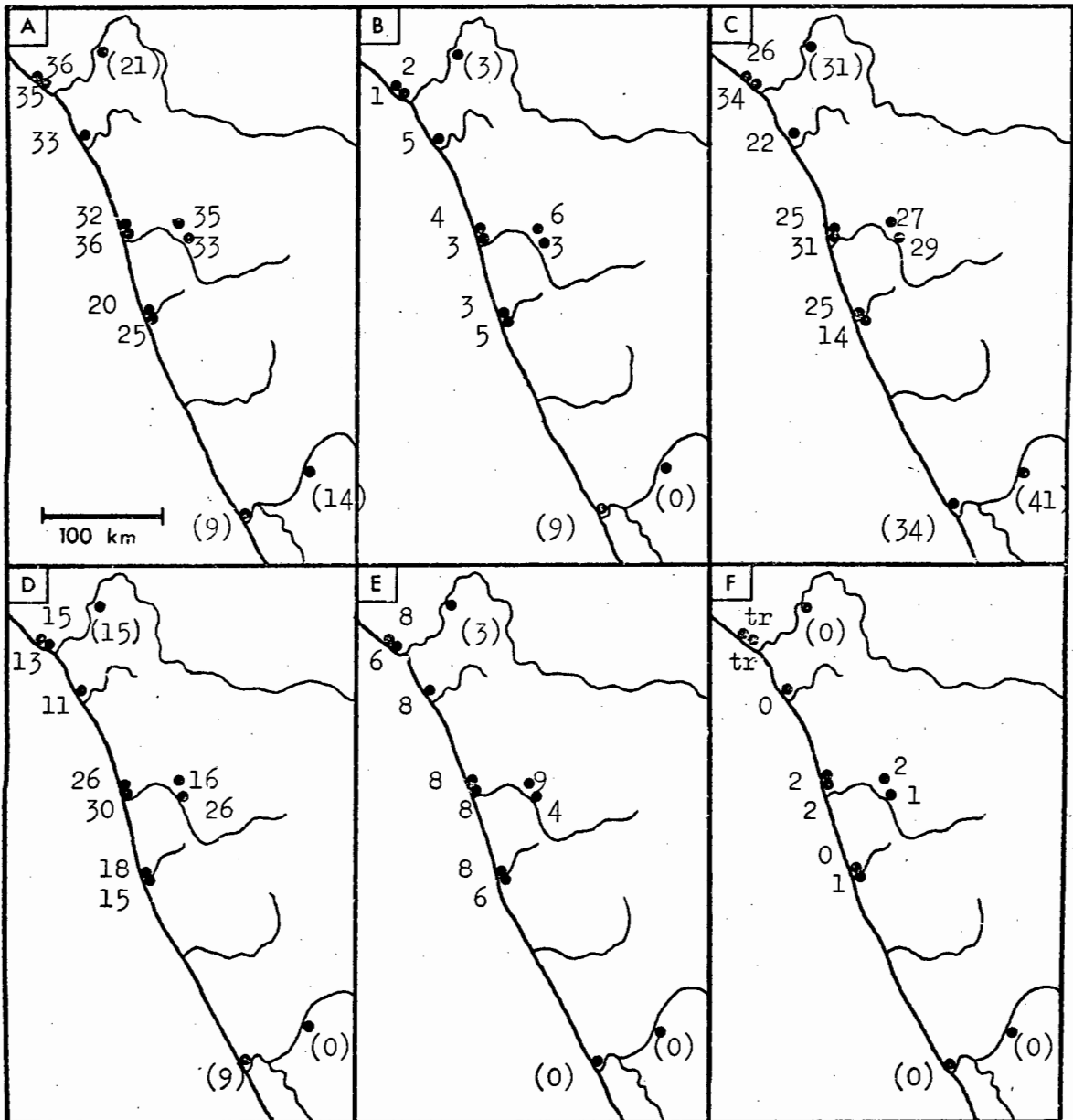


Figure 102. Plots of the percentages of the diamonds in samples from Namaqualand and neighbouring areas, which display particular, pristine surface textures. (Bracketed data refer to samples of less than 100 diamonds).

- A. With tetrahexahedroid surfaces, displaying terraces.
- B. Displaying chemically-polished surfaces.
- C. With tetrahexahedroid surfaces, displaying lamination lines.
- D. Displaying frosting.
- E. Displaying scratch-like markings.
- F. Displaying positively-oriented surface textures.

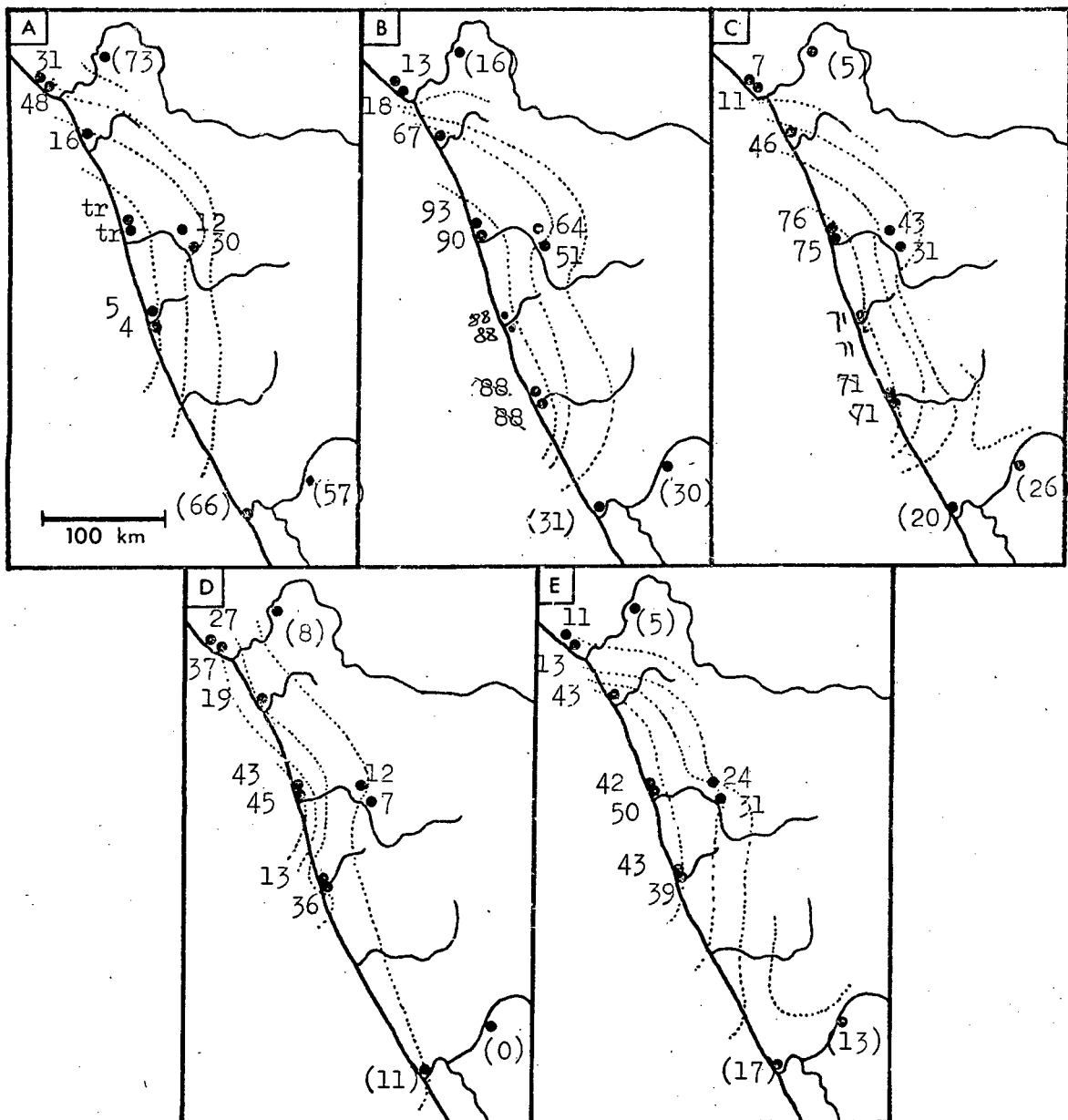


Figure 103. Plots of the percentages of the diamonds in samples from Namaqualand and neighbouring areas, which display particular abrasional features. (Bracketed data refer to samples of less than 100 diamonds).

- A. Unabraded.
- B. With more than only sharp corners abraded.
- C. With at least "A" edges abraded.
- D. Displaying large percussion markings.
- E. Displaying small percussion figures.

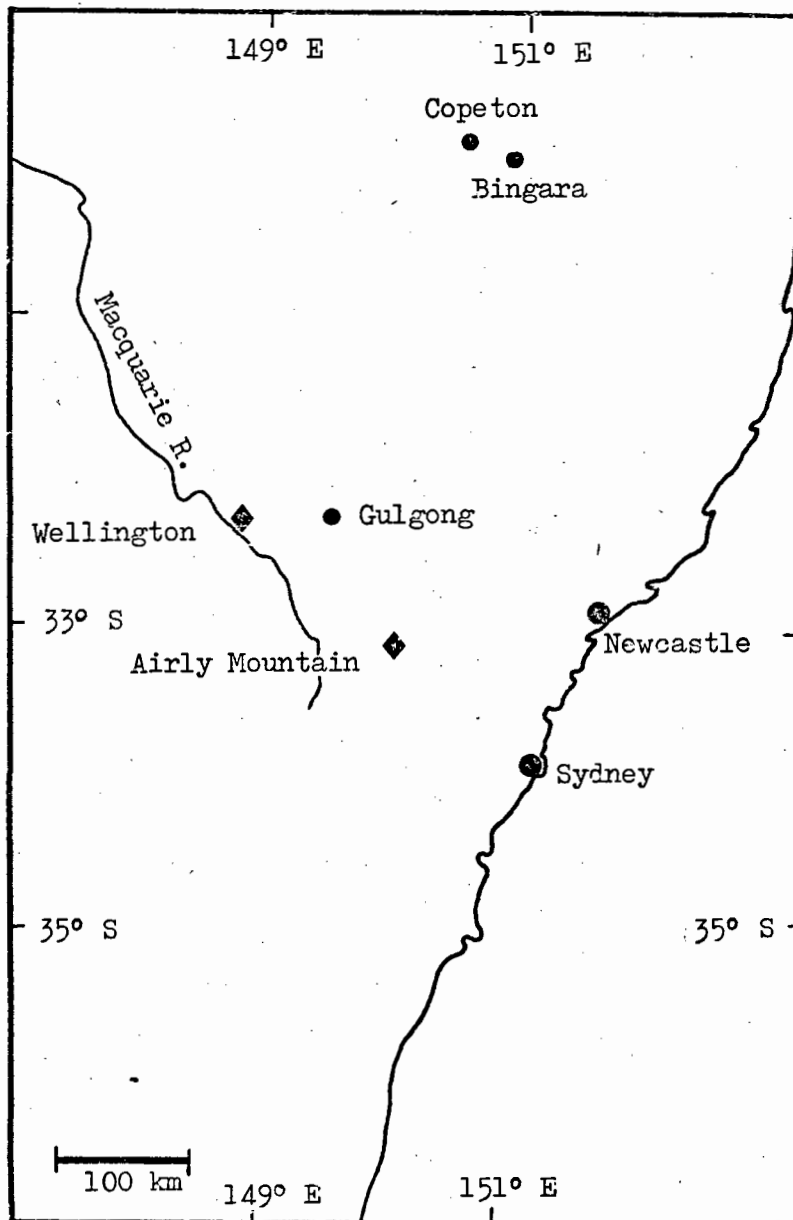


Figure 104. Locality map for New South Wales, Australia.

(◆ Sample localities).

TABLE 1

DIAMOND SIEVE APERTURE DIAMETERS, THE APPROXIMATE CRITICAL SIZE  
OF DIAMOND PASSING THROUGH EACH SIEVE AND THE APPROXIMATE  
AVERAGE SIZE OF THE DIAMONDS IN EACH SIEVE CLASS

SIEVE	APERTURE DIAMETER mm	APPROXIMATE CRITICAL SIZE, carats/stone	APPROXIMATE AVERAGE SIZE, carats/stone
23	10,31	9,2	5,0
21	7,93	3,9	2,7
19	6,35	1,9	1,7
17	5,74	1,5	1,3
15	5,41	1,2	0,9
13	4,52	0,7	0,6
12	4,09	0,5	0,4
11	3,45	0,32	0,23
9	2,85	0,17	0,14
7	2,46	0,12	0,10
6	2,16	0,08	0,07
5	1,83	0,05	0,04
3	1,47	0,03	0,02
2	1,32	0,02	
1	1,09	0,01	

Note: Critical size is that size which will just pass through the appropriate screen. Critical size and average size depend on diamond shapes. Average figures are given. These vary slightly from one diamond sample to another.

TABLE 2

DETAILS OF THE KIMBERLITIC DIAMOND SAMPLES STUDIED

SAMPLE LOCALITY (FORM OF ORE-BODY)		KIMBERLITE VARIETY	NO. OF DIAMONDS STUDIED	DIAMOND SIEVE CLASS
De Beers Mine (pipe)	595 m level	Central core	246	-23+11
			150	-11+9
			635	-9+5
		Peripheral	18	-23+11
			36	-11+9
			173	-9+5
	Breccia	19	-23+11	
		44	-11+9	
		108	-9+5	
	720 m level	Central Core	162	-23+11
			134	-11+9
			509	-9+5
		Peripheral	20	-23+11
			22	-11+9
			78	-9+7
		Breccia	2	-13+11
			11	-11+9
			29	-9+7
785 m level	Central Core	21	-13+11	
		2	-11+9	
		41	-9+7	
	Peripheral	2	-13+11	
		5	-11+9	
		75	-9+7	
Finsch Mine (Pipe)		undifferentiated	300	-11+9

(Continued overleaf)

TABLE 2 (Continued)

SAMPLE LOCALITY (FORM OF ORE-BODY)		KIMBERLITE VARIETY	NO. OF DIAMONDS STUDIED	DIAMOND SIEVE CLASS
Premier Mine (Pipe)	538 m level	Brown	500	-11+9
		Grey	500	-11+9
		Black	500	-11+9
Letseng-le-terai		K6	83	-21+13
			100	-11+9
			50	-6+5
		Remainder	148	-21+13
			50	-11+9
			50	-6+5
		Satellite	112	-21+13
			100	-11+9
			50	-6+5
Orapa Mine (Pipe)	trenches cut at $\pm$ 35 m	epiclastic	200	-11+9
		epiclastic	200	-11+9
Letlhakane (two Pipes)	DK 1	undifferentiated	300	-11+9
	DK 2	undifferentiated	300	-11+9
Pipe BK 9 (Pipe)	NW Sector	magmatic	300	-11+9
	SE Sector	magmatic	300	-11+9
		Breccia	80	-11+9
Dokolwayo (Pipe)	trenches	undifferentiated	200	-11+9
			100	-7+5
Mir Mine (Pipe)		undifferentiated	50	-12+11
			25	-11+9
			25	-6+5

(Continued overleaf)

TABLE 2 (Continued)

SAMPLE LOCALITY	KIMBERLITE	NO. OF	DIAMOND
	VARIETY	DIAMONDS	SIEVE
		STUDIED	CLASS
Prairie Creek (Pipe)	Breccia	32	-13+5
Loxtondal Mine (Constricted pipe)	undifferentiated	25	-19+17
		100	-11+9
		50	-6+5
Helam Mine (Dyke)	Main fissure	372	-21+11
		246	-11+9
Anglo W Tvl. Mine (Dyke)	Main fissure	100	-15+11

TABLE 3

DETAILS OF THE SAMPLES STUDIED FROM PLACER DEPOSITS

LOCALITY	TYPE OF DEPOSIT	NO. OF DIAMONDS STUDIED	DIAMOND SIEVE CLASS
Lichtenburg	Tertiary alluvial gravel	64	-21+17
		300	-11+9
		50	-7+5
Boskuil	Tertiary alluvial gravel	33	-19+17
		135	-11+9
Hlane	Triassic fluviatile grit	100	-7+5
C.D.M., C Beach	Tertiary littoral gravel	300	-11+9
		50	+21
F Beach	Tertiary littoral gravel	300	-11+9
		50	+21
State Diggings	Tertiary littoral gravel	300	-11+9
Dreyers Pan	Tertiary littoral gravel	300	-11+9
Annexe Kleinzee	Tertiary littoral gravel	300	-11+9
Koinignaas	Uplifted terr.	200	-11+9
	Rec.-emerged terr.	200	-11+9
De Punt	Recent (?) littoral gravel	37	-11+9
Daberas	Tertiary (?) alluvial gravel	64	-13+7
Buffelsbank	Tertiary (?) alluvial gravel	300	-11+9

(Continued overleaf)

TABLE 3 (Continued)

LOCALITY	TYPE OF DEPOSIT	NO. OF DIAMONDS STUDIED	DIAMOND SIEVE CLASS
Langhoogte	Tertiary (?) alluvial gravel	245	-11+9
Quaggaskop	Tertiary (?) alluvial gravel	36	-13+7
Wits Banket	Precambrian conglomerate	10	-13+7
Wellington	Recent (?) alluvium	89	-15+9
Airly Mountain	Tertiary alluvial gravel	9	-13+9
Urals	Recent alluvium (?)	70	-15+11

TABLE 4  
 CHEMICAL COMPOSITION OF THE STARTING MATERIALS USED FOR  
 DIAMOND ETCHING EXPERIMENTS AT 30 KILOBARS PRESSURE

	1. KIMBERLITE AUTOLITH	2. VOLATILE-FREE KIMBERLITE AUTOLITH	3. KIMBERLITE AUTO- LITH + ILMENITE + Cr <sub>2</sub> O <sub>3</sub>
SiO <sub>2</sub>	34,14	38,76	35,93
TiO <sub>2</sub>	2,40	2,73	6,15
Al <sub>2</sub> O <sub>3</sub>	4,10	4,65	3,05
Cr <sub>2</sub> O <sub>3</sub>	—	—	4,44
FeO	8,30	9,41	10,22
MnO	0,17	0,20	0,15
MgO	25,71	29,20	20,35
CaO	9,04	10,27	10,31
Na <sub>2</sub> O	0,48	0,55	0,81
K <sub>2</sub> O	2,02	2,30	1,09
P <sub>2</sub> O <sub>5</sub>	1,70	1,93	0,91
CO <sub>2</sub>	4,07	—	2,16
H <sub>2</sub> O	7,86	—	4,25
TOTAL	99,99	100,00	99,83

TABLE 5  
 DETAILS OF THE EXPERIMENTS AT 30 KILOBARS AND  
 OF THE DIAMOND FEATURES PRODUCED

Capsule	EXPERIMENTAL DETAILS							OBSERVATIONS ON DIAMONDS						
	Run No.	Temperature, °C	Duration (mins.)	Starting material *	% CO <sub>2</sub> added	H <sub>2</sub> O added	Approximate log fO <sub>2</sub>	Degree of graphite coating **	Degree of etching **	Surface textures				
									Irregular pits on (111)	-ve trigons on (111)	Serrated lam. on (111)	-ve tetragons on (100)	Scratch-like markings	
Graphite	A/6	1273	20	2	47,7	-	-8,1	W	S		X		X	
	A/7	1392	20	2	22,4	-	-6,5	S	S	X			X	
	A/8	1405	20	2	16,6	-	-6,4	S	S		X	X	X	
	A/10	1300	20	2	21,6	-	-7,7	S	S		X		X	
Molybdenum	A/12	1394	120	1	15,6	-	-9,8	S	W	X			X	
	A/13	1297	30	1	-	-	-10,8	W	W		X		X	X
	A/14	1194	66	1	-	-	-12,0	N	N					
	A/15	1395	282	1	-	-	-9,7	W	VS		X	X	X	
	A/16	1352	282	1	-	-	-10,2	N	W		X	X	X	
	AI/17	1327	160	3	20,4	-	-10,4	W	S		X	X	X	
	AI/18	1451	88	3	26,3	-	-9,2	S	S	X	X		X	
	AI/19	1402	201	3	26,1	-	-9,7	S	S		X	X	X	
AW/20	1149	320	3	-	sat.	-12,6	N	W	X	X		X	X	

\* For starting composition see Table 1.

\*\* N = none, W = weak, S = strong, VS = very strong.

TABLE 6

THE RELATIVE AGES AND LIKELY CONDITIONS OF FORMATION OF  
SOME DIAMOND CHARACTERISTICS

RELATIVE AGE	COLOUR	CRYSTAL FORM	SURFACE TEXTURE				LIKELY PROCESS	T °C
			OCTAHEDRAL	CUBIC	TETRAHEDRAHEDROID	UNRESTRICTED		
Oldest	Yellow, green, blue, some colourless, grey	Octahedron, cube	Pointed plates, some smooth surfaces		Potential for zig-zag texture, terraces	Potential for macle lines and some network patterns	Crystal growth	>1 200
	Post-genetic, pre-resorption	Colourless from yellow						
	Light brown and brown	Some distortion			Potential for lamination lines		Plastic deformation	>950
Oldest due to chemical reaction		Tetrahexahedroid, dodecahedron, Some crystal breakage	Shield-shaped laminae, trigons, serrate laminae	Crescentic steps, tetragons	Terraces, elongate hillocks, pyramidal hillocks, zigzag texture, low-relief surfaces, shagreen texture, ribbing (on dodecahedral surfaces)	Macle lines, lamination lines, pitted hemispherical cavities, chemical polish, knob-like asperities, some network patterns, some ruts, (some incl. cavities)	Resorption and high-temperature etching by oxidation	>950
							(strain about inclusions)	

(Continued overleaf)

TABLE 6 (Continued)

Oldest post-resorption	Hexagonal pits including examples containing trigons	Shallow depressions, Circular micro-corrosion sculpture, pits, (some patterns of micro-network patterns) pits, microdisk patterns, coarse frosting	High-temperature etching by oxidation Down to 950		
			Potential for scratch-like markings Friction <950		
Youngest due to reaction	Some crystal breakage	Positively-oriented trigonal pits	Positively-oriented tetragonal pits	Transverse hillocks, imbricate wedge-markings Scratch-like markings, fine frosting	Etching by oxidation 950-450
Youngest	Some crystal breakage				Strain about inclusions <950

TABLE 7

PARTICULARS OF DIAMOND- AND/OR GRAPHITE-BEARING  
ECLOGITE XENOLITHS STUDIED

	ECLOGITE TYPE	SPECIMEN NUMBER	KIMBERLITE LOCALITY	MASS EXAMINED, g *	APPROX. MODAL COMPOSITION **		
					cpx	ga.	other
Diamond		AK 1/9	Orapa	(7,4)	20	80	
		AK 1/10	Orapa	(14,7)	30	70	
		AK 1/111	Orapa	(4,5)	60	40	
		DB 1	Doornkloof	(15,2)	50	50	
		DB 2	Doornkloof	(13,3)	30	70	
		DB 3	Doornkloof	(3,1)	30	70	
		DB 4	Bobbejaan	(9,1)	60	40	
		DB 5	Jagersfontein	(1,5)	65	35	
		DB 6	Excelsior	(24,2)	75	20	ky 5
		DB 7	Excelsior	(10,8)	50	45	ky 5
		DB 8	Doornkloof	(0,7)	--	100	
		PJL 18	Roberts Victor	260,7	75	25	
	Diamond-graphite Alkr.		AK 1/110	Orapa	1,6	--	100
		HRV 247	Roberts Victor	943,0	30	70	
		XRV 22	Roberts Victor	248,1	70	30	
		JJG 531	Jagersfontein	13,1	85	15	
Graphite		AK 1/25	Orapa	12,0	40	60	
		AK 1/12	Orapa	11,6	60	30	ky 10
		AK 1/13	Orapa	8,5	30	70	
		AK 1/24	Orapa	8,4	50	50	cor tr
		AK 1/26	Orapa	(2,1)	65	35	
		AK 1/27	Orapa	4,9	50	50	ky tr

(Continued overleaf)

Graphite	AK 1/28	Orapa	(1,8)	80	20	
	AK 1/29	Orapa	8,8	20	80	
	AK 1/30	Orapa	(8,5)	15	85	
	AK 1/31	Orapa	24,4	35	65	
	AK 1/34	Orapa	(21,2)	60	35	cor 5

---

\* Figures enclosed in brackets refer to specimens examined only superficially.

\*\* Diamond and graphite not included. Accessory rutile and secondary (?) phlogopite commonly also present. cpx--clinopyroxene, ga = garnet, ky = kyanite, cor = corundum.

TABLE 8

DETAILS OF THE DIAMOND AND GRAPHITE CRYSTALS IN ECLOGITE XENOLITHS

XENOLITH	NO. OF DIAMOND CRYSTALS	DIAMOND CRYSTAL FORMS	LARGEST DIAMOND CRYSTAL, carats	NO. OF GRAPHITE CRYSTALS	GRAPHITE CRYSTAL HABITS
*AK 1/9	14	od, oe, eo	0,06		
*AK 1/10	2	od	0,2		
*AK 1/111	1	o	0,32		
*DB 1	1	fragment	-		
*DB 2	1	od	1,8		
*DB 3	1	e	0,15		
*DB 4	1	od	>1		
*DB 5	5	fragment	0,01		
*DB 6	1	o	>1		
*DB 7	1	o	4		
*DB 8	2	o	-		
PJL 18	10	od, od	<0,01		
AK 1/110	644	o, od	<0,01		
HRV 247	47	o, od, oe, oda	0,2	† 200	ur, m
XRV 22	119	o, od, oe, e, a	<0,01	† 200	ur
JJG 531	6	o,od	1	† 80	m, ur, u
AK 1/25	1	o	<0,01	16	u, ur
AK 1/12				3	u
AK 1/13				3	e
AK 1/24				25	e, ur
*AK 1/26				3	u
AK 1/27				5	u
*AK 1/28				28	ur
AK 1/29				11	ur
*AK 1/30				11	u

(Continued overleaf)

TABLE 8 (Continued)

XENOLITH	NO. OF DIAMOND CRYSTALS	DIAMOND CRYSTAL FORMS	LARGEST DIAMOND CRYSTAL, carats	NO. OF GRAPHITE CRYSTALS	GRAPHITE CRYSTAL HABITS
AK 1/31				2	damaged
*AK 1/34				2	u

\* Superficial examination only.

Crystal forms and habits are listed in descending order of abundance.

Diamond crystal forms: o = octahedron, a = cube, d = dodecahedron,

e = tetrahexahedroid.

Graphite crystal habits: u = euhedral, r = rounded, m = embayed.

TABLE 9.

THE DIAMOND "GRADE" OF SOME ECLOGITE XENOLITHS

SPECIMEN	GRADE, cpmt*
AK 1/9	> 18 000
AK 1/110	37 000
PJL 18	17
HRV 247	3 500
XRV 22	650
JJG 531	> 15 000

\* Carats per metric tonne

TABLE 10

ECLOGITE KENOLITH HRV 247 : DETAILS OF THE PORTIONS TREATED  
AND OF THE FREE CARBON PHASES RECOVERED

DESIGNATION	PORTION		RECOVERY			
	MASS, gm		NO. OF DIAMOND CRYSTALS	NO. OF DIAMOND FRAGMENTS	MASS OF DIAMOND, gm	MASS OF GRAPHITE FLAKES, gm
A	416		47	192	0,6599	0,0623
F2	405		-	27	0,0008	0,3968
G	122		-	1	tr	0,1786

TABLE 11

ECLOGITE XENOLITH HRV 247 : THE PERCENTAGES OF THE MAIN  
CRYSTAL FORMS AND OF DIAMONDS DISPLAYING PARTICULAR  
SURFACES, FOR THE VARIOUS SIZES RECOVERED

SIZE CLASS	MAIN FORM							WITH SURFACES LISTED BELOW				NO. OF DIAMONDS CONSIDERED
	SINGLE CRYSTALS	PARALLEL GROWTHS	MACLES	AGGREGATES	DODECAHEDRA	IRREGULAR CRYSTALS	FRAGMENTS	OCTAHEDRAL	DODECAHEDRAL OR TETRAHED.	CUBIC	BREAKAGE	
>3 mm	0	67	0	33	0	0	0	100	100	100	67	3
2-3 mm	50	22	6	6	6	0	11	94	94	72	33	18
1-2 mm	28	0	3	19	6	6	38	85	85	53	72	32
<1 mm	4	0	0	0	0	1	96	7	7	3	99	186

TABLE 12

EXAMPLES OF APPROXIMATE, 95 PER CENT CONFIDENCE LIMITS FOR  
PERCENTAGE DATA INVOLVING PARTICULAR NUMBERS OF DIAMONDS

SAMPLE DETERMINATION %	NUMBER OF DIAMONDS INVOLVED IN THE SAMPLE DETERMINATION						
	10	30	50	100	200	300	500
1	0-34	0-14	0-9	0-6	0-4	0-2	0-2
5	0-40	1-20	2-15	2-12	3-10	3-8	3-7
10	0-46	2-27	4-22	5-18	6-16	7-14	7-13
20	2-57	7-39	10-34	12-29	14-27	16-25	16-24
40	11-75	22-60	26-55	30-50	33-47	34-46	35-45
60	25-88	40-77	45-74	50-70	52-67	54-66	55-65
80	43-99	61-92	66-90	70-87	73-86	75-84	76-84
90	54-100	73-98	78-97	82-95	84-94	85-93	86-93
95	60-100	80-100	85-99	89-98	90-97	92-97	92-97

CONFIDENCE LIMITS, %

TABLE 13

THE PERCENTAGE DISTRIBUTIONS OF DIAMOND COLOURS  
IN KIMBERLITIC SAMPLES

LOCALITY	BODY COLOUR					SURFACE STAIN		SIZE NOT -11+9
	COLOURLESS	YELLOW	LIGHT BROWN	BROWN	OTHER	GREEN	BROWN	
Finsch	31	7	37	24	1	0	0	
Premier, 538 m, Brown	67	3	17	11	3	0	0	
Grey	39	2	6	54	0	0	0	
Black	40	1	9	50	tr	0	0	
Letseng-le-terai, K6	41	7	16	34	2	0	0	-23+13
	48	4	6	42	0	0	0	
	30	6	20	44	0	0	0	-6+5
Remainder	46	15	7	28	4	0	0	-23+13
	32	12	14	42	0	0	0	
	34	8	18	40	0	0	0	-6+5
Satellite	63	7	1	15	14	0	0	-21+13
	73	1	4	14	8	0	0	
	84	2	2	10	2	0	0	-6+5
Orapa, Trenches	38	13	22	18	9	1	0	
±35 m	36	16	17	23	8	1	0	
Letlhakane, DK/1	66	tr	13	18	1	8	0	
DK/2	75	2	12	8	1	5	0	

(Continued overleaf)

TABLE 13 (continued)

LOCALITY	BODY COLOUR					SURFACE STAIN		SIZE NOT -11+9
	COLOURLESS	YELLOW	LIGHT BROWN	BROWN	OTHER	GREEN	BROWN	
BK/9, Magmatic, NW	46	5	24	25	tr	0	0	
SE	62	3	11	23	1	0	0	
Breccia	60	8	11	19	3	5	0	
Dokolwayo	73	4	10	12	1	3	0	
	57	3	14	24	1	4	0	-7+5
Murfreesboro	6	32	38	21	3	0	0	-13+5
Loxotondal	80	8	12	0	0	16	0	-19+17
	89	4	7	0	0	32	0	
	90	2	4	2	0	34	0	-6+5
Helam	60	4	3	19	14	9	0	-21+11
	65	4	7	17	7	12	0	
Anglo Western Transvaal	56	7	7	16	14	nd	nd	-15+11

(Note: Murfreesboro = Prairie Creek locality).

TABLE 14

PERCENTAGE DISTRIBUTIONS OF MAIN CRYSTAL FORMS AND OF DIAMONDS  
EXHIBITING PARTICULAR SURFACES, IN KIMBERLITIC SAMPLES

LOCALITY	MAIN FORMS								WITH SURFACES LISTED BELOW				SIZE NOT -11+9	
	OCTAHEDRA				TETRAHEDR.*				OCTAHEDRAL	CUBIC	TETRAHEDRAHEDROID*	BREAKAGE		
	SINGLE CRYSTALS	MACLES	AGGREGATES	CUBES	SINGLE CRYSTALS	MACLES	AGGREGATES	FRAGMENTS						
De Beers Mine	Central Core	10	tr	0	0	52	5	1	32	27	4	70	63	-23+11
		9	1	0	0	55	2	1	32	27	1	68	56	
		6	tr	tr	0	31	tr	tr	62	16	2	40	72	-9+5
	Peripheral	0	0	0	0	83	0	6	11	22	0	89	39	-23+11
		11	0	0	0	56	0	0	33	25	0	67	53	
		12	3	1	0	40	8	0	36	27	1	66	72	-9+5
	Breccia	16	5	0	0	58	5	0	16	47	0	84	37	-23+11
		9	5	2	0	37	9	7	32	52	2	68	55	
		10	0	1	0	27	2	0	60	20	2	42	83	-9+5
	Central Core	12	3	0	0	59	3	0	23	41	1	77	56	-23+11
		10	3	1	0	41	4	0	41	24	1	66	69	
		5	4	tr	0	23	1	tr	67	11	1	32	84	-9+5
Peripheral	10	0	0	0	75	5	0	10	35	0	90	60	-23+11	
	5	0	0	0	36	0	0	59	18	0	41	82		
	8	0	0	0	31	1	0	60	14	1	40	76	-9+5	
Breccia	9	4	0	0	17	9	0	61	13	0	39	87	-13+7	
Central Core	19	0	0	0	44	4	0	33	37	7	78	70	-13+7	
	Peripheral	8	0	4	0	38	0	0	54	23	0	46	88	-13+7
785 m														
Finsch		10	2	tr	1	67	10	7	3	31	8	97	49	

(Continued overleaf)

TABLE 14 (continued)

LOCALITY		MAIN FORMS								WITH SURFACES LISTED BELOW				SIZE NOT -11+9
		OCTAHEDRA				TETRAHEDR.*				OCTAHEDRAL	CUBIC	TETRAHEDRAL*	BREAKAGE	
		SINGLE CRYSTALS	MACLES	AGGREGATES	CUBES	SINGLE CRYSTALS	MACLES	AGGREGATES	FRAGMENTS					
Premier 538 m	Brown	5	1	tr	tr	70	12	3	8	21	4	91	71	
	Grey	12	1	tr	1	63	9	5	8	38	8	91	59	
	Black	10	3	1	tr	61	12	6	8	36	7	91	54	
Letseng-le-terai	K6	8	2	0	0	52	13	1	23	27	5	80	59	-21+13
		7	0	0	0	73	10	0	10	27	2	92	63	
	Remainder	2	4	0	0	80	8	0	6	26	4	94	50	-6+5
		2	1	0	0	66	14	0	17	16	4	87	64	-21+13
		2	0	0	0	72	12	0	14	12	4	86	64	
		2	2	0	0	74	6	0	16	12	0	88	68	-6+5
	Satellite	1	0	0	1	75	5	2	16	8	7	85	70	-21+13
		0	1	0	0	80	8	0	11	5	5	89	76	
		0	0	0	81	2	0	16	8	2	86	74	-6+5	
Orapa, Trenches ‡35 m	8	3	2	2	45	7	34	2	44	17	98	42		
	8	3	2	3	38	7	40	1	44	15	100	45		
Letlhakane, DK/1 DK/2	8	2	2	2	60	6	11	10	32	13	90	46		
	3	1	0	4	74	3	8	6	19	17	96	37		
BK/9, Magmatic, NW SE Breccia	2	tr	1	0	64	9	20	3	12	5	97	32		
	4	1	tr	0	73	4	17	1	13	6	98	34		
	10	1	1	4	58	8	16	3	28	14	97	25		

(Continued overleaf)

TABLE 14 (continued)

LOCALITY	MAIN FORMS								WITH SURFACES LISTED BELOW				SIZE NOT -11+9
	OCTAHEDRA			CUBES	TETRAHEX.*			FRAGMENTS	OCTAHEDRAL	CUBIC	TETRAHEDRAHEDROID*	BREAKAGE	
	SINGLE CRYSTALS	MACLES	AGGREGATES		SINGLE CRYSTALS	MACLES	AGGREGATES						
Dokolwayo	6	1	0	1	73	5	15	1	31	10	97	33	
	4	0	0	0	74	4	14	4	31	10	96	49	-7+5
Mir	79	14	0	0	8	0	0	0	98	12	26	59	-12+11
	88	8	0	0	4	0	0	0	100	8	40	52	
	60	16	8	0	4	8	4	0	100	0	46	68	-6+5
Murfreesboro	0	0	0	0	94	3	3	0	6	3	100	50	-13+5
Loxtondal	44	8	0	0	32	4	0	12	72	4	72	64	-19+17
	39	9	0	1	31	7	0	13	73	11	83	45	
	24	6	0	0	50	6	0	14	56	2	82	46	-6+5
Helam	10	0	0	22	52	0	3	13	21	51	86	49	-21+11
	11	0	0	22	51	tr	tr	15	23	60	84	44	
Anglo Western Tvl.	14	0	0	24	57	0	0	5	29	69	95	9	-15+11

\* Includes the dodecahedral form noted in the De Beers Mine samples (rare), Premier Mine samples (very rare in the Brown Kimberlite, approximately 5 per cent of the tetrahexahedroid data in the Grey and Black Kimberlites), at Orapa (approximately 5 per cent of the tetrahexahedroid data) and in the Letlhakane samples (5 to 10 per cent of the tetrahexahedroid data).

tr = trace

TABLE 15

THE APPROXIMATE PERCENTAGES OF CRYSTALS OF PARTICULAR SHAPES, IN SOME OF THE KIMBERLITIC SAMPLES. (The individual crystal components are considered in the case of aggregates).

LOCALITY	EUBEDRAL, EQUIDIMENSIONAL	EUBEDRAL, DISTORTED (OR BROKEN)	FLAT	ELONGATE	IRREGULAR	FRAGMENTAL	NEARLY SPHERICAL	WITH CONCAVE EDGES	PAIRED PSEUDOHEMIMORPHIC	SIZE NOT -11+9
Finsch	10	64	7	1	14	3	0	1	0	
Premier, 538 m, Brown	nd	nd	nd	nd	nd	8	0	0	0	
Grey	nd	nd	nd	nd	nd	8	tr	0	2	
Black	nd	nd	nd	nd	nd	8	te	0	1	
Letseng-le-terai, K6	2	25	8	0	42	23	0	0	0	-21+15
	4	49	1	1	35	10	0	0	0	
	10	44	0	0	40	6	0	0	0	-6+5
Remainder	10	29	7	1	36	17	0	0	0	-21+15
	5	41	4	0	36	14	0	0	0	
	16	48	2	2	16	16	0	0	0	-6+5
Satellite	2	19	4	3	56	16	0	0	0	-21+15
	6	25	4	6	48	11	0	0	0	
	6	26	4	6	42	16	0	0	0	-6+5

(Continued overleaf)

TABLE 15 (Continued)

LOCALITY	EUBEDRAL, EQUIDIMENSIONAL		EUBEDRAL, DISTORTED (OR BROKEN)		FLAT	ELONGATE	IRREGULAR	FRAGMENTAL	NEARLY SPHERICAL WITH CONCAVE EDGES	PAIRED PSEUDOHEMIMORPHIC	SIZE NOT -11+9
Orapa, Trenches ± 35 m	5	56	2	1	34	2	0	2	0		
	5	63	1	2	28	1	0	1	1		
Dokolwayo	9	68	4	2	17	1	0	1	0		
	7	61	7	2	19	4	0	0	0	-7+5	
Prairie Creek	0	28	6	9	56	0	0	0	0		
Loxtondal	4	48	4	0	24	12	0	8	0	-19+17	
	1	43	1	0	40	13	0	2	0		
	0	48	2	0	30	14	0	6	0	-6+5	
Helam	nd	nd	nd	nd	nd	nd	0	6	0	-21+11	
	nd	nd	nd	nd	nd	nd	0	4	0		

TABLE 16

THE PERCENTAGE DISTRIBUTIONS OF DIAMONDS DISPLAYING UNRESTRICTED SURFACE TEXTURES, IN KIMBERLITIC SAMPLES. (Fragments are excluded from the determinations).

LOCALITY	KNOB-LIKE PROTUBERANCES	CHEMICAL POLISH	NETWORK PATTERNS	RVTS	INCLUSION CAVITIES	PITTED HEMISPHERICAL CAVITIES	COARSE FROSTING	FINE FROSTING	SCRATCH-LIKE MARKINGS	SIZE NOT	
De Beers, 595 m, Central Core	0	0	0	23	nd	0	10	4	0	-23+11	
	1	0	0	21	nd	0	9	4	1		
	tr	0	0	29	nd	0	7	3	0	-9+5	
	Peripheral	0	0	0	19	nd	0	0	0	0	-23+11
		4	0	0	43	nd	0	0	0	0	
	Breccia	2	0	0	41	nd	0	5	1	0	-9+5
0		0	0	22	nd	0	6	0	0	-23+11	
0		0	0	37	nd	0	0	4	0		
720 m, Central Core	3	0	0	32	nd	0	3	0	0	-9+5	
	3	0	0	24	nd	0	10	0	0	-23+11	
	1	0	0	23	nd	0	3	3	0		
	2	0	0	14	nd	0	11	3	0	-9+5	
	Peripheral	3	0	0	10	nd	0	3	3	0	-13+7
		0	0	0	30	nd	0	0	0	0	-13+7
785 m, Central Core	10	0	0	22	nd	0	22	0	0	-13+7	
	0	0	0	23	nd	0	0	0	0	-13+7	

(Continued overleaf)

TABLE 16 (Continued)

LOCALITY	KNOB-LIKE PROTUBERANCES	CHEMICAL POLISH	NETWORK PATTERNS	RUTS	INCLUSION CAVITIES	PITTED HEMISPHERICAL CAVITIES	COARSE FROSTING	FINE FROSTING	SCRATCH-LIKE MARKINGS	SIZE NOT -11+9
Finsch	0	0	0	35	nd	0	0	0	1	
Premier, 595 m, Brown	tr	0	0	24	nd	0	2	12	14	
Grey	3	0	0	21	nd	0	10	1	1	
Black	4	0	0	17	nd	0	1	tr	1	
Letseng-le-terai, K6	0	0	0	52	nd	0	0	3	0	-23+13
	0	0	0	49	nd	0	0	3	0	
	0	0	0	52	nd	0	0	7	0	-6+5
Remainder	0	0	0	33	nd	0	0	8	0	-21+13
	0	0	0	36	nd	0	0	2	0	
	0	0	0	32	nd	0	0	2	0	-6+5
Satellite	0	0	0	29	nd	0	0	5	0	-21+13
	0	0	0	34	nd	0	0	1	0	
	0	0	0	34	nd	0	0	0	0	-6+5
Orapa, Trenches	4	0	0	17	4	0	1	1	3	
± 35 m	2	0	0	23	15	0	0	1	0	
Lethakane, DK/1	11	0	0	19	5	0	0	0	0	
DK/2	7	0	0	15	8	0	8	0	0	
BK/9, Magmatic, NW	0	0	0	29	nd	0	1	tr	1	

(Continued overleaf)

TABLE 16 (Continued)

LOCALITY	KNOB-LIKE PROTUBERANCES	CHEMICAL POLISH	NETWORK PATTERNS	RUTS	INCLUSION CAVITIES	PITTED HEMISPHERICAL CAVITIES	COARSE FROSTING	FINE FROSTING	SCRATCH-LIKE MARKINGS	SIZE NOT
BK/9, Magmatic, SE	0	0	0	23	nd	0	3	0	0	
Breccia	0	0	0	21	nd	0	1	0	0	
Dokolwayo	0	0	0	36	8	0	2	2	0	
	0	0	0	26	8	0	0	5	0	-7+5
Mir	0	0	0	nd	nd	0	0	0	0	-12+5
Murfreesboro	0	0	0	31	16	13	0	6	0	-13+5
Loptondal	0	0	0	24	3	0	0	0	0	-19+17
	0	0	0	25	1	0	0	0	0	
	0	0	0	18	0	0	0	2	0	-6+5
Helam	tr	0	0	28	1	0	0	tr	0	-21+11
	0	0	0	22	0	0	0	tr	0	
Anglo Western Transvaal	0	0	0	9	3	0	0	0	0	-15+11

nd = not determined

TABLE 17

THE PERCENTAGES OF DIAMONDS WITH TETRAHEXAHEROID SURFACES WHICH DISPLAY PARTICULAR TETRAHEXAHEROID SURFACE TEXTURES, IN KIMBERLITIC SAMPLES.

(In most samples, more than 80 per cent of the diamonds are considered in the determinations\*)

LOCALITY		TERRACES	COARSE HILLOCKS	HILLOCKS WITH HEXAGONAL PITS	LOW-RELIEF SURFACES	TRIANGULAR PYRAMIDS	ZIGZAG TEXTURE	CLOSELY-SPACED LAMINATION LINES	WIDELY-SPACED LAMINATION LINES	CORROSION SCULPTURE	SHALLOW DEPRESSIONS	MICRODISK PATTERNS	PATTERNS OF MICRO-PITS	FINE STRIATION, EDGE ENHANCEMENT	CIRCULAR MICRO-PITS	IMBRICATE WEDGE-MARKINGS	TRANSVERSE HILLOCKS	SIZE NOT -11+9	
De Beers Mine	595 m	C.Core	25	nd	0	6	1	0	29	0	23	nd	1	0	0	0	0	0	
		Periph.	38	nd	0	8	1	0	35	0	24	nd	1	0	0	0	0	0	-13+7
		Breccia	35	nd	0	2	0	0	4	0	6	nd	0	0	0	0	0	0	-13+7
		C.Core	1	nd	0	9	0	0	15	0	88	nd	0	0	0	0	0	0	
		Periph.	7	nd	0	11	0	0	14	0	7	nd	4	0	0	0	0	0	-13+7
		Breccia	15	nd	0	0	8	0	8	0	62	nd	0	0	0	0	0	0	-13+7
785 m	C.Core	20	nd	0	12	0	0	31	0	50	nd	4	4	0	0	0	0	-13+7	
	Periph	33	nd	0	0	0	0	36	0	0	nd	0	0	0	0	0	0	-13+7	
Finsch		32	5	0	5	1	1	45	5	0	0	1	0	0	0	0	0		
Premier, 538 m,	Br.	10	5	0	9	3	1	41	0	1	6	0	0	0	0	0	tr	0	
	Grey	8	14	11	nd	2	tr	43	0	17	18	3	1	0	0	1	0		
	Bl.	9	11	17	nd	2	3	53	0	10	12	4	2	0	0	1	0		

(Continued overleaf)

TABLE 17 (continued)

LOCALITY		TERRACES	COARSE HILLOCKS	HILLOCKS WITH HEXAGONAL PITS	LOW-RELIEF SURFACES	TRIANGULAR PYRAMIDS	ZIGZAG TEXTURE	CLOSELY-SPACED LAMINATION LINES	WIDELY-SPACED LAMINATION LINES	CORROSION SCULPTURE	SHALLOW DEPRESSIONS	MICRODISK PATTERNS	PATTERNS OF MICRO-PITS	FINE STRIATION, EDGE ENHANCEMENT	CIRCULAR MICRO-PITS	IMBRICATE WEDGE-MARKINGS	TRANSVERSE HILLOCKS	SIZE NOT
Letseng-le-terai	K6	11	0	0	70	4	0	50	0	2	9	5	2	0	0	0	0	-23+13
		7	0	0	72	1	1	43	0	1	2	0	0	0	0	0	0	
		9	0	0	51	2	2	63	0	0	0	0	0	0	0	2	0	-6+5
	Remainder	11	0	0	62	3	2	40	0	3	0	6	0	0	0	0	0	-23+13
		9	0	0	51	2	0	56	0	0	5	0	0	0	0	0	0	
		2	0	0	4	10	0	56	0	2	5	0	0	0	0	0	0	-6+5
	Satellite	4	0	0	66	2	0	29	0	2	1	1	1	0	0	0	0	-21+13
	0	0	0	73	3	5	22	0	1	1	0	0	0	0	0	0		
	5	0	0	57	3	5	19	0	0	0	2	2	0	0	0	0	-6+5	
Orapa, Trenches		3	5	0	nd	1	0	5	4	0	0	0	0	0	0	0	0	
‡ 35 m		4	3	0	nd	1	0	6	8	0	1	0	0	0	0	0	0	
Lethlakane, DK/1		10	4	0	nd	9	4	9	10	0	tr	2	0	0	0	0	0	
DK/2		11	1	0	nd	11	1	7	8	8	8	3	0	0	0	0	0	
BK/9, Magmatic, NW		3	3	0	1	2	0	5	16	88	0	0	0	0	0	tr	0	
SE		1	4	0	tr	3	tr	5	16	79	0	1	0	0	0	tr	0	
Breccia		4	9	0	0	1	tr	11	6	0	0	0	0	0	0	0	0	
Dokolwayo		35	nd	0	9	8	3	18	13	0	0	1	0	10	0	0	0	
		23	nd	0	10	4	3	47	7	0	0	0	0	11	0	0	0	-7+5

(Continued overleaf)

TABLE 17 (continued)

LOCALITY	TERRACES	COARSE HILLOCKS	HILLOCKS WITH HEXAGONAL PITS	LOW-RELIEF SURFACES	TRIANGULAR PYRAMIDS	ZIGZAG TEXTURE	CLOSELY-SPACED LAMINATION LINES	WIDELY-SPACED LAMINATION LINES	CORROSION SCULPTURE	SHALLOW DEPRESSIONS	MICRODISK PATTERNS	PATTERNS OF MICRO-PITS	FINE STRIATION, EDGE ENHANCEMENT	CIRCULAR MICRO-PITS	IMBRICATE WEDGE-MARKINGS	TRANSVERSE HILLOCKS	SIZE NOT -11+9
Mir	nd	nd	0	nd	0	0	9	2	0	0	0	0	0	0	0	0	-12+5
Murfreesboro	0	6	0	91	13	0	25	13	0	3	0	0	0	0	0	0	-13+5
Loxtondal	17	6	0	12	0	0	0	0	17	nd	0	0	0	0	0	0	-19+17
	8	5	0	27	1	0	4	0	20	nd	0	0	0	0	0	0	
	2	8	0	50	0	0	27	0	27	nd	0	0	0	0	0	0	-6+5
Helam	1	8	0	3	0	0	38	0	0	4	1	0	0	0	0	0	
Anglo Western Tvl.	4	14	0	1	1	0	31	0	1	16	0	0	0	0	0	0	-15+11

\* Exceptions are some of the size classes in the De Beers Mine samples (abundant fragments) and the Loxtondal and Mir samples (abundant sharp-edged octahedra), where more than 50 per cent of the diamonds may be excluded.

nd = not determined

tr = >0 <0,5

TABLE 18

THE PERCENTAGES OF DIAMONDS WITH OCTAHEDRAL FACES WHICH  
 DISPLAY PARTICULAR OCTAHEDRAL SURFACE TEXTURES  
 IN KIMBERLITIC SAMPLES

LOCALITY		TRIANGULAR PLATES	TRIGONS	SERRATE LAMINAE	HEXAGONAL PITS (EMPTY)	HEX. PITS CONTAINING TRIGONAL PITS	POSITIVELY-ORIENTED TRIGONAL PITS	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
De Beers,	m, Central Core	28	98	3	20	13	0		40
	Peripheral	50	100	4	4	4	0	-13+7	27
	Breccia	22	100	0	3	3	0	-13+7	32
	m, Central Core	13	100	13	0	13	0		32
	Peripheral	10	90	40	0	10	0	-13+7	10
	Breccia	50	100	25	25	0	0	-13+7	4
	m, Central Core	16	100	16	0	16	0	-13+7	13
	Peripheral	13	100	0	0	6	0	-13+7	8
Finsch		6	100	1	0	0	0		93
Premier, 538 m,	Brown	1	100	3	7	0	0		105
	Grey	5	98	18	0	51	0		190
	Black	7	98	16	0	38	0		181
Letseng-le-terai, K6		0	100	0	52	0	0	-21+15	22
		0	100	1	22	0	0		27
		0	100	15	15	0	0	-6+5	13

(continued overleaf)

TABLE 18 (Continued)

LOCALITY	TRIANGULAR PLATES		SERRATE LAMINAE	HEXAGONAL PITS (EMPTY)	HEX. PITS CONTAINING TRIGONAL PITS	POSITIVELY-ORIENTED TRIGONAL PITS	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
	TRIANGLES	TRIGONS						
Letseng-le-terai, Remainder   Satellite	0	100	0	28	0	0	-21+15	24
	0	83	17	17	0	0		6
	0	100	17	33	0	0	-6+5	6
	0	100	0	72	0	0	-21+15	9
	0	100	20	100	0	0		5
	0	100	0	75	0	0	-6+5	4
Orapa, Trenches ± 35 m	6	100	8	1	0	0		87
	7	100	10	1	0	0		88
Letlhakane, DK/1 DK/2	11	100	35	0	0	0		96
	2	100	21	1	0	0		37
BK/9, Magmatic, NW SE Breccia	0	100	8	3	0	0		36
	0	100	3	0	0	0		39
	0	100	8	4	0	0		24
Dokolwayo	0	100	0	0	3	0		62
	0	100	0	0	3	0	-7+5	31
Mir	34	96	0	0	0	0	-12+5	99

(continued overleaf)

TABLE 18 (Continued)

LOCALITY	TRIANGULAR PLATES	TRIGONS	SERRATE LAMINAE	HEXAGONAL PITS (EMPTY)	HEX. PITS CONTAINING TRIGONAL PITS	POSITIVELY-ORIENTED TRIGONAL PITS	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Murfreesboro	0	100	0	100	0	0	-13+5	2
Loxtondal	0	100	0	0	0	0	-19+17	18
	15	92	3	3	0	0		73
	0	96	14	0	0	0	-6+5	28
Belam	42	82	5	0	0	0		57
Anglo Western Transvaal	28	91	3	0	0	0	-15+11	29

TABLE 19

THE PERCENTAGES OF DIAMONDS WITH CUBIC SURFACES WHICH DISPLAY PARTICULAR  
CUBIC SURFACE TEXTURES, IN KIMBERLITIC SAMPLES

LOCALITY	TETRAONS	CRESCENTIC STEPS	POINTED PLATES	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
De Beers, 595 m, Central Core	100	100	0		2
Peripheral	100	0	0	-13+7	1
Breccia	100	50	0	-13+7	2
720 m, Central Core	100	0	0		1
Peripheral	100	0	0	-13+7	1
Breccia	-	-	-	-13+7	0
795 m, Central Core	50	50	0	-13+7	2
Peripheral	-	-	-	-13+7	0
Finsch	93	21	0		24
Premier, 538 m, Brown	100	18	0		19
Grey	100	34	0		39
Black	100	15	0		36
Letseng-le-terai, K6	100	0	0	-21+15	4
	100	0	0		2
	100	0	0	-6+5	2

(Continued overleaf)

TABLE 19 (Continued)

LOCALITY	TETRAONS	CRESCENTIC STEPS	POINTED PLATES	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Letseng-le-terai, Remainder	83	0	0	-21+15	6
	100	0	0		2
	-	-	-	-6+5	0
Satellite	100	0	0	-21+15	8
	100	0	0		5
	100	0	0	-6+5	1
Orapa, Trenches	100	24	0		34
± 35 m	100	63	0		30
Lethakane, DK/1	100	41	0		39
DK/2	100	64	0		50
BK/9, Magmatic, NW	100	0	0		15
SE	100	0	0		18
Breccia	100	0	0		11
Dokolwayo	100	40	0		20
	100	10	0	-7+5	10
Mir	100	0	0	-12+5	8
Murfreesboro	100	0	0	-13+5	1

(Continued overleaf)

TABLE 19 (Continued)

LOCALITY	TETRAGONS	CRESCENTIC STEPS	POINTED PLATES	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Loxtondal	100	23	0	-19+5	13
Helam	98	56	3		147
Anglo Western Transvaal	100	59	3	-15+11	69

TABLE 20

THE MAIN CHARACTERISTICS OF A SAMPLE OF DIAMONDS RECOVERED FROM  
 METAMORPHOSED GREY KIMBERLITE AT THE UPPER CONTACT WITH A  
 GABBRO SILL AT THE 370 m LEVEL OF THE PREMIER MINE

% MAIN FORMS				% WITH SURFACES LISTED BELOW				% WITH SURFACE TEXTURES LISTED BELOW				DIAMOND SIZE	NO. OF DIAMONDS EXAMINED
OCTAHEDRA	CUBES	TETRAHEDRAHEDROIDA	FRAGMENTS	OCTAHEDRAL	CUBIC	TETRAHEDRAHEDROID	BREAKAGE	CORROSION SCULPTURE	SHALLOW DEPRESSIONS	KNOB-LIKE ASPERITIES	COARSE FROSTING		
17	0	65	18	30	4	76	76	11	9	8	3	-12+3	105

TABLE 21

PERCENTAGE DISTRIBUTIONS OF DIAMOND COLOURS  
IN SAMPLES FROM PLACER DEPOSITS

LOCALITY	BODY COLOUR					SURFACE STAIN		SIZE NOT -11+9
	COLOURLESS	YELLOW	LIGHT BROWN	BROWN	OTHER	GREEN	BROWN	
Lichtenburg	70	18	9	0	2	5	0	-21+17
	62	12	4	21	1	3	0	
	74	8	10	8	0	0	0	-7+5
Boskuil	79	12	3	3	3	0	0	-19+17
	73	10	7	10	1	3	0	
Hlane	58	1	14	26	1	7	0	-7+5
C.D.M., C Beach	70	24	4	2	0	2	0	+21
	78	10	3	9	0	tr	0	
F Beach	68	26	2	4	0	0	0	+21
	66	15	6	12	1	tr	0	
State Diggings	70	16	9	7	0	26	2	
Dreyers Pan	63	12	16	9	0	10	tr	
Annexe Kleinzee	67	13	11	9	0	11	tr	
Koningnaas	Uplifted terrace	60	9	12	20	0	0	
	R.-emerged terrace	63	20	8	10	0	0	

(Continued overleaf)

TABLE 21 (continued)

LOCALITY	BODY COLOUR					SURFACE STAIN		SIZE NOT -11+9
	COLOURLESS	YELLOW	LIGHT BROWN	BROWN	OTHER	GREEN	BROWN	
De Punt	51	17	20	12	0	9	3	
Daberas	64	24	4	7	0	4	0	-13+7
Buffelsbank	62	13	15	9	1	22	tr	
Langhoogte	67	14	10	9	0	15	1	
Quaggaskop	39	26	13	22	0	4	17	-13+7
Wits Banket	70	30	0	0	0	100	80	-13+7
Wellington	41	49	4	4	0	1	2	-15+9
Airly Mountain	44	33	11	11	0	0	33	-13+9

TABLE 22

PERCENTAGE DISTRIBUTIONS OF MAIN CRYSTAL FORMS AND OF DIAMONDS  
EXHIBITING PARTICULAR SURFACES, IN SAMPLES FROM PLACER DEPOSITS

LOCALITY	MAIN FORMS								SURFACES LISTED BELOW				SIZE NOT -11+9
	OCTAHEDRA				TETRAHEDR.*				OCTAHEDRAL	CUBIC	TETRAHEDRAL*	BREAKAGE	
	SINGLE CRYSTALS	MACLES	AGGREGATES	CUBES	SINGLE CRYSTALS	MACLES	AGGREGATES	FRAGMENTS					
Lichtenburg	11	0	0	4	73	7	2	4	38	31	96	42	-21+17
	8	1	1	0	72	8	2	7	22	6	93	47	
	6	1	0	1	80	10	1	1	17	6	99	11	-7+5
Boskuil	9	0	0	0	61	24	3	0	39	15	100	9	-19+17
	8	0	0	0	86	4	1	0	20	3	99	21	
Hlane	8	1	1	0	77	2	7	4	22	6	96	66	-7+5
C.D.M., C Beach	30	2	0	0	64	0	0	4	60	20	96	32	+21
	5	tr	0	tr	90	4	0	0	20	7	100	5	
F Beach	38	2	0	0	40	20	0	0	82	12	100	10	+21
	5	tr	0	tr	85	8	tr	1	16	6	99	15	
State Diggings	4	1	0	0	90	5	1	0	23	3	100	7	
Dreyers Pan	4	0	0	0	92	3	tr	0	20	4	100	9	

(Continued overleaf)

TABLE 22 (Continued)

LOCALITY	MAIN FORMS								WITH SURFACES LISTED BELOW				SIZE NOT -11+9	
	OCTAHEDRA				TETRAHEDR.*				OCTAHEDRAL	CUBIC	TETRAHEDROID*	BREAKAGE		
	SINGLE CRYSTALS	MACLES	AGGREGATES	CUBES	SINGLE CRYSTALS	MACLES	AGGREGATES	FRAGMENTS						
Annexe Kleinzee	5	0	0	tr	91	4	0	0	24	4	100	5		
Koringnaas	Uplifted terr.	11	2	9	2	73	12	1	2	29	10	99	14	
	R.-emerged terr.	12	1	0	1	80	7	0	1	33	7	100	5	
De Punt	6	0	0	3	83	6	0	3	9	9	100	14		
Daberas	3	2	0	0	90	3	2	2	19	5	97	9	-13+7	
Buffelsbank	5	0	0	1	89	5	1	0	17	5	100	9		
Langhoogte	5	1	0	tr	82	11	0	0	25	6	99	4		
Quaggaskop	4	9	4	0	74	9	0	0	30	9	96	13	-13+7	
Wits Banket	10	0	0	0	90	0	0	0	10 <sup>x30</sup>	0	90 <sup>x15</sup>	0	-13+7	
Wellington	0	1	0	1	87	11	0	0	11	2	97	25	-15+9	
Airly Mountain	0	0	0	0	89	11	0	0	11	0	100	11	-13+9	
Urals	3	0	0	0	97	0	0	0	12	0	100	10	-15+11	

\* Includes the dodecahedral form noted only as very rare examples in some Namaqualand deposits.

TABLE 23 .

THE APPROXIMATE PERCENTAGES OF CRYSTALS OF PARTICULAR  
SHAPES, IN SAMPLES FROM PLACER DEPOSITS

LOCALITY	EUHEDRAL, EQUIDIMENSIONAL	EUHEDRAL, DISTORTED (OR BROKEN)	FLAT	ELONGATE	IRREGULAR	FRAGMENTAL	NEARLY SPHERICAL	WITH CONCAVE EDGES	PAIRED PSEUDOHEMIMORPHIC	SIZE NOT -11+9
Lichtenburg	11	50	0	0	35	4	0	5	0	-21+17
	11	56	3	2	21	7	0	2	0	
	44	35	0	0	20	1	0	2	0	-7+5
Boskuil	6	52	6	0	26	0	0	0	0	-19+17
	16	69	6	2	7	0	0	2	0	
Hlane	7	56	14	1	18	4	0	1	0	-7+5
C.D.M., C Beach	40	34	8	0	14	4	0	6	0	+21
	44	33	7	10	6	0	0	1	0	
F Beach	42	24	22	0	12	0	0	0	0	+21
	38	19	26	12	4	1	tr	tr	0	
State Diggings	23	63	8	4	2	0	tr	1	0	
Dreyers Pan	26	65	3	4	2	0	0	0	0	



TABLE 24

PERCENTAGE DISTRIBUTIONS OF DIAMONDS DISPLAYING UNRESTRICTED SURFACE TEXTURES, IN SAMPLES FROM PLACER DEPOSITS. (AT LEAST 95 PER CENT OF THE DIAMONDS IN THE SAMPLE ARE CONSIDERED IN ALL OF THE DETERMINATIONS)

LOCALITY	Knob-like protuberances	Chemical polish	Network patterns	Ruts	Inclusion cavities	Pitted hemispherical cavities	Coarse frosting	Fine frosting	Scratch-like markings	Size not -11+9
Lichtenburg	0	0	0	29	7	0	0	7	7	-21+17
	0	0	0	21	6	0	tr	5	3	
	0	0	0	12	2	0	4	8	0	-7+5
Boskuil	0	6	3	3	6	0	0	12	12	-19+17
	0	2	1	10	3	0	2	16	7	
Hlane	0	0	0	27	4	0	0	5	0	-7+5
CDM, C Beach	0	0	7	10	4	0	0	6	14	+21
	0	2	5	8	5	0	3	12	8	
F Beach	0	0	2	0	0	0	0	2	10	+21
	0	1	5	10	4	0	3	10	6	
State Diggings	0	5	2	9	3	0	2	9	8	
Dreyers Pan	0	4	3	5	1	0	13	13	8	

(Continued overleaf)

TABLE 24 (Continued)

LOCALITY		KNOE-LIKE PROTUBERANCES	CHEMICAL POLISH	NETWORK PATTERNS	RUTS	INCLUSION CAVITIES	PITTED HEMISPHERICAL CAVITIES	COARSE FROSTING	FINE FROSTING	SCRATCH-LIKE MARKINGS	SIZE NOT -11+9
	Annexe Kleinzee	0	3	4	6	3	0	16	14	8	
Koningmaas	Uplifted terrace	1	3	2	11	1	0	0	18	8	
	R.-emerged terrace	0	5	1	8	2	0	0	15	6	
	De Punt	0	9	6	9	0	0	0	9	0	
	Daberas	0	3	3	8	1	0	5	10	3	-13+7
	Buffelsbank	0	3	10	11	4	0	3	23	4	
	Langhoogte	0	6	12	8	6	0	3	13	9	
	Quaggaskop	0	0	4	13	15	0	0	0	0	-13+7
	Wits Banket	0	10	10	10	20	10	0	0	0	-13+7
	Wellington	0	1	1	31	2	54	1	6	8	-15+9
	Airly Mountain	0	11	11	0	11	0	0	0	0	-13+9
	Urals	0	4	5	0	0	0	0	4	0	-15+11

TABLE 25

THE PERCENTAGES OF CRYSTALS WITH TETRAHEXAHEDROID SURFACES WHICH DISPLAY PARTICULAR TETRAHEXAHEDROID SURFACE TEXTURES, IN SAMPLES FROM PLACER DEPOSITS

LOCALITY	TERRACES	COARSE HILLOCKS	HILLOCKS WITH HEXAGONAL PITS	LOW-RELIEF SURFACES	TRIANGULAR PYRAMIDS	ZIGZAG TEXTURE	CLOSELY-SPACED LAMINATION LINES	WIDELY-SPACED LAMINATION LINES	CORROSION SCULPTURE	SHALLOW DEPRESSIONS	MICRODISK PATTERNS	PATTERNS OF MICRO-PITS	FINE STRIATION, EDGE ENHANCEMENT	CIRCULAR MICRO-PITS	IMBRICATE WEDGE-, ARKINGS	TRANSVERSE HILLOCKS	SIZE NOT
Lichtenburg	34	8	0	19	2	2	15	0	2	6	4	2	0	0	2	2	-21+17
	29	3	0	12	3	4	27	0	1	2	4	2	0	0	tr	1	
	24	2	0	12	0	2	24	0	2	2	4	0	0	0	0	2	-7+5
Boskuil	39	9	0	0	3	9	6	0	0	3	0	0	0	0	0	0	-19+17
	41	4	0	13	3	5	18	1	2	6	6	1	0	0	0	0	
Hlane	16	0	0	15	5	1	26	9	0	0	0	0	4	0	0	0	-7+5
C.D.M., C Beach	42	6	0	2	0	2	2	0	0	2	0	0	0	0	0	0	+21
	36	8	0	12	2	8	26	0	2	4	8	2	0	0	tr	0	
F Beach	60	2	0	6	0	0	6	0	0	4	2	0	0	0	0	0	+21
	35	7	tr	10	2	5	34	0	1	5	8	4	0	0	0	tr	
State Diggings	33	4	0	15	2	7	20	2	1	2	1	tr	0	0	0	0	
Dreyers Pan	32	4	0	17	tr	2	24	1	2	1	1	0	0	0	0	2	

(Continued overleaf)



TABLE 26

THE PERCENTAGES OF DIAMONDS WITH OCTAHEDRAL CRYSTAL  
 FACES WHICH DISPLAY PARTICULAR OCTAHEDRAL SURFACE  
 TEXTURES, IN SAMPLES FROM PLACER DEPOSITS

LOCALITY	TRIANGULAR PLATES	TRIGONS	SERRATE LAMINAE	HEXAGONAL PITS (EMPTY)	HEX. PITS CONTAINING TRIGONAL PITS	POSITIVELY-ORIENTED TRIGONAL PITS	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Lichtenburg	4	100	0	0	0	0	-21+17	24
	3	100	3	2	0	2		65
	6	100	0	0	0	0	-7+5	17
Boskuil	8	100	8	0	0	0	-19+17	13
	4	100	0	0	0	0		27
Hlane	0	100	0	0	5	0	-7+5	22
C.D.M., C Beach	3	100	0	0	6	0	+21	30
	1	100	0	0	6	0		60
F Beach	10	100	0	0	8	0	+21	39
	2	100	7	0	7	0		45
State Diggings	3	100	0	1	1	1		69
Dreyers Pan	1	100	0	0	0	1		59

(Continued overleaf)

TABLE 26 (Continued)

LOCALITY		TRIANGULAR PLATES	TRIGONS	SERRATE LAMINAE	HEXAGONAL PITS (EMPTY)	HEX. PITS CONTAINING TRIGONAL PITS	POSITIVELY-ORIENTED TRIGONAL PITS	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Annexe Kleinzee		3	100	0	0	0	3		71
Koiningnaas	Uplifted terr.	5	100	4	2	0	4		58
	Rec.-emerged terr.	6	100	0	0	0	3		65
De Punt		0	100	0	0	0	0		3
Daberas		0	100	0	11	0	0	-13+7	9
Buffelsbank		6	100	0	0	2	0		50
Langhoogte		4	100	4	2	2	0		75
Quaggaskop		0	100	0	56	0	0	-13+7	8
Wits Banket		0	100	0	33	0	0	-13+7	1
Wellington		0	33	0	44	0	56	-15+9	9
Airly Mountain		0	100	0	100	0	0	-13+9	1
Urals		0	100	0	13	0	0	-15+11	8

TABLE 27

THE PERCENTAGES OF DIAMONDS WITH CUBIC SURFACES WHICH  
 DISPLAY PARTICULAR CUBIC SURFACE TEXTURES, IN  
 SAMPLES FROM PLACER DEPOSITS

LOCALITY	TETRAGONS	CRESCENTIC STEPS	POINTED PLATES	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED
Lichtenburg	100	43	0	-21+17	21
	100	16	0		19
	100	0	0	-7+5	6
Boskuil	100	40	0	-19+17	5
	100	25	0		4
Hlane	100	0	0	-7+5	6
C.D.M., C Beach	100	50	0	+21	8
	100	19	0		21
F Beach	100	0	0	+21	6
	100	6	0		18
State Diggings	100	11	0		9
Dreyers Pan	100	0	0		12

(Continued overleaf)

TABLE 27 (Continued)

LOCALITY	TETRAGONS	CRESCENTIC STEPS	POINTED PLATES	SIZE NOT -11+9	NO. OF DIAMONDS CONSIDERED	
Annexe Kleinzee	100	9	0		12	
Koiingnaas	Uplifted terr.	100	19	0		21
	R.-emerged terr.	100	38	0		13
De Punt	100	0	0		3	
Daberas	100	0	0	-13+7	6	
Buffelsbank	100	44	0		16	
Langhoogte	100	8	0		17	
Quaggaskop	100	0	0	-13+7	3	
Wits Banket	-	-	-	-13+7	0	
Wellington	100	0	0	-15+9	1	
Airly Mountain	-	-	-	-13+9	0	
Urals	-	-	-	-15+11	0	

TABLE 28

THE PERCENTAGES OF DIAMONDS ABRADED TO PARTICULAR DEGREES  
 (THOSE EXCLUDED FROM SOME DETERMINATIONS ARE ALSO GIVEN)  
 AND THE PERCENTAGES DISPLAYING PERCUSSION MARKINGS

LOCALITY	UNABRADED	SHARP POINTS ABRADED	POINTS AND SHARP EDGES ABRADED	"A" EDGES ABRADED	"C" EDGES ABRADED	DISTINCTLY ROUNDED	EXCLUDED FROM CONSIDERATION	LARGE PERCUSSION CRACKS	SMALL PERCUSSION FIGURES	SIZE NOT -11+9
Lichtenburg	27	38	35	0	0	0	11	2	0	+21+17
	40	42	16	1	1	0	8	0	tr	
	80	19	1	0	0	0	2	0	0	-7+5
Boskuil	21	48	28	3	0	0	14	0	0	-19+17
	46	41	10	3	0	0	8	2	2	
Hlane	100	0	0	0	0	0	0	0	0	-7+5
C.D.M. "C Beach"	2	33	45	17	2	0	16	46	36	+21
	31	56	6	5	2	0	12	27	11	
"F Beach"	0	53	30	9	6	2	6	66	22	+21
	48	35	7	7	4	tr	10	37	13	
State Diggings	16	17	21	36	10	0	10	19	43	
Dreyers Pan	tr	7	17	49	27	tr	17	43	42	
Annexe Kleinzee	tr	9	15	45	28	2	15	45	50	

(Continued overleaf)

TABLE 28 (Continued)

LOCALITY		UNABRADED	SHARP POINTS ABRADED	POINTS AND SHARP EDGES ABRADED	"A" EDGES ABRADED	"C" EDGES ABRADED	DISTINCTLY ROUNDED	EXCLUDED FROM CONSIDERATION	LARGE PERCUSSION CRACKS	SMALL PERCUSSION FIGURES	SIZE NOT -11+9
Koringnaas	Upl. terrace	5	7	17	32	33	6	7	13	43	
	Rec. emerged terrace	4	8	17	37	29	5	4	36	39	
De Punt		66	3	11	17	3	0	0	11	17	
Daberas		73	11	11	3	2	0	3	8	5	-13+7
Buffelsbank		30	21	20	21	10	0	11	7	31	
Langhoogte		12	23	22	34	8	1	15	12	24	
Quaggaskop		57	13	4	9	17	0	0	0	13	-13+7
Witwatersrand Banket		56	44	0	0	0	0	0	11	0	-13+7
Wellington		85	6	7	1	0	0	0	0	2	-15+9
Airly Mountain		22	44	22	11	0	0	0	11	11	-13+7
Urals		74	22	4	0	0	0	0	0	4	-15+11

TABLE 29

THE PERCENTAGES OF LIGHT BROWN TO BROWN AND OTHER DIAMONDS DISPLAYING  
BREAKAGE SURFACES AND DISPLAYING LAMINATION LINES, IN SOME SAMPLES. THE  
DATA ARE FOR MINUS 11 PLUS 9 DIAMONDS, UNLESS OTHERWISE INDICATED

LOCALITY	DIAMOND COLOUR	BROKEN DIAMONDS	DIAMONDS DISPLAYING LAMINATION LINES ON TETRAHED. SURFACES	
Finsch	browns	54	71	
	others	41	18	
Premier, 538 m, Brown Kimberlite	browns	61	57	
	others	75	35	
	Grey Kimberlite	browns	47	51
		others	78	31
	Black Kimberlite	browns	46	62
		others	63	40
Orapa	browns	32	13	
	others	50	11	
Dokolwayo	browns	45	49	
	others	29	27	
	-7+5	browns	50	84
	-7+5	others	48	35
Helam	browns	41	84	
	others	45	18	
State	browns	8	56	
	others	7	15	
Buffelsbank	browns	19	85	
	others	6	11	