

result of which they assume pear-shaped habits, the apex being in the vicinity of the larger inclusion of the mineral E. Crystals of galena completely enveloped by chalcopyrite were rarely observed to hold more than one pellet of E exceeding 12μ in diameter. On the other hand, isolated rounded or oval grains of the mineral E varying in diameter from 20μ to 50μ are almost invariably unassociated with galena pellets, and occur either singly or in discontinuous linear aggregates in chalcopyrite and cubanite. In some instances such pellets were observed to be partially rimmed by "frills" of blende, or appear to obstruct locally the replacement of chalcopyrite by vallerite. It is doubtful whether the mineral E preceded or succeeded galena in the paragenetic sequence, while both of them appear to be earlier than blende, chalcopyrite or vallerite.

Mineral F (Niggliite). To the unaided eye small grains of the mineral F appear to be silvery white in colour. It is brittle, and apparently devoid of any cleavage, breaking with a conchoidal fracture. The mineral F appears to be non-magnetic, while its density exceeds that of chalcopyrite. At low red heat it fuses to a yellowish tinted metallic globule. It is soft, being easily scratched by a needle, whilst under the microscope its hardness was found to be greater than that of galena, but less than that of tetrahedrite. The mineral polishes readily, yielding perfectly smooth surfaces free from scratches, and resistant to tarnish. For etch reaction, see Table 4 (p. 180). It is characterised by a very high reflectivity (± 60 per cent.), intense pleochroism (pale blue to bright cream, the difference in reflectivity being ∓ 20 per cent) and intense anisotropism, the colour variation ranging from very bright pinkish-cream to very dark blue or black when the vibration planes of the nicols are at right angles. If the analyser is rotated through an angle of about 10° , the colour variation of the mineral in polished section varies from a bright pinkish-cream to cobalt blue. Anisotropism affords a means of recognising irregular grains, and it was found to be an advantage under such circumstances to increase the angle of rotation of the analyser to about 20° from the crossed position. This method of identification was employed to separate a few milligrams of the mineral F from concentrates of the chalcopyrite-cubanite ore which had previously been crushed (to pass the 0.5 mm. mesh) and washed, the removal of the magnetic fraction being effected by means of an electromagnet. A single homogeneous grain dissolved in aqua regia left a yellowish residue on evaporation of the acid. Subsequent tests yielded positive reactions for platinum and tellurium only. A single grain, a fraction of a milligram in weight, assayed by E. Beyers was found to contain 34.8 per cent. of pure metallic platinum. Since platinum and tellurium appear to be the only elements present, the composition of the mineral should correspond to $PtTe_3$. Owing to the limited amount of material available, the formula assigned must be regarded as tentative. A few

milligrams of the mineral F obtained by sorting the concentrate already referred to was forwarded to Professor P. Niggli, to whom the writer is indebted for the following X-ray data:—

“Hier war lediglich die Herstellung einer Pulveraufnahme möglich. Die beobachteten Interferenzen sind die folgenden:—

Intensitäten.	Ablenkungswinkel θ . mit Cu K α Strahlung.	Netzebenenperioden d.
m	12° 33'	3.54 x
s	13° 27'	3.30
s	14° 45'	3.02
ms	15° 05'	2.95
ms	15° 49'	2.82
s?	19° 18'	2.33
s?	19° 48'	2.27
st	20° 59'	2.14
st	22° 03'	2.07 (5)
ms	25° 45'	1.769 xx
ms	27° 12'	1.682
s	28° 03'	1.63 (5)
s	28° 36'	1.606
st	31° 14'	1.482
s	32° 39'	1.425
s	33° 03'	1.410
ms	34° 33'	1.355
ms	35° 00'	1.340
s	35° 30'	1.324
m	36° 12'	1.301 (5)
m	37° 24'	1.266
st	39° 45'	1.202
m	40° 30'	1.184 xxx
ms	42° 48'	1.131
ss	45° 00'	1.087
ms	45° 27'	1.078
s	47° 45'	1.038
m	48° 30'	1.026

mit Angabe der Intensitäten (s=schwach, m=mittel, st=stark). Ablenkungswinkel und berechneten Netzebenenperioden d. (Schwache Linien könnten eventuell von Verundreinigungen herrühren (?).”

Small grains of the mineral F were observed in the concentrates obtained by panning large quantities of the oxidised ore from the dumps at Waterfall Gorge, Insizwa. Microscopically, the mineral was observed to be moulded on silicates (Pm. 83) and sperrylite. Rounded inclusions in and mutual boundaries between F and minerals like chalcopyrite, cubanite, G, L, O, M and N are typical, the first four mentioned being most commonly associated with the mineral F (Pm. 83), whilst minute grains of it were also observed to occur in association with, as well as surrounded by (R), an unknown copper-red pleochroic and anisotropic mineral (embedded in mineral O), whose etch reactions could not be determined. Long acicular crystals, as well as more or less equidimensional six-sided euhedral grains of mineral F, were occasionally seen to be enveloped by G, while angular

salient boundaries of crystals of the former were also observed in contact with H and chalcopyrite. The new minerals F and G were first recognised towards the end of the year 1932 in the laboratory of the E.T.H., at Zurich while the present research work was in progress, when the writer benefited greatly by the valued advice and criticism of Professors P. Niggli and R. Parker. The author, therefore, proposes the name "Niggliite" for the former (F), and "Parkerite" for the latter (G).

Mineral G (Parkerite) appears to be a new nickel sulphide. The partial quantitative analysis of a few milligrams of material by W. E. Schilz suggests that its formula corresponds either to Ni_2S_3 or NiS_2 ; the former symbol seems to be the more likely one. Microchemical tests prior to analysis indicated the presence of nickel and sulphur only, while the spectroscope revealed traces of iron in addition to nickel. Of the standard etch reagents, only KCN and KOH gave negative results. Etched surfaces of polished sections sometimes revealed the presence of minute irregular areas, which remained unstained. The true nature of these could not be investigated owing to the limited amount of material on hand. It is noteworthy that the mineral dissolves readily with effervescence in 50 per cent. HNO_3 .

Fragments of the mineral may easily be recognised under the microscope owing to the fact that it cleaves in three directions yielding rhomboidal plates which closely resemble cleavage fragments of calcite. The lustre of the flakes is analogous to that of molybdenite, and like the latter, the mineral G is soft enough to mark paper. Under the microscope, the hardness of the mineral, which was determined by means of an improvised micro-sclerometer, appeared to be slightly less than that of galena.

Polished surfaces of the mineral G are perfectly smooth, the reflectivity is approximately 45 per cent., whilst the colour is creamy white with a faint mauvish tint. It is strongly anisotropic, and is almost invariably characterised by multiple lamella twinning (Pms. 89 and 90). The pleochroism is sufficiently distinct to enable recognition of the presence of the twin lamellae—a phenomenon which is enhanced by the use of oil immersion lenses. The study of polished sections leads one to conclude that the mineral G cleaves most readily in one of the three above-mentioned directions. In twinned crystals, the trace of this cleavage makes an angle of about 50° with the composition face. As a result of the twinning, a continuous cleavage trace suffers displacement at the junction of alternate lamellae.

This direction of cleavage appears to be the only one visible in polished sections, and when present the zig-zag trace (Pm. 84) is sufficiently characteristic to permit the recognition of the mineral parkerite. It is noteworthy that $FeCl_3$ is a useful etch reagent for bringing out the twin lamellae and cleavages.