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A NEW LOOK AT PRAIRIE CREEK, ARKANSAS

*B.H. SCOTT SMITH** and E.M.W. SKINNER
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Previous studies of the Prairie Creek occurrence have identified three main rock types namely; "volcanic breccias", "tuffs and fine-grained breccias" and hypabyssal kimberlite or peridotite. We take a new look at these rocks in the light of a suggestion by R.H. Mitchell (pers. comm.) that the body is not a true kimberlite but rather a lamproite.

Our investigation confirms the presence of three distinct rock groups which include both hypabyssal and crater-facies types. The so-called "volcanic breccia" and "tuffs" are both considered to be predominantly of pyroclastic origin. The "volcanic breccias" are subdivided into two sub-groups. One, composed of igneous lapilli set in a serpentinous base, is interpreted as a primary tuff. The other is thought to be a reworked tuff. The latter group is similar in many respects to the so-called "tuffs". These contain abundant comminuted and xenolithic material in addition to igneous lapilli. Certain features of these rocks are atypical of kimberlites.

The hypabyssal rocks contain two generations of relatively abundant olivine (Fo_{88-93}) in a fine-grained matrix composed of phlogopite, clinopyroxene, amphibole, perovskite, spinel and serpentine. Some phlogopite and serpentine crystallised from a glass. Although many petrographic features of these rocks are similar to those of kimberlites, the form of the euhedral olivine, presence of abundant glass and occurrence of potassic richterite are uncharacteristic of kimberlite but typical of lamproitic rocks. Both the groundmass phlogopite (4-5 wt.% TiO_2) and the bulk rock have compositions intermediate between lamproite and kimberlite.

It is concluded that the Prairie Creek intrusion is transitional between kimberlite and lamproite.

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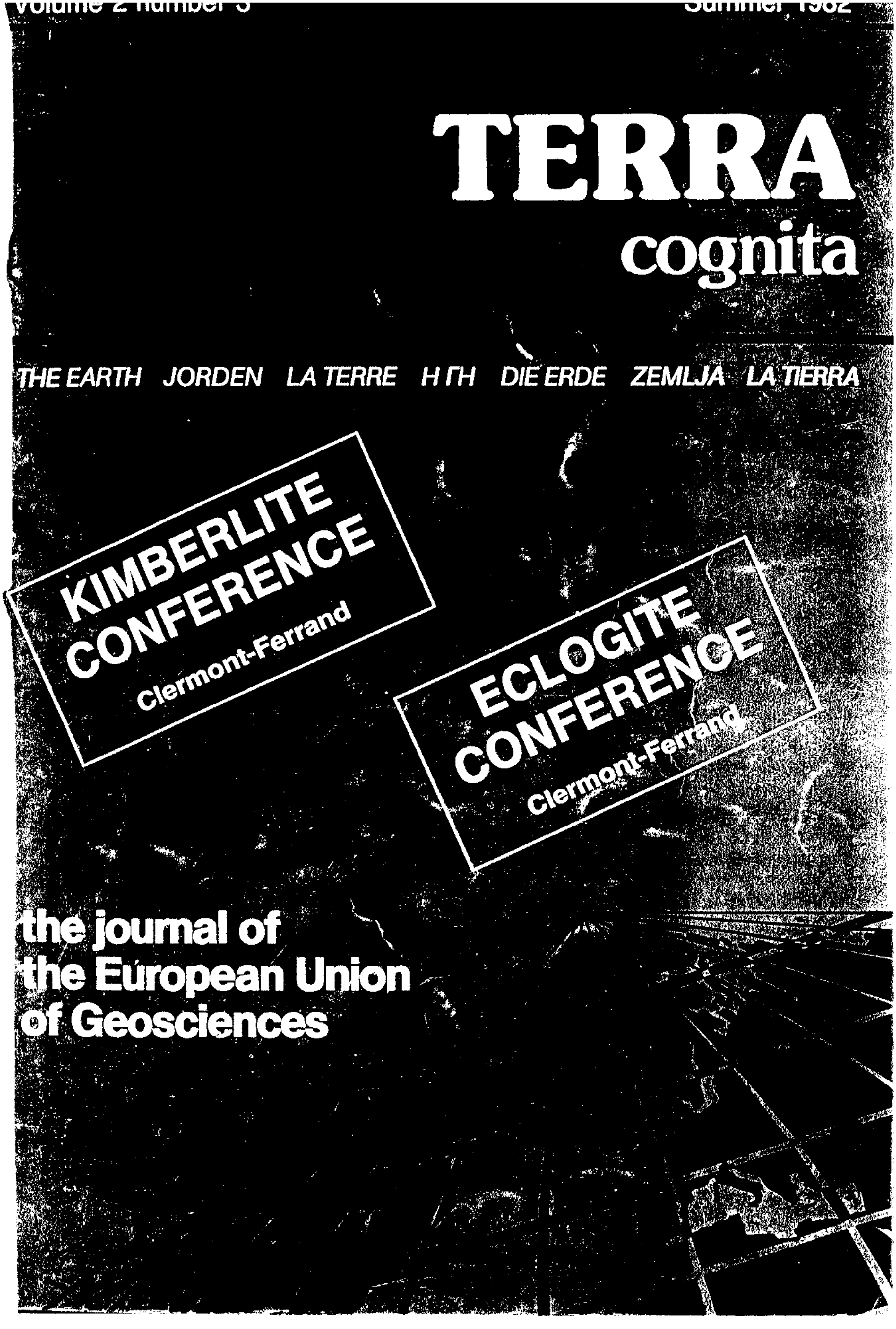

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post-fluidization crystallization, under stagnant conditions, are described. The formation of segregationary and uniform textures by post-fluidization crystallization of vapour condensates are also considered.

Some attention is paid to the effects of fluidization (and contemporaneous contamination of residual fluids during fluidization) on the mineralogy of diatreme-facies kimberlites.

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POSSIBLE PRE-KIMBERLITE SERPENTINIZATION IN ULTRABASIC XENOLITHS FROM BULTFONTEIN AND JAGERSFONTEIN MINES, SOUTH AFRICA

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Textural analyses of garnet peridotites showing various degrees of deformation revealed an early generation of pre- and synkinematic serpentine that appears to predate kimberlite emplacement. In sheared nodules, serpentine fibers between recrystallized olivine and in fractured porphyroclasts and layers of orthopyroxene are consistently parallel with the planar fabric. Numerous porphyroclastic nodules have sets of serpentine-filled fractures perpendicular to the mineral elongation. In some porphyroclastic nodules random networks of serpentine-filled fractures are deformed near orthopyroxene and garnet porphyroclasts. Sections of xenolith-kimberlite contacts show that deformation-related fibrous serpentine veins may have been reopened and filled by a late generation of nonfibrous serpentine.

Time relationships between early serpentinization and K-metasomatism at Bultfontein are difficult to establish, though rare textures suggest that richterite may have overgrown olivine with serpentine-filled fractures. As some of the K-metasomatism is also synkimmatic, it is possible that the two are related. Recognition of a pre-kimberlite serpentinization overprint on anhydrous assemblages of diverse P-T conditions at Jagersfontein casts doubt on the interpretation that the two rock types were incorporated into the kimberlite at different depths. It raises the possibility that rocks originally equilibrated at different P and T became tectonically juxtaposed prior or during serpentinization preceding incorporation into the kimberlite.

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THE KOIDU KIMBERLITE COMPLEX, Sierra Leone.

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Three Kimberlite pipes, multiple dikes, and a small ring-dike complex of kimberlite occur in the Yengema-Koidu area. Dikes are both older and younger than the kimberlite pipes and a variety of textural, petrological, and mineralogical types characterize the complex. Discrete ilmenite nodules show evidence of coupled exsolution (ilm_{ss} from $geik_{ss}$) and subsolidus reduction (sp_{ss} from ilm_{ss}) associated with Cpy + Po+Pn. These ilmenites have 3-6 wt% MgO and 0.2-1.4 wt% Cr_2O_3. Redox reactions producing Mn-rich ilmenites (up to 16% MnO) and spinels (up to 1.2 wt% MnO are intimately associated with calcite. Ilmenites in Ilm-pyroxene intergrowths contain 10-12 wt% MgO and 0.8-1.5 wt% Cr_2O_3, and are associated with Jd pyroxene, sulfides, and trapped magmatic inclusions. Both diamond-bearing and non-diamond bearing eclogites are present, and metallic Fe has been identified in one eclogite. Discrete chlorite nodules (up to 5cm in size) and primary groundmass chlorite are highly oxidized (8-20 wt% Fe_2O_3, low in Al_2O_3 (9-10 wt%), and high in MgO (21-28 wt%) Phylogopites low in Cr_2O_3 (0.05 wt%), TiO_2 (0.20 wt%) and high in FeO (7-8 wt%) have reversed pleochroism, and are mantled by normal pleochroic phlogopites high in Cr_2O_3 (1.5 wt%), TiO_2 (2-3 wt%), and low in FeO (4-5 wt%). Core phlogopites are preferentially replaced by chlorite. Bulk chemistry of dike and pipe kimberlites are markedly different in the ranges of composition: the former are tightly clustered (e.g. MgO= 26-32 wt%, CaO= 3-8 wt%, Al_2O_3= 2-4 wt%) whereas the latter are heterogeneous (e.g. MgO= 16-30 wt%, CaO= 2-18 wt%, Al_2O_3= 2-9 wt%). Volatile variations (CO_2 and H_2O) suggest that the earliest kimberlite magma (i.e. autolith) was H_2O enriched, that the later kimberlite was CO_2 enriched (i.e. autolith encasement) and that the host kimberlite (i.e. youngest) was intermediate. Preliminary paleomagnetic studies record paleovector directions