TABLE 2b. Descriptions of Rocks Analyzed and Data Sources

Crater	Sample Designation	Description and Data Source
Brent	BC	Coarsest-grained phase of Brent melt. Analysis by R. Wirthlin.
	BF	Fine-grained phase of Brent melt. Mean of analyses by R. Wirthlin and *Currie and Shafiqullah* [1967].
	B952	Mixed breccia with melted matrix in central hole 1–59 of Brent crater, 952 ft below collar of hole. Analysis from *Currie and Shafiqullah* [1967].
West Clearwater Lake	WC-F	Average of 5 analyses of fine-grained, inclusion-rich melt ('coherent breccia,' from *Bostock* [1969]).
	WC-C	Analysis of fresh black glass with small inclusions, from *von Engelhardt and Dence* [1971].
	WC-B	Average of 5 analyses of mixed breccias with shocked fragments. Analyses of *Bostock* [1969] –3; *von Engelhardt and Dence* [1971] –2.
Lake Wanapitei	W	Electron microprobe analysis of fresh glass matrix from mixed breccia. Analysis by P. B. Robertson, from *Dence and Popelar* [1971].
		Sources for Other Data (in Figures 2 and 3)
Ries	301, 303	Garnet-biotite-gneiss of Maihingen and Appetshofen. Possible source rocks for Ries glasses [*von Engelhardt et al.*, 1969, Tables 10 and 11].
	T1, T2, T3	Average compositions of fresh, partially recrystallized and recrystallized Ries glasses [*von Engelhardt*, 1967, Table 6].
	T3W	Average composition of recrystallized glasses from Wörnitzostheim drill hole [*von Engelhardt*, 1967, Table 6].
	153, 155	Crystalline suevite of Amerbach [*von Engelhardt*, 1967, Table 5].
	DB1.	Altered suevite glasses, Deiningen drill hole 330–350 meters [*Förstner*, 1967, Table 4].
Henbury	H-S	Average subgreywacke [*Taylor*, 1967, Table 3].
	27	Throw-out subgreywacke [*Taylor*, 1967, Table 3].
	G	Average glass [*Taylor*, 1967, Table 1].
Carswell	CAR	Average country rock and melt [*Currie and Shafiqullah*, 1967, Table 1 (c and a)].
East Clearwater Lake	EC	Average country rock and melt [*Currie and Shafiqullah*, 1968, Table 1 (c_1 and a)].
Manicouagan	MAN	Average country rock and melt ('doreite') [*Currie and Shafiqullah*, 1968, Table 1 (c and a_1)].
Brent	B	Average country rock, [*Currie and Shafiqullah*, 1967, Table 1 ($d_1 + d_2$)].
West Clearwater Lake	WC	Average country rock, [*Bostock*, 1969, Table 1].
	WC-M	Average igneous rock ('quartz latite') [*Bostock*, 1969, Table 5].
Charlevoix	C	Average melt rock ('impactite') [*Rondot*, 1968].
Dellen	D	Igneous rock ('andesite') [*Eskola*, 1921].
Jänisjärvi	J	Igneous rock ('dacite') [*Eskola*, 1921].
Lake Mien	M	Igneous rock ('rhyolite') [*Eskola*, 1921].
New Quebec	NQ	Igneous rock [*Currie*, 1966].
Vredefort	V	Average enstatite granophyre, [*Willemse*, 1937].

Impact Model

The theory of hypervelocity impact [*Bjork*, 1961; *Gault and Heitowit*, 1963], supported by experiment [*Shoemaker et al.*, 1963], shows that for typical terrestrial impact velocities of 15–20 km/sec significant quantities of both the target materials and the projectile will be vaporized or fused. In Figure 3 a model, modified from *Gault et al.* [1968] and *Dence* [1968], for the excavation stage of such a cratering event is presented. Attenuation of the shock wave is based on an initial impact pressure of about 5 Mb and an indicated shock pressure of about 200 kb immediately below the region of deepest excavation. The theory indicates that, for a low porosity, polymineralic material such as

basalt or granite, most of the target shocked above about 2 Mb will be vaporized, and most shocked to between 0.5 and 2 Mb will be fused or partially fused. The shock-melted materials will be given particle velocities in the directions indicated by the arrows in Figure 3 and will engulf less strongly shocked and accelerated materials in the outer parts of the growing crater. The impacting body will undergo a similar sequence of shock events and will in part be mixed with the melted target materials, probably remaining concentrated in the upper parts of such a melt. A portion of the melt will be ejected as indicated, leaving the remainder as a lining of the cavity when growth ceases. The relatively thin lining will then consist of melt overlying mixed breccia, with the proportion of breccia to melt increasing toward the crater margin.

The crater at this stage has been called the *primary crater* [*Dence*, 1968] but may as aptly be termed the *transient cavity* to emphasize the interpretation that a rapid readjustment takes place to give the final crater form. The general sequence of events, as presented by *Dence* [1968], is illustrated in Figure 4. Small, simple craters are formed by slumping of the crater walls (Figure 4*a*). In this case the melted and brecciated materials lining the transient cavity are swept into the center of the crater with large amounts of weakly shocked material from the crater walls to form a lens of complexly mixed breccias. Melt and breccia at the bottom of the transient cavity are over-ridden

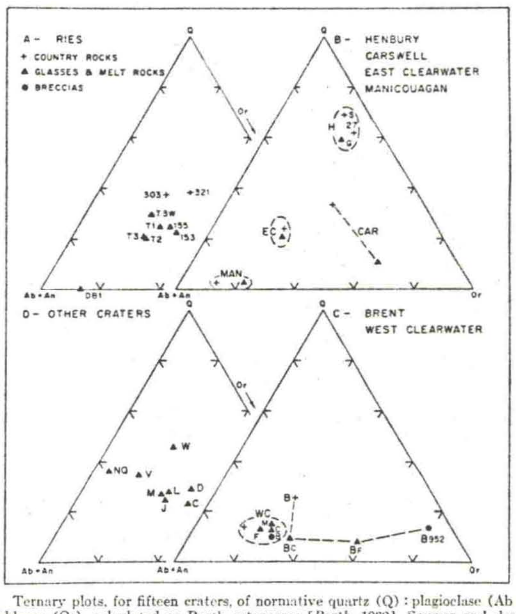

Fig. 1. Ternary plots, for fifteen craters, of normative quartz (Q) : plagioclase (Ab + An) : potash feldspar (Or), calculated as Barth catanorms [*Barth*, 1962]. Sources and descriptions of analyses given in Table 2.