intrusion, and is probably much younger than the commonly deformed and altered rocks which rim the intrusion. A large amount of talus derived from the islet was in the dredge on top of the alkali basalt fragments; evidently this talus was the last material to enter the dredge.

Table 1 gives the bulk analysis of a sample from which the nodules were extracted after coarse crushing. The basalt is perfectly fresh in hand specimen and in thin section. To remove any possible salt contamination, the sample was washed in distilled water after fine grinding. The high titania, soda and potash, and the low silica, are particularly significant in the analysis. These features, and the presence of nepheline in the norm, clearly place the basalt in the alkali olivine basalt series. Deep sea basalts may have "alkaline affinities"⁴, and may contain abundant normative and modal olivine, but rarely contain normative nepheline in the amount recorded here. The high barium (300 p.p.m.), strontium (500 p.p.m.) and zirconium (200 p.p.m.) further confirm the alkaline nature of this basalt, although the high nickel (270 p.p.m.) and chromium (250 p.p.m.) are anomalous for alkali basalts.

Table 1. COMPOSITION OF ALKALI OLIVINE BASALT*, A II-20, 43-49, DREDGED A FEW KILOMETRES NORTH-EAST OF ST. PAUL'S ROCKS

		Norm	
SiO ₂	43.15	Or	9.63
Al ₂ O ₃	13.46	Ab	9.67
Fe ₂ O ₃	4.52	An	16.34
FeO	8.22	Ne	10.67
MnO	0.11	Di	22.23
MgO	10.80	Ol	16.76
CaO	9.80	Mt	6.55
Na ₂ O	3.47	Il	5.13
K ₂ O	1.63	Ap	1.64
H ₂ O +	1.21		
H ₂ O -	0.15		98.61
TiO ₂	2.70		
P ₂ O ₅	0.75		
	99.97		

Analyst: E. Jarosewich

* The analysed basalt is extremely fine grained and contains olivine phenocrysts in a matrix of microlites of plagioclase (about An₅₀), titan-augite, olivine and light brown barkevikitic hornblende. Accessories include an iron-titanium oxide, biotite, apatite and possibly hauyne. Small amounts of clear glass and alkali feldspar also occur. Modal nepheline is not present.

The predominance of low potash tholeiitic basalt on the ocean floor and the apparent restriction of alkali basalts to the top of high volcanic edifices has been noted by Engel *et al.*⁵. In the Hawaiian Islands, alkali basalts occur mainly as late, quantitatively minor extrusives. These relationships led some petrologists⁶ to postulate, first, that alkali basalts are derived by low pressure differentiation of sub-alkaline olivine basalts of the "oceanic tholeiite" type in near surface magma chambers, and second, that "oceanic tholeiite" magma is the only basaltic magma derived from the mantle. Experimental data indicate that low pressure differentiation of tholeiitic magma should not yield normative nepheline liquids⁷, and thus argue against the first view.

The alkali basalt described here also suggests mantle derivation of alkali basalts. The basalt is clearly not part of a thick "oceanic tholeiite" pile (Fig. 1), and thus based on field occurrence alone is an unlikely low pressure differentiation of "oceanic tholeiites". It would appear that "parental" alkali basalt magma originates by some other, more deep-seated phenomena, such as partial fusion of eclogite of tholeiitic basalt composition—a process outlined by Yoder and Tilley⁷.

The St. Paul's Rocks situation clearly indicates that it is not always true that oceanic alkaline basalts occur as late eruptives in otherwise tholeiitic sequences. Thus caution should be used in tying the origin of all oceanic alkaline basalts to the situation exemplified, for example, by the Hawaiian Islands.

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WILLIAM G. MELSON
EUGENE JAROSEWICH
RICHARD CIFELLI

Smithsonian Institution,
Washington, D.C.

GEOFFREY THOMPSON

Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts.

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PHYSICS

Identification of High Gain Laser Lines in Argon

BRISBANE has reported three high gain laser lines in a pulsed discharge in argon¹.

The first line at 1.270 μ m is explained in Paschen notation as the transition $3d_5-2p_6$, which has the wavelength 12,638.480 Å (ref. 2). We believe that the observed line is the same that we have reported earlier³ as a super-radiant line with the wavelength 12,702.21 Å. It corresponds to the transition $3d'[1\frac{1}{2}]_1 \rightarrow 4p'[1\frac{1}{2}]_1$ in Racah notation ($3s'_1 \rightarrow 2p_2$ in Paschen notation) and the wavelength in spontaneous emission is 12,702.280 Å (ref. 2).

The second line at 1.793 μ m is explained as the transition $3d_5-2p_6$, which has the wavelength 17,914.726 Å (ref. 2). It could also be explained as the transition $3d_6 \rightarrow 2p_7$ with the wavelength 17,914.629 Å (ref. 2) as pointed out by Patel *et al.*⁴, who observed the line in a CW operated laser.

K. BOCKASTEN
O. ANDRADE

Lund Institute of Technology,
Lund.

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Validity of the Debye Scattering Equation in Elastic Electron Diffraction

THE methods of Debye¹ are accepted in the scattering of electrons by gases, but despite the application to thin films by Germer and White² their use in kinematic electron diffraction from polycrystalline solids has seemed suspect and none of the recent texts on electron diffraction mention the methods. Possibly this is because of a pre-occupation with dynamical theory. Many real specimens, however, diffract kinematically and the Debye "gas" equation, if valid for closely packed small crystals, would enable the detailed intensity profile for polycrystalline films to be computed. The objection to the Debye theory is that it neglects interference between atoms situated in different crystals; while this is permissible for a gas of large molecules, it requires justification if the molecules (or small crystals) are densely packed.