

CORRESPONDENCE

Note on the stratigraphic position of igneous rocks of the Larne Borehole, County Antrim

SIR, – In the *Bulletin of the Geological Survey of Great Britain* No 50, 1975, a paper by P. I. Manning, H. E. Wilson and others has been published dealing with the stratigraphy of rocks penetrated by the Larne Borehole. In particular the descriptions of strata in the Larne and Carnduff Halite Members have been given, in which magmatic rocks of basic composition have been mentioned at nine places in the borehole. The writers affirmed that magmatic rocks represented by dolerites and basalts were intrusions which penetrated into the Triassic salt in the Tertiary period. They also objected to my ideas on the abyssal nature of salt.

My knowledge of geology of salt-bearing basins of the world and the modern state of the problem of halogenesis permits me to call in question the assertion of P. I. Manning and H. E. Wilson on different age for the salt and magmatic rocks of the Larne basin.

As a result of the study of geology of salt-bearing basins of the Ukraine I have paid attention to the presence of volcanic rocks among halogenic formations synchronous with salt. During the revision of geologic data of other regions of the world magmatic rocks in the salt formations have been discovered in the vast majority of them (Sozansky, 1963, 1965, 1973 *a, b*).

These data and others, such as the concentration of huge masses of salt deposited during a short stretch of time, the synchrony of salt accumulation with the most active stages of geologic development of basins, sterility of salt in respect of the remains of sea organisms and so on, were the basis of my hypothesis on an abyssal source of salt taking part in the formation of halite series. I have come to conclusion that ancient salt-bearing series have been accumulated as a result of precipitation of salt from hot juvenile brines emerged from the deep parts of the earth along deep faults. This conclusion is in agreement with modern ideas on the nature of the world ocean according to which the water and salinity composition of the ocean are the product of the degasification of the entrails of the earth (Rubey, 1951; Vinogradov, 1962).

I assume that juvenile brines enter not only through the bottom of the ocean and salinize its water but are carried out directly into the basin of salt accumulation during the manifestation of orogenic movements along deep faults. This process was accompanied very often by volcanic eruptions. However, I do not consider the salt as derivative product from basalts, diorites or diabases. Their joint occurrence indicates only that salt and volcanic rocks are abyssal substances which entered basins of salt accumulation along the same ways – deep faults.

For the control of the suggested theory on endogenous origin of ancient salt rocks the data on geology of the Larne basin are of exceptional importance. The English geologists hold the opinion that salt and volcanic rocks of the basin have been formed at different times, i.e. the igneous rocks have been intruded into the Triassic salt during the Tertiary period.

The English geologists support their conclusions by the reasons of general geology. Thus, W. B. Evans from the Institute of Geological Sciences (Leeds) in a letter asserts that the Larne basin is situated in N.E. Ireland, which 'is the part of a Tertiary igneous province and the dolerites associated with the Triassic salt are believed to be Tertiary intrusions. The petrographic evidence seems fairly positive, though no isotope datings have been made.'

Data on absolute age of magmatic rocks occurring in the salt members of the Larne Borehole are also absent in the detailed report of P. I. Manning, H. E. Wilson and others (1975).

It seems that, in the present instance, only on the base of results of isotope dating could one draw conclusions on the time of manifestation of volcanism. Thus, the data of the absolute age of the effusives encountered among salt rocks of the Dnepr–Donetz basin and the Irkutsk amphitheatre corroborate synchrony of salt accumulation and volcanic activity in these regions.

The general geologic data do not support the assignment of the magmatic rocks of the Larne Borehole as Tertiary intrusions. As P. I. Manning, H. E. Wilson and others note, magmatic rocks of the borehole are confined solely to the halite members. If magmatic rocks have invaded the Larne basin during the Tertiary period, they would have penetrated into the rocks overlying the salt and magmatic rocks would have occurred also in the Jurassic deposits. The presence of magmatic rocks exclusively in the Halite Members Larne and

Carnduff indicate the paragenetic relation of effusives and salt; that, in my opinion is one of arguments in favour of juvenile source of salt taking part in the formation of halogenic rocks.

I consider that for the determination of the stratigraphic position of magmatic rocks encountered by the Larne Borehole the isotopic dating of these rocks must be done. I made an attempt to determinate the absolute age of dolerite of the Larne Borehole on the specimen which was kindly sent to me by Mr H. E. Wilson but the small quantity of the specimen did not permit carrying out all the necessary investigations and the problem of absolute age of magmatic rocks encountered among salt in the Larne Borehole remained unsettled.

My proposed idea on juvenile source of salt allows us to suppose that dolerites and basalts intersected in the borehole are effusives which flowed out during the Triassic and are in paragenesis with salt rocks. The isotopic datings will solve this question once and for all.

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SIR, – The South Antrim salt field lies at the edge of the Tertiary basalt plateau and the whole district is notable for the numerous minor intrusions – sills and dykes – of Tertiary age. The dykes can be seen to intersect the lavas – dated at 59 Ma – and their intensity is such that a crustal stretch of 1% can be postulated over a distance of several tens of km, while both dykes and associated sills are seen penetrating the Triassic mudstones and and later Mesozoic rocks in coastal sections.

Dykes have been seen penetrating the halite in several working mines in the district and it is not unexpected to find igneous rocks in the thick halite in the Larne Borehole. There is no indication that this rock is not of the same age as the other local intrusions, but like many of the dykes it shows some kaolinization and is not suitable for radiometric age determination.

I find Dr Sozansky's ideas interesting but cannot find any evidence to substantiate them in this district.

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