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CAMBRIDGE, U. K.

January 15th 1963.

President Nelson Glueck,
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Clifton Avenue,
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Dear Dr Glueck,

Thankyou so much for your letter and for your offer to answer questions which have been raised in connection with your work in the Arabah. I do hope that they are not too lengthy as I realise you have more than enough to occupy you.

I would not trouble you but for the fact that I am interested in the facts of your work. Rothenburg in the PEQ has produced arguments based on what he understands you to have seen. To counteract his arguments with similar arguments of my own seems a waste of time. Obviously your own hypothesis is more valid since you have been able to weigh all the data which he has not been able to do. Nevertheless you may slightly have altered the details of your thesis in the light of other material.

On the smelting sites in the Arabah Rothenburg states (PEQ 94 p 15) " In spite of the most intensive search we reached the conclusion that no smelting furnaces of stone were built." The buildings you describe as furnaces at the sites he identifies as tombs. Although copper furnaces were used in Iron Age Palestine (cf. for example at Qasileh) have you any direct evidence that smelting was done in furnaces and not in charcoal heaps in the Arabah?

From his study of sites in the western Arabah Rothenburg concludes :-

- i Smelting was done in open fires with tuyeres built into the side of the pile of charcoal and ore. In the base of the fire globules of reduced sulphide collected to form ingots of copper. (he deduced this although none were found in situ).
- ii He finds no evidence that the sites were worked at any other period other than between 1000-900 B.C. Would you still defend the view that they were worked later in the Iron Age ?
- iii He proposes that the industry far from being the basis of foreign trade was not even a paying concern, and was carried out only to enable the Temple to be built.
- iv the copper produced was rough and needed refining. This he suggests was done in the Jordan valley between Succoth and Zarethan (1 Ki. 7⁴⁶) and not as you suggest at Ezion Geber. The latter is too out of the way. He states, "There is no evidence whatsoever for the assumption that Solomon exported copper in his Tarshish

fleet in exchange for gold, silver etc." This is a contradiction of your views as well as those expressed by G.E.Wright, W.F.Albright and John Bright. Obviously many will be unhappy with them.

Tell el-Kheleifeh Rothenburg believes to have been a caravanserai. He does not believe it to have been a refinery on two counts ; - First; If Tell el-Kheleifeh was a refinery as late as the 5 century B.C. where did its raw materials come from ? This since he believes the mines were worked only in the 10 th century B.C. as mentioned above. Secondly; Since the ores were reduced to copper in one stage at the Arabah sites the need of further refining he sees as superfluous. (this despite his already avowed understanding of the clay ground of 1 Ki 746 as the " melting-refining-casting workshops " to which " the rough copper produced in the Arabah must have been sent." (p. 43)) Thus he finds; "the reports on the excavation add numerous pertinent problems. " (p. 49.)

- 1 Slag : A refinery using even the flapping method of refining must over several centuries have produced considerable slag. Where is it ? Is it possible that the slag piles were formed away from the main buildings or put in the sea ?
- 2 Flues : The flues could not have provided the requisite draught to reach the high temperatures needed for the fusion of copper. The lower set of flues pierced only inside walls, and in any case were soon buried beneath debris. The upper set led into an inter-wall channel along which a small and ineffective draught could have been blown. Further he adds, the additional separation wall " which was not bonded into the walls of period 1 " had two rows of flues merely joining the two halves of a divided chamber. On Rothenburg's understanding the flues could not have been flues at all so ineffective must they have been. The flues seem reminiscent of those found in modern brick-works, which connect chambers allowing them to be fired and cooled successively. Under this system some part of the kiln is always working and hot air circulating through the flues aids the firing process. Whether there could be any parallel is uncertain. If the furnaces were sealed during use the hot air in the system might possibly have impeded oxidation of the melt.
- 3 Staining : The yellowish-green stains on the walls (whether exterior as well as interior seems important,) Rothenburg explains as being due to the presence of impurities in the bricks which reacted when the refinery was destroyed by fire. I feel that this explanation would not account the bricks being "consistently well baked" as you described them (BASOR 71 p.5.).
- 4 Crucibles : The pottery you identified as crucibles Rothenburg suggests were merely domestic vessels of a type since found to be common.

It seems that crucibles with metal adhering to the sides

occur at Chalcolithic Tell Abu Matar (Israel Expl. Journal 5 p. 80.), Iron Age Qasileh (IEJ 1.) and Shechem (BA p. 119.). Moreover he states that on the crucibles there was "no slag or any copper incrustation" - in apparent ignorance of your record in BASOR 159 p. 14.

- 5 The Industrial square : This he seems to interpret as a typical Solomonic case-mate wall. He adds that if this were the industrial square and centre of the local industry it is odd that it should have been built over in period II.
- 6 Wind : This could not he suggests, have been a significant factor in the siting of the establishment as it varies very little along the northern shore of the Gulf of Aqabah. The local nature of the storm which you recorded explains not as a local wind phenomenon but as dust from the excavation which had been caught by the wind.

As you will see from the above Rothenburg has raised a number of problems in his paper. Many of them seem to be based on either faulty or invalid reasoning. I expect that you will be able to answer most of them from your own work at Tell el-Kheleifeh and subsequently.

The case for there having been a refinery at Ezion Geber seems too well established to discount so easily. It appears that in the light of meteorological data his doubts about the wind and flues are justifiable. The general impression that Rothenburg's paper gives is one of subjectivity. He appears to have twisted some of the facts to suit his hypothesis.

One further question I have is about Iron smelting in the Arabah sites - Have you any further light on this? Wright et al seem to doubt that this was done as early as the tenth century B.C. You yourself did not do much other than suggest that this was in fact the case.

I do greatly appreciate your offer of help in trying to sort out these difficulties so that I can the more clearly assess the nature and significance of mining in Solomon's Israel. I do apologize for the length this has run to and trust that I haven't taken up too much time.

Yours sincerely,

David Gerrish

(David Gerrish.)