and the Mount Mittamatite Granite, intrude the Koetong-Corryong Batholith. Brooks and Leggo (1972) and Kolbe and Taylor (1966) summarised the essential features of these granites which are similar to leucogranites that are part of the Murrumbidgee Batholith (Snelling, 1960; Joyce, 1973). Small contact aureoles are present around the former bodies. East of Mitta Mitta, a hornblende-bearing granodiorite, the Bannimboola Granodiorite, crops out on the western flank of Mount Benambra. In road cuttings in this area, the granodiorite boundary is seen to be dipping shallowly outwards from the centre of the mass, and a contact aureole having an outcrop width of six kilometers is developed in low-grade regional metasediments to the west and south of the granodiorite. This granodiorite has most of the features of the *Bathurst-type* granites of Vallance (1969).

MINERALIZATION OF THE LUCKY HIT COPPER MINE, MERRILLA MINE AND GURRUNDA BARITE DEPOSIT, NEW SOUTH WALES

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See Programme and Abstract Volume of Conference.

ANTIMONY MINERALIZATION IN VICTORIA – A CASE FOR REGIONAL ZONING?

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See Programme and Abstract Volume of Conference.

6. SPECIALIST STUDIES

$^{34}S/^{32}S$ RATIOS IN SOME SULPHIDES OF THE LACHLAN FOLD BELT

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Over geological time a distinct pattern in the distribution of the isotopes of sulphur has resulted from the combined effects of a variety of natural processes. The processes which lead to this isotopic fractionation are becoming increasingly understood and accordingly offer wider opportunities for the application of isotopic measurement to geological problems.

Sulphides from a number of localities in the Lachlan Fold Belt are being investigated as part of a wider study. The expectations are that these measurements might eventually reveal mineralization patterns, sources of sulphur, centres of volcanic activity and directions of flow of mineralizing solutions. It is yet too early to attempt the interpretation of the very limited data in all these directions, but the preliminary isotopic data for sulphides from the Lachlan Fold Belt, selected where possible from main ore bearing horizons (Fig.1), reveal a considerable range of $\delta^{34}S$ values.

Although the genesis of ores of the Kuroko type sulphide deposits is still subject to some doubt, it is generally agreed that seawater sulphate, either coeval or fossil, is the principal sulphur source in a submarine, hydrothermal process operating at a temperature of 250-300°C. Typical metal sulphide and sulphur isotope distribution patterns have been described with ^{34}S contents decreasing from $+10^0/_{00}$ and $+8^0/_{00}$ in underlying pyritic veins through values of $+6^0/_{00}$ to $+3^0/_{00}$ in the ore zone. In the uppermost layers where contact with Miocene ocean water occurred, barites with $\delta^{34}S$ values of $+22^0/_{00}$ to $+23^0/_{00}$ are found.

Sulphides from deposits at Woodlawn and Colo Creek have distributions and isotopic compositions which generally correspond closely with the Kuroko values and which also suggest equilibration temperatures approaching 300°C. Only in respect of the ^{34}S contents of the barites is there a significant difference. Those from the Lachlan Fold Belt appear to be more enriched in the heavier isotope, a difference in composition which correlates well with the increased ^{34}S content of the ocean sulphate during the Silurian.

A similar isotopic relationship, indicating the same equilibration temperature (250-300°C), also exists between the sulphides from Mount Bulga and Currawang, although all samples are depleted in the heavier sulphur isotope. Similarly depleted are the three remaining sulphide deposits of similar age, that is those at Copper Hill, Lime Kilns and Basin Creek, but, since only chalcopyrite and pyrite were examined or were present in these, comparisons with other sulphides become less meaningful.

Thus, whilst isotopic fractionations between sulphides from the same deposit all seem to be in general accord, quite marked differences in the ^{34}S contents of sulphides from different deposits are seen. Two alternative explanations for this latter effect are either that varying ^{34}S contents reflect the relative contribution of sulphur from volcanic and ocean water sources, or that the sulphur source and reservoir remain unchanged and decreasing ^{34}S values in the sulphides reflect increases in pH or oxygen fugacity.

Interest in the Devonian samples from E. Gippsland centres largely on the associated barite. The isotopic composition of this as given in Fig. 1 is in accord with the values generally accepted for Devonian ocean sulphate.

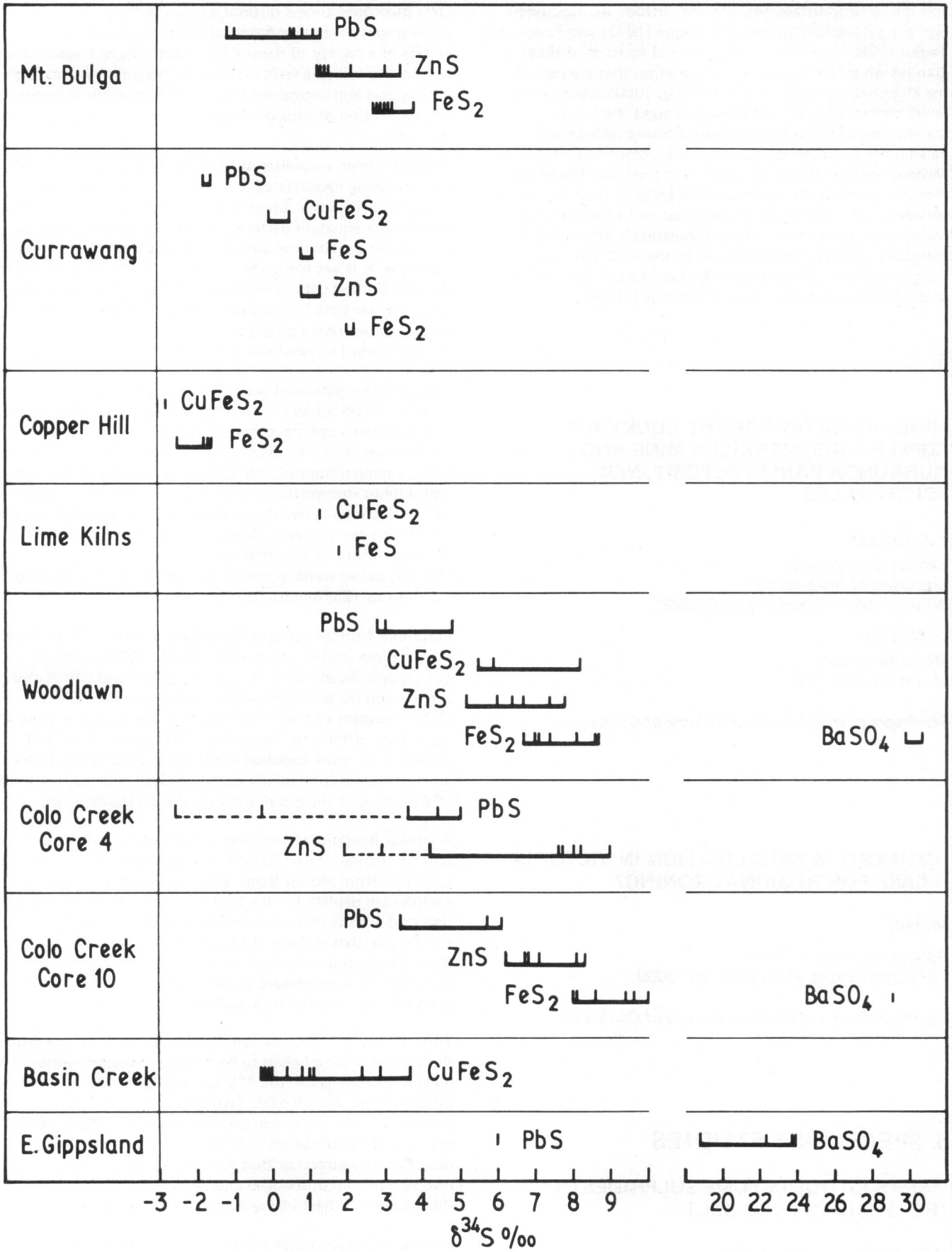

FIG 1. ^{34}S CONTENTS OF SULPHIDES FROM LACHLAN FOLD BELT