must occur in post-Burdigalian rocks"[7] was reached after an examination of the type Aquitanian–Burdigalian planktonic foraminiferal fauna. Eames *et al.* state that the type samples are poorly fossiliferous, but this is not true. More than 100 specimens of planktonic Foraminifera have been extracted from each of the 5 youngest samples and the uppermost Burdigalian sample has innumerable planktonic foraminiferal specimens.

My "more recent work" on the type Aquitanian–Burdigalian fossils was undertaken in order to try and break the deadlock of opinion regarding the entry of *Orbulina* in European rocks which has retarded efforts at mid-Tertiary stratigraphic inter-continental correlation. The 'British School'[2] advocate the entry of *Orbulina* in the Upper Aquitanian and the "Continental School"[8–10] have apparently proved its entry in the Helvetian–Tortonian.

If Eames *et al.* maintain that the initial stratigraphic appearence of *Orbulina* occurs in the Upper Aquitanian, then more convincing evidence must be presented to substantiate this theory. If *Orbulina* were found in the type Upper Aquitanian–Burdigalian rocks it would pose the problem of the double entry of the lineage in European Miocene rocks and two well-separated *Orbulina* datum lines.

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OCEANOGRAPHY

Evidence of a South Equatorial Countercurrent in the Atlantic Ocean in July 1963

An eastward-flowing current of speeds of 4–7 cm/sec has been indicated in the Atlantic Ocean between 5° and 12·5° S. at about 14° W. longitude.

The evidence lies in the calculations of geostrophic flow at the sea surface with respect to the 1,000-decibar surface. The results for these calculations were collected during June 29–July 7, 1963, aboard the *Argo* on the seventh leg of the *Lusiad* expedition. A line of 13 oceanographic stations was made extending from 14° 54·5′ S., 019° 22′ W. to 05° 0′ N., 012° 39·5′ W. It is the first such section made across the equator in that season. The eastward flow between 5° S. and 12·5° S. averaged 4·5 cm/sec; the greatest speed of the eastward flow was about 7·4 cm/sec and was observed between the two stations at 12·5° S. and 10° S.

Flow to the east at this latitude is not indicated by any of the various atlases in any season[1,2]; instead, the flow in the area south of 6° S. is indicated as westward but very much weaker than that in the area north of 6° S. (ref. 1). It is not impossible that a weak eastward flow (4–7 cm/sec) could prevail in this season in all years without being detected from the ordinary set and drift observations. The set from such a current might easily be masked by the effect of the south-easterly trade winds that average more than Beaufort Force 4 (5·5–8 m/sec) in June and July[3]. Furthermore, the major shipping routes do not cross this area, and the few transits are on nearly north–south courses[4]; vessels would spend only a short time in the area of this eastward flow; they would be subject to a total current-drift of only about 7·8 km even if they required 48 h to cross the area. This is within the error of celestial navigation, and is probably smaller than the effect of the winds in that area.

There is no other sort of evidence available to examine the existence of this current. The other hydrographic data in the area are few and isolated and are not enough to confirm or deny such a current[5]; those measurements of density that lie near the *Argo* data are in agreement with them, however, and suggest that the *Argo* was not observing an unusual condition. It is interesting that this easterly flow was observed at the same season when the (North) Equatorial Countercurrent prevails in the Atlantic, and at the same season that the South Equatorial Countercurrent has been most clearly observed in the Pacific[6].

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CHEMISTRY

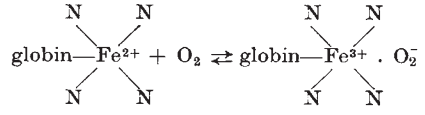
Nature of the Iron–Oxygen Bond in Oxyhæmoglobin

J. J. Weiss[1] has proposed that oxyhæmoglobin is a hæmoglobin peroxide, with the iron atom in the ferric state and the oxygen molecule present as an O_2^- ion, which is then taken up in the co-ordination shell of the ferric ion. He states that such an assumption accounts for the properties of oxyhæmoglobin.

Oxyhæmoglobin is, however, diamagnetic[2], and the generally accepted definition of oxidation number[3] requires that the iron atom in any diamagnetic molecule or complex containing one iron atom (no iron–iron bond) has an even oxidation number. It is accordingly not possible for an iron atom in oxyhæmoglobin to be described as ferric (oxidation number +3) unless a definition of oxidation number different from the usually accepted one is used.

The problem discussed by Weiss, the nature of the iron–oxygen bond in oxyhæmoglobin, was given a thorough discussion by me in two communications published about 15 years ago[4,5]. It is now possible to amplify the discussion somewhat, in part because of further development of the theory of the chemical bond[6] and in part because of the increased knowledge about the structure of oxyhæmoglobin and related molecules that has been obtained by the X-ray diffraction investigations of Kendrew[7] and Perutz[8].

Weiss has illustrated his proposal by writing the following equation:



In the formula at the right, the dot represents not an electron but some sort of bond.

The structural formula which I proposed for oxyhæmoglobin[4,5] is the following: