would be expected along, or beside, a simple tensional split but rather, say, what would result from a southward movement of Ireland relative to Great Britain.

Most of the activity of the BTIP probably preceded the opening of the North-east Atlantic and the Greenland activity by several million years; it does not occur along the margins of the rift, and occurred in a stress field that does not seem to be related to that of an opening ocean.

These observations do not affect the conclusion of Carter *et al.*, that there is no evidence for an undepleted mantle source-region for any of the basalts they discussed. However, their assumption that the BTIP is simply due to the formation of the North-east Atlantic oversimplifies our understanding of how the BTIP formed. Here it is relevant that they point out that the BTIP may be anomalous as there may have been "overall higher temperatures in the lower crust in North-west Scotland at the time of basalt eruption than elsewhere in the North Atlantic Tertiary Province".

Perhaps it just was not part of this province!

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Cubomedusae belong to the class Cubuzoa, not Scyphozoa

IN their report on the neurophysiology of *Carybdea rastonii* Haacke (a cubomedusa), Satterlie and Spencer[1] emphasised that "... properties of the neuromuscular system ... clearly show it to be of the scyphozoan type ...". They also name the Cubomedusae as an order within the class Scyphozoa according to Haeckel's taxonomic scheme[2]. Since the discovery of the first polyp of a cubomedusa[3], Werner[4–7] and Chapman[7,8] have made extensive studies of the anatomy, behaviour, life history and systematic position of members of this group. The results of these studies led Werner to give the Cubomedusae the rank of a class (Cubozoa)[4,5]. This conclusion was supported by Chapman's study of the microanatomy of a cubopolyp[8].

The principal factor which has led to the new classification is the structure of the polyp. Those cubopolyps which have been studied (*Tripedalia* and *Carybdea*) differ from polyps of the class Scyphozoa in that they lack, among other features, the gastric septa and tetramerous symmetry which are diagnostic of scyphopolyps[5,6,8–10]. The cubopolyps share radial symmetry, lateral budding, capitate tentacles and other important features with hydrozoan polyps and also possess unique features[5,6,8]. The neuromuscular system (which Satterlie and Spencer[1] equate with that of the Scyphozoa), like the features mentioned above, clearly illustrates the mixture of unique, scyphozoan-, and hydrozoan-like features in the Cubozoa. For example, it has long been known that cubomedusae possess a marginal nerve ring[2,9], like the hydromedusae but unlike the scyphomedusae. A unique feature of the Cubozoa is the presence of an ectodermal–endodermal nerve-ring pair in the polyp[8]. Although Satterlie and Spencer[1] cite the paper by Werner *et al.*[6] on the neuromuscular system of a cubopolyp, they discuss in their own article only the medusa of *Carybdea* and only scyphozoan-like features of the medusa.

When one is dealing with organisms with a complex life history, such as coelenterates, one must bear in mind all stages of the life cycle if one wishes to draw conclusions about taxonomic position. Satterlie and Spencer's[1] fascinating findings on the neurophysiology of *Carybdea* do not support the retention of the Cubomedusae in the class Scyphozoa but do provide further support for Werner's[4,5] theory that the Cubozoa are intermediate between the Scyphozoa and Hydrozoa and that the Scyphozoa are the class most similar to the ancestors of the three groups.

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SATTERLIE AND SPENCER REPLY— Our article was not intended to give definitive evidence for the taxonomic position of the Cubomedusae. However, judged by the neuromuscular properties of the swimming system of *Carybdea*, the medusae strongly resemble the scyphomedusae. This similarity is so convincing as to make it unnecessary to create a new class, the Cubozoa, to accommodate any unique features. In addition, the structure and function of the swimming system of *Carybdea* is unlike any known hydromedusan system.

The one cubomedusan feature frequently considered hydrozoan-like, the subumbrellar nerve ring, is not structurally or functionally similar to the marginal nerve rings of hydromedusae. In the latter, swimming pacemakers are distributed throughout the inner nerve ring, as an electrically coupled network of 'giant' neurones. In both cubomedusae and scyphomedusae, the swimming pacemakers are restricted to the rhopalia. Transmission of pacemaker output throughout the subumbrellar muscle sheet in both cubomedusae and scyphomedusae is through networks of large bi- and tripolar neurones, making up subumbrellar nerve nets. Although subumbrellar nerve nets are present in some hydromedusae, the subumbrellar muscle cells show widespread intercellular electrical coupling, and in some cases, make up a conducting musculo-epithelium. Ultrastructural evidence argues against such electrical coupling in cubomedusae. Each swimming contraction of hydromedusae is an all-or-none event, accompanied by an all-or-none action potential in the muscle sheet. In comparison, both cubomedusae and scyphomedusae exhibit graded muscle contractions, and at least in *Carybdea*, graded muscle potentials. As this short comparison points out, not only is there a lack of similarity between the hydromedusan and cubomedusan swimming systems but also a lack of originality on the part of the cubomedusae, as all features are distinctly scyphozoan-like.

As Leonard points out, most of the evidence for proposing a new class comes from work on the structure of cubopolyps. It is difficult to determine whether some of the structural characteristics of cubopolyps, such as the lack of tetramerous symmetry and gastric septa, are primitive features or secondarily derived from a true scyphozoan ancestor. Cubomedusae exhibit structural specialisations in both stages of their life cycle; however, at least in the medusa generation, these specialisations are morphologically and physiologically consistent with the scyphozoan line.

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0028–0836/80/130377—01$01.00