critical mass for a neutron configuration breaks up into many smaller objects, a point of view proposed several years ago[12]. Some fragments may be thrown out of the nebula, at high speeds, and thus there might be quite an extensive population of such objects in and around our galaxy. The recent discovery that the pulsar *NP* 0527 lies only about a degree from the Crab and may have been thrown out of it at relativistic speed (preprint by E. C. Reifenstein, W. D. Brundage and D. H. Staelin) supports this view. Only those objects with velocities $\gtrsim 500$ km s^{-1} would still, after 1,000 yr, lie inside the Crab nebula. It is again tempting to speculate that it is the energy residing in these fragments and being released in the form of high energy particles which maintains the activity in the Crab. It should also be pointed out that there is considerable evidence from the extragalactic radio sources that they are generated by coherent objects which are thrown out in a large scale explosion from the nucleus of a galaxy or a quasi-stellar object[13].

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Preliminary Results of Measurements of Deep Currents in the Pacific Ocean

From June 18 to August 5, 1968, the STYX expedition of the Scripps Institution of Oceanography made measurements of deep flow in the South Pacific Ocean. As early as 1871 (ref. 1) it had been suggested that the deep and bottom waters of the North Pacific Ocean are not formed by modification of North Pacific surface waters, but have flowed in through the South Pacific from other areas. Wust[2] has traced the flow of cold bottom water (deeper than 4,000 m) from the Antarctic Circumpolar Current to the western North Pacific; the observed temperature variation beyond was too small to indicate a clear path. Other investigators[3,4] have confirmed his results by the distributions of dissolved oxygen and salinity, and some further indirect evidence of a deep strong northward flow across 29° S has recently been submitted[5,6].

A flow that is strong enough and continuous enough to be detected from temperature variations might be strong enough to be measured directly by a simple current meter, especially in an area where the bottom topography limits all the deep flow to a narrow channel. The recent charts by Udintsev *et al.*[7] and Menard[8] suggested that such a channel might exist in the area between the Samoan and Tuamotu islands, though the soundings were not sufficient to be sure. The STYX expedition located a deep channel passing through at about 9° S 169° W; this seems to be the only passage connecting the South and North Pacific at depths greater than 5,000 m. Sill depth is about 5,200 m and the passage seems to be about 50 km wide at the 5,000 m level and 200 km wide at the 4,000 m level.

The current meters were similar to those used at depths of about 4,000 m off California[9]. They consist of a rotor, a vane, a recorder and a float and anchor. A release-link that can be set for various intervals up to about 5 days was used. The instruments fall freely to the bottom and operate for a pre-set period and then release the anchor and return to the surface where they transmit a radio signal to aid in their recovery. Work in the deep water off California[9] had shown a predominantly semidiurnal variation of amplitude of about 2 cm s^{-1} about a mean of the same order: records at least as long as 24 h were required before a useful average could be taken.

The STYX expedition surveyed the channel and made measurements of water characteristics as well as the current measurements. The current meters were placed at various depths from 30 to 1,000 m above the bottom in depths as great as 5,900 m (in the Tonga Trench), but most of the forty-four series were made close to the bottom in depths between 4,500 and 5,500 m. In the earlier part of the expedition short period drops were made to locate areas of higher speed. Once the channel was located, records from 24 to 72 h (with one as long as 95 h) were obtained.

Measurements in depths less than 4,400 m in the surrounding area usually showed low average speeds (less than 5 cm s^{-1}) with no consistency in the directions. Those within the narrow part of the channel, at depths greater than 4,800 m, and operating for periods from 11 to 46 h, showed average flows of from 5 to 15 cm s^{-1} with directions between 013° *T* and 065° *T*; the largest tidal amplitude estimated from the records in the channel was about 3 cm s^{-1}.

The highest average speed was in the channel at 4,806 m, and was 15 cm s^{-1} toward 023°, averaged over 43 h. The maximum speed during this series was 19·5 cm s^{-1} toward 005° *T* and the lowest was 11 cm s^{-1} toward 030°. The tidal amplitude estimated from the record was 0·4 cm s^{-1} for the diurnal and 1·5 cm s^{-1} for the semidiurnal. Thus not all of the variation was tidal. In the further analysis we shall compare the records with the nearest tide stations.

The longest individual record was 95 h, taken in the wide basin to the south that feeds the channel. The basin was estimated to be about 330 km wide at the 5 km level and 470 km wide at the 4 km level. Average flow at 3 m above the bottom in 5,275 m depth was 4·4 cm s^{-1} toward 343° T (leading directly toward the channel). The tidal amplitude was calculated from the record to be about 2·5 cm s^{-1} for the semidiurnal and 1·3 cm s^{-1} for the diurnal components.

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