the two just mentioned grand mal seizures were particularly common.

Since it was evident from the data of the experiment just described that the failure to elicit a conditioned response during a well propagated hippocampal afterdischarge was not due to the actual disruption of the coupling between the conditioned stimulus and the conditioned response, the motor side of the phenomenon was subjected to closer scrutiny. Electrodes were implanted in the motor cortex so that electrical stimulation would elicit a movement of the forepaw. Electrodes were also placed in both hippocampi. After the animals had fully recovered from the effects of the operation, the magnitude and latency of cortically evoked movement were determined in the presence and absence of propagated hippocampal afterdischarges. The results of this study are shown in Table 1. The latency of the cortically evoked movement increases during hippocampal afterdischarge, and correspondingly the magnitude of the movement decreases. Although all the cats show differences in the same directions, the magnitudes of the differences are not the same. In order to record the movements in the chronic preparation it was necessary to use a weight to bring the forepaw to a consistent starting point. This, together with other differences such as the strength of the cat, the placement of the electrodes, and threshold values, probably accounts for the observed differences between animals.

The occurrence of learning during hippocampal afterdischarges renders unlikely the thesis that the hippocampus is the main recording system of experience. It also makes improbable the supposition that hippocampal afterdischarges are responsible for the amnesia of epilepsy or shock treatments. The decrease in the cortically evoked motor response during hippocampal afterdischarges provides an explanation, at least in part, of the disruption of the learned response during such seizures (*5*).

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20 January 1960

Scintillation Counting of Beta Activity on Filter Paper

Abstract. Scintillation counting of beta activity on filter paper, with monoisopropylbiphenyl as a solvent of low volatility, was investigated. The method is attractive since no sample preparation is involved, and the activities are measured directly on the filter paper wetted with the scintillator solution. A linear dependence of counting rate on total activity was found for iodine-131, phosphorus-32, sodium-22, and carbon-14, and counting efficiencies were determined.

Radioactive samples are frequently collected on filter paper during the processes of separation or purification of labeled material. Direct scintillation counting of the sample on filter paper is feasible (*1*). Such a procedure circumvents difficulties arising from insolubility of the sample in aromatic liquid scintillation solvents. Although it is usually possible to synthesize the sample into a form soluble in a liquid scintillator (*2*), or to incorporate small amounts of aqueous solution in a liquid scintillator (*3*), these methods are indirect and time consuming, and they frequently result in a marked decrease in the fluorescence efficiency of the solution with a concomitant reduction in the absolute counting efficiency.

It is patently advantageous to assay the activity of the sample with a minimum amount of purification or special preparation. In varying degrees, suspension of the active material in gels (*4*), or thickened systems (*5*), or the use of plastic capillary detectors (*6*) to count aqueous solutions of beta emitters, achieves this desired result.

An alternative technique (*1*) is to wet a filter paper containing an active deposit with a liquid scintillator solution. The organic solvent renders the paper relatively transparent, and surprisingly good light collection is possible. The method suffers from the evaporation of the solvent on a warm phototube surface and this results in a change in solute concentration with an accompanying change in detection sensitivity.

In order to overcome this weakness in the method, monoisopropylbiphenyl, which was recently reported as a scintillation solvent by Swank (*7*), was tested for its suitability for filter paper counting. This solvent possesses a vapor pressure about 1/1000 that of toluene at room temperature, and has a correspondingly lower rate of solvent loss by evaporation.

To test the counting method, samples of beta emitters of differing energy were chosen. A series of aliquots of aqueous solutions of calcium-14, sodium-22, iodine-131, and phosphorus-32 were pipetted onto No. 1 Whatman filter paper 1⅜ inches in diameter. The

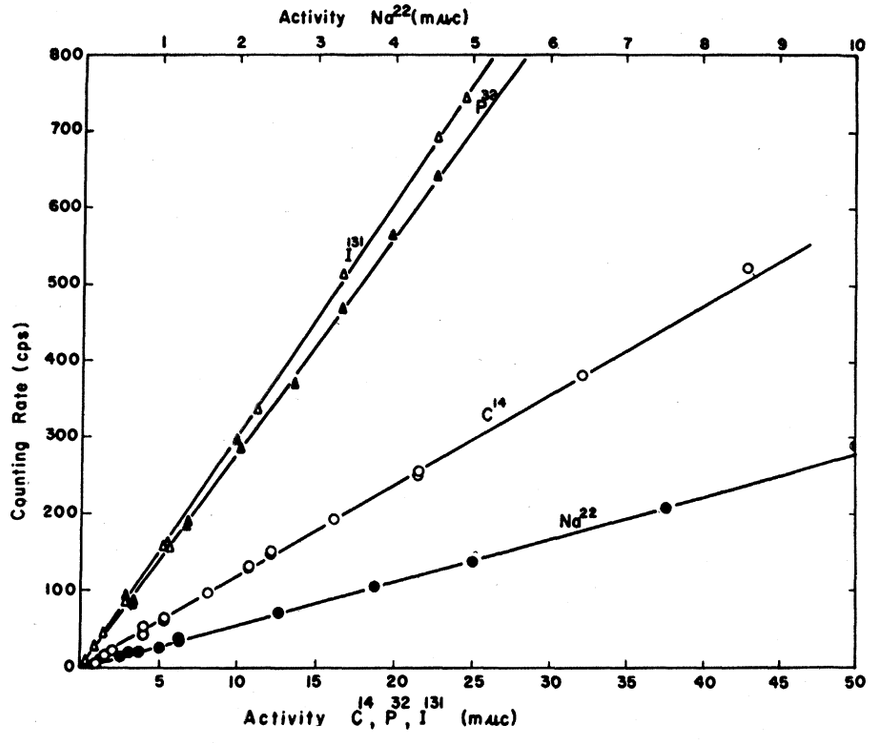

Fig. 1. Linear dependence of counting rate on activity of four beta emitters on filter paper.

isotopes have maximum beta energies of 0.155, 0.542, 0.608, and 1.70 Mev, respectively. The volumes of aqueous solution employed were in the range of 25 to 100 μl. The active filter papers were dried and then wetted with a liquid scintillator solution containing *p*-terphenyl (4.0 gm/liter) and 1,4-di-(2-(5-phenyloxazolyl))-benzene (POPOP) (0.1 gm/liter) in monoisopropylbiphenyl. The solvent was purified by washing with concentrated H_2SO_4, followed by 10-percent NaOH solution, and successive washings with pure water. It was then dried over $CaSO_4$, treated with chromatographic alumina, and vacuum distilled at 4 mm at 135° to 136°C.

The impregnated filter paper was placed on the surface of a Dumont 6292 photomultiplier tube, covered with aluminum foil, and counted on a scintillation counting assembly, without phototube refrigeration or anticoincidence circuitry. A linear amplifier and an integral pulse height selector, set at the lowest level commensurate with tolerable photomultiplier noise, were employed.

The data are succinctly illustrated in Fig. 1, where it can be seen that a linear dependence of counting rate on the activity of the sample is obtained. The absolute activity of the stock solution was checked and calibrated by internal liquid scintillation counting. This permitted the determination of counting efficiencies for the various isotopes under the conditions of measurement. The background counting rates were consistently in the region of 0.7 to 0.8 count per second, and the counting efficiencies, in percentage, were as follows: I^{131}, 83; P^{32}, 78; Na^{22}, 76; and C^{14}, 31.5.

The lower efficiency for P^{32} was believed due to incomplete capture of the energy in the thin layer of scintillator employed. In order to investigate the effect of thickness of scintillator solution, a series of experiments was conducted in which a petri dish was placed on the photomultiplier tube and the filter paper was suspended horizontally parallel to the tube face between a series of narrow metal rings of ¼ inch wall thickness. With rings of varying depth the thickness of the layer of liquid scintillator above and below the filter paper could be varied. The detection efficiency for P^{32} increased with added depth of scintillator solution to a maximum of 96-percent with a volume of 3.5 ml.

This method of filter paper counting has the additional advantage of preventing possible contamination of the photomultiplier face.

The results indicate that direct filter paper counting can be employed as a technique for rapid and reproducible measurement of small quantities of low-energy beta emitters, with good detection efficiency and minimum sample preparation, and is particularly valuable for the measurement of inorganic compounds which are not readily soluble in organic solvents.

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25 February 1960

Late Glacial and Postglacial Hudson Bay Sea Episode

Abstract. Geological investigations, archeological studies, and radiocarbon dates indicate a similarity of events around Hudson Bay, commencing at the time Hudson Bay Basin was freed of glacier ice. The sea that then spread around Hudson Bay 7000 to 8000 years ago is here named "Tyrrell Sea." The subsequent rate of land emergence decreased exponentially.

Recent studies of Pleistocene deposits around Hudson Bay, including ice recession and marine overlap studies by Bird (*1*), archeological studies by Rainey and Ralph (*2*), and ice recession and stratigraphic studies by Fyles (*3*) and by me (*4, 5*), suggest a correlation of events.

This region is within the central zone of the maximum Wisconsin ice sheet. It was greatly downwarped during occupation by the ice, was flooded during ice recession, and later partly emerged as upwarping progressed. The dominant marker in these events is the marine submergence, to which the name "Tyrrell Sea" is here given.

The Tyrrell Sea reached its maximum extent 7000 to 8000 years ago, as indicated by radiocarbon ages obtained on shells collected from near the highest strand lines west and south of the bay. The age of 6975 ± 250 years was obtained on shells from west of Hudson Bay (*4*) (site 1 in Fig. 1), and south of the bay ages of 7875 ± 200 and 7280 ± 50 years were obtained on shells collected by O. L. Hughes from sites 2 and 3 in Fig. 1 (the various laboratories engaged in this work are listed in the figure legend). Dates are not yet available for the east coast of Hudson Bay. Comparative ages on other Pleistocene seas outside of the central zone of the maximum Wisconsin glaciation are: about 10,000 to 11,000 years before the present (B.P.) for the Champlain Sea episode (*6*) and 13,325 years for the marine overlap along the Atlantic Coast, near Saint John, New Brunswick [dating index I (GSC) 7]. The latter date is on shells I collected from beds of marine clay which were overlain by deltaic gravels.

The advance of the Tyrrell Sea into the Hudson basin shaped the direction of the last ice recession. These shifts of glacier flow are recorded both west and east of Hudson Bay in the distribution of erratics and the orientations of drumlins and striations (*4, 5*). The former positions of the ice-sea contacts are recorded in distinctive drift ridges, termed by me straight-ridged minor moraines for the region west of the bay (*4*) and washboard moraines for the region east of the bay (*5*). I have since studied the classical area of washboard moraines in the Chibougamau region of Quebec (*7*), and they all appear to have had a similar origin. These shifts of flow and washboard moraines indicate similar ice-sea conditions both west and east of the bay.

Upwarping of the land began upon removal of the load of the ice sheet, and caused a regression of the Tyrrell Sea. Radiocarbon dates on shells, wood, and bones collected from the marine deposits at known elevations around Hudson Bay give information on the rates of this land emergence. The highest shore lines, about 800 to 900 feet above present sea level, are recorded east of Hudson Bay (*5*), in contrast to about 400- to 600-foot elevations west of the bay (*3, 4*). This difference in elevation is due either to greater rebound east of Hudson Bay, where the ice sheet had been thicker, or to greater, unrecorded uplift having taken place west of Hudson Bay before the highest shore lines were formed. The information on emergence is summar-