Controls were sprayed with water containing the detergent.
4. The leaves were studied after they reached mature size. The growth usually required 4 to 5 weeks.
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3 November 1955

International Comparisons of Radioactivity Standards

During the period May 1952 to November 1954, international comparisons have been made of standard samples of the radioactive nuclides Na^{24}, P^{32}, Co^{60}, $Sr^{90}+Y^{90}$, I^{131}, and Au^{198}. The organizations taking part in these measurements and comparisons have been the U.S. National Bureau of Standards, Atomic Energy of Canada Limited, and four British laboratories (the National Physical Laboratory; the Atomic Energy Research Establishment, Harwell; the Royal Cancer Hospital, London; and the Medical Research Council, London, coordinated through the NPL Advisory Committee on Radioactive Standards). Periodic meetings between representatives of the three countries have been arranged by the U.S. National Research Council Subcommittee on Beta- and Gamma-ray Measurements and Standards. Several papers on the work have already appeared (*1–12*).

The samples used for the comparisons were standard solutions prepared by the NBS, except the $Sr^{90}+Y^{90}$ and Au^{198} samples, which were prepared by the AERE. The solutions generally contained a few microcuries per gram. In the case of Co^{60} and I^{131}, stronger solutions containing of the order of 1 millicurie per gram were provided. The disintegration rates of the samples were determined at each of the laboratories by one or more of the following methods: total β counting in a 4π solid angle, $4\pi\beta\gamma$ and $\beta\gamma$ coincidence counting, and $\gamma\gamma$ coincidence counting. The results of measurements under what are considered to be the best conditions attainable at present are in agreement to within about ± 2 percent except for 4π counting of low-energy β rays.

In measurements of Na^{24} and Au^{198} by $4\pi\beta$ counting, the fractional losses of β particles by absorption are small and the results agree within ± 2 percent. They also agree within these limits with $4\pi\beta\gamma$ and $\beta\gamma$ coincidence results. The basic counting measurements for I^{131} are in agreement within 1 percent, but there is some uncertainty concerning the allowance to be made for self-absorption. No such allowance is applied by the British and Canadian laboratories, but it has been calculated by the NBS to be about 2 percent. Owing to the complex disintegration scheme of I^{131}, there is unfortunately no ready means of providing a cross check. The apparent systematic difference of about 3 percent between the NBS results for I^{131} and the standard of this nuclide at present adopted in Great Britain and at Chalk River is thus attributable to the correction assumed for self-absorption.

Agreement to within ± 1 percent was obtained in the measurements of Co^{60} by $\beta\gamma$ and $\gamma\gamma$ coincidence counting. A wide range of values by $4\pi\beta$ counting was reported, however, by the British laboratories. Subsequent investigations at the NBS showed that owing to the relatively low energies of the β particles, the apparent disintegration rates obtained by $4\pi\beta$ counting were critically dependent on the amount of solid material in the source and on its distribution. Consideration of the Co^{60} results leads to the conclusion that owing to the precautions necessary in source preparation, and the uncertainties in the absorption corrections, the $4\pi\beta$ counting method of standardizing this nuclide is at present less reliable than the coincidence method. However, it is considered that the distintegration rate of the solution distributed was determined by the coincidence method to an accuracy approaching ± 1 percent.

Ionization chamber equipment for preserving standards of the nuclides used for these comparisons has been set up at the NBS, and similar equipment is being calibrated at the NPL. The cooperation between the NBS, AECL, and the British laboratories on all matters relating to the establishment and the maintenance of radioactivity standards is to be continued in order to check the agreement already attained and to extend the comparisons to other nuclides. It is hoped that standardizing laboratories in other countries will participate in future comparisons; those interested should write to the most convenient of the authors of this letter.

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28 November 1955

Explanation for the So-Called "Ascending Impulses" in the Pyramidal Tract

In 1953 Brodal and Kaada (*1*) reported responses to peripheral nerve stimulation in the medullary pyramid of the cat. They related this unorthodox finding to previous studies in which ascending fibers had been demonstrated histologically (*2*). The possibility that their responses were related to activity in the medial lemniscus was considered and rejected. A further evaluation of their experiments was suggested by the observation that the antidromic cortical responses to medullary pyramidal tract shocks are seriously complicated by spread of the stimulus current to the sensory pathway in the adjoining lemniscus.

In adult cats that had been lightly anesthetized with Surital, the sigmoid motor cortices and superficial radial nerves were exposed for stimulation, and the ventral medullary surface was exposed for recording. The animal was placed in a supine position, the space ventral to the medulla being filled with Tyrode's solution. Responses of medullary points were mapped following both a constant ipsilateral cortical stimulus and a maximal contralateral nerve shock.

The electrodes were 75-μ steel wires cemented together with the tips 1 mm apart. Bipolar recording proved more effective, but monopolar recording of the "active" lead against an indifferent lead in the cervical soft tissue was also used. The area adjacent to the midline was explored from the origin of the

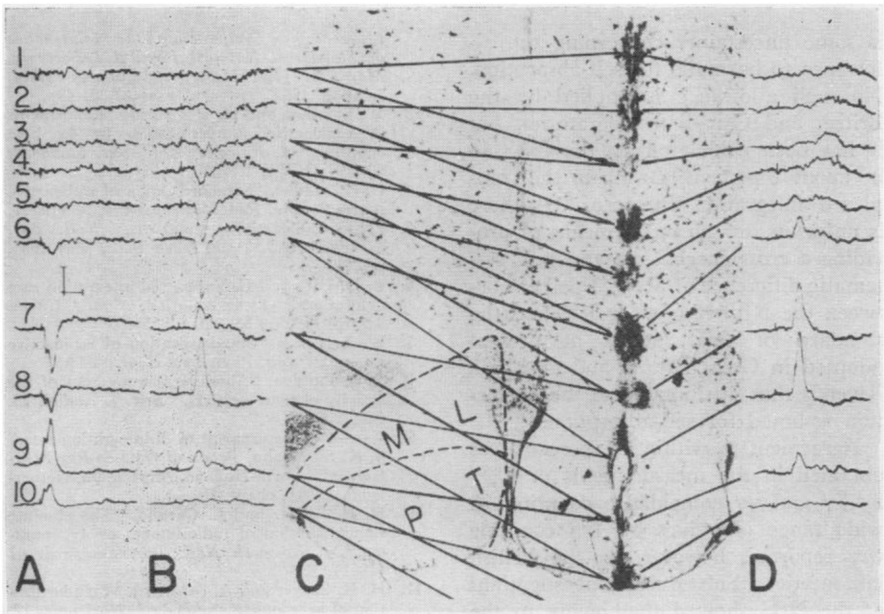

Fig. 1. (*A*) Bipolar recording of response to motor cortex stimulation. (*B*) Bipolar recording of response to nerve stimulation. (*C*) Lines showing recording sites in histological section; the approximate anatomical location of medial lemniscus and pyramidal tract is marked. (*D*) Monopolar recording of "sensory" responses as in *B*; upward deflection indicates relative positivity at upper electrode. Calibration 100 µv and 5 msec.

basilar artery to the pons. Because of the toughness of the medullary pia, the electrode was usually inserted to maximal depth at the start; subsequent records from more superficial points were made at 0.5-mm intervals as it was withdrawn. All electrode tracts were identified histologically using Marshall's technique (*3*).

The active lead in the medulla always gave a positive response, presumably the consequence of leading from the injured regions of active axons. In every case, the response to cortical stimulus lay superficial to the area responsive to nerve stimulus (Fig. 1). Histological check revealed

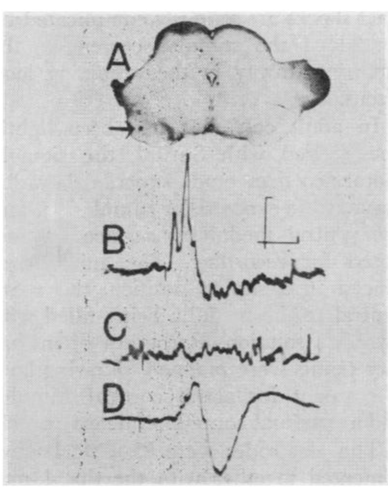

Fig. 2. (*A*) Recording site in cerebral peduncle. (*B*) Response to cortical stimulus. (*C*) Absent response to nerve stimulus. (*D*) Posterior sigmoid cortex response simultaneous with *C*. Calibration 100 µv and 5 msec.

that the former identifies the pyramidal tract; the latter, the medial lemniscus. Bipolar differential recording of the potential gradients gave distinctly separate reversals of the cortical and nerve-activated potentials at depths about 1 mm apart (Fig. 1*A*,8,9 and *B*,6,7). Both dorsal and ventral to the maximal lemniscus response, similar but rapidly diminishing smaller potentials could be recorded.

The small "sensory" potential in the dorsal portion of the pyramid (Fig. 1*B*,9) was often entirely absent at the trapezoid body where auditory fibers intervene between the diverging medial lemniscus and corticospinal tract. Nerve and cortical stimuli were given together and at various intervals when the electrode was properly situated to record both responses. The potentials always added algebraically without interaction. Reduction of shock strength at both stimulus sites resulted in a uniform fall in response at all recording positions.

In the cerebral peduncle where the medial lemniscus has moved away from the pyramidal fibers, a cortical stimulus elicited a large potential, while a nerve shock that fired somatosensory cortex produced no response (Fig. 2).

The latency of the nerve response in the medulla was about 4 to 5 msec. With monopolar recording (sometimes also with the bipolar leads), there was a subsequent slow wave at 8 to 10 msec (Fig. 1*D*). This could be recorded through most of the medulla and at times even in the overlying pool. It was often irregular in form, and in the dorsal reticular substance there were some related spike potentials. The late potential may be assigned to a diffuse response of the medullary gray. Occasional irregularities in shape when this wave was recorded from the pyramidal tract suggested that a descending cortical reflex response to the sensory volley might also be present. Two attempts to test this hypothesis by severing the tract at the pons were not entirely satisfactory; the response pattern did not change significantly.

From the data presented, it is reasonable to assign the potentials recorded from the pyramidal tract after sensory stimulation to current spread from the subjacent medial lemniscus. The misinterpretation of Brodal and Kaada may be explained by their exclusive reliance on monopolar recording, and by their lack of precise anatomical control of electrode placement. The results obtained do not negate the histological demonstration of ascending axons in the pyramid, although the morphological data have been questioned elsewhere (*4*). At this time there is no reason to qualify Sherrington's functional definition of the pyramidal tract as a descending internuncial pathway (*5, 6*).

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31 October 1955

Pluto Not a Planet?

The recent announcement of G. P. Kuiper—with the usual fanfare of a sensational magazine, radio, and TV accompaniment that we have come to expect of him—that Pluto might not be an original planet, strikes most astronomers somewhat humorously, coming, as it does, nearly 20 years after the original suggestion to this effect by R. A. Lyttleton.

In the December number of the *Monthly Notices of the Royal Astronomical Society* for the year 1936, Lyttleton published the ingenious suggestion that Pluto might have been a satellite of Neptune and that it and the present big satellite Triton might have gone through a very close approach to each other, with the result that Pluto was removed from Neptune's control and Triton turned around to become the outstanding