dioxide system raised the question of whether the variations were due to the differences between techniques or whether they were due to a difference between sea water and distilled water. In order to resolve the problem, a number of samples were re-run by the saturometer technique in a distilled water–carbon dioxide system, and the results were much closer to the results obtained with sea water and saturometer than to those obtained with stirred, distilled water. The probable interpretation is that in the saturometer system the solution concentration rises rapidly until new growth of more stable carbonate can equal the rate of dissolution of the unstable carbonate. In the stirred system, where the grains constitute about 1 percent of the solution volume, the calcium and carbonate concentration in the solution rises much more slowly and hence there is more time for the new inorganic surfaces to grow. At steady state, the ratio of new to original surface is therefore higher in the distilled water experiment than in the saturometer experiment. At steady state one would therefore expect smaller apparent solubility differences in the distilled water experiment.

Some of the geologic and oceanographic implications of these differences in skeletal solubility have been discussed by Chave (*5*). The distribution of minerals among the various-sized fractions of modern carbonate sediments suggests that the more unstable, more soluble minerals are being dissolved on the sea floor in many areas. Studies of the mineralogy and type of preservation of fossil assemblages indicate that skeletons with more soluble carbonates are being selectively dissolved by groundwater in ancient rocks.

The chemical problem of the solubility of skeletal carbonates is not solved. It is hoped that the presentation of the information which we have to date will stimulate others to work on the problem, and that more precise data will eventually be obtained.

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5 February 1962

Preliminary Results of Recent Deep Drilling on Cape Cod, Massachusetts

Abstract. In 1961 a 1000-foot drill hole near Harwich on Cape Cod, Massachusetts, penetrated 435 feet of Pleistocene deposits above 50 to 60 feet of crystalline limestone and phyllitic schist, and more than 500 feet of phyllitic schist with abundant quartz veins. Similar rock is known in the Pennsylvanian and Precambrian (?) sections of Massachusetts and Rhode Island. Material of Eocene age was found in earlier drilling near Provincetown, but none was identified from this hole.

A 1000-foot hole, the first to penetrate crystalline rock on Cape Cod, was completed late in 1961 in the town of Harwich, Massachusetts. The hole was started at about 25 feet above sea level.

The overburden here is 435 feet thick, and is of Pleistocene age. The upper 160 feet is a fine sand, with scattered coarser grained layers. This is underlain by 153 feet of bluish-gray, coarse to clayey silt, which also has scattered coarser grained layers, of possible lacustrine or marine origin. Below this is 116 feet of bouldery till with a matrix of silt similar to that of the overlying material. The majority of the boulders are crystalline rocks, for the most part granites. The lower 6 feet of overburden, also interpreted to be till, is stained brown by iron oxide, perhaps as a result of groundwater movement along the bedrock surface.

Eocene material was found in earlier drilling near Provincetown, Massachusetts (*1*), but no material of this age was identified from the hole at Harwich. However, recovery of samples from the 6-foot brownish zone above the bedrock was poor, and the zone may contain some unrecognized Eocene material.

The bedrock, penetrated for a distance of 565 feet, is a fine-grained, sericitized micaceous phyllitic schist. It is medium to dark gray, and has a bluish to greenish cast. The upper 50 to 60 feet contains as much as 30 percent greenish-gray to gray crystalline limestone in beds as much as ⅜ inch thick. Below the carbonate-bearing zone, quartz veins bordered by chloritic alteration products are abundant. Pyrite is the most noticeable accessory mineral. A 15-inch core taken 593 feet below the surface shows the rock to be thinly bedded and to have a good foliation that dips about 80°.

The age of the bedrock has not been established. The samples show lithologic similarities to the Rhode Island Formation of Pennsylvanian age in the Narragansett basin as well as to the Blackstone Series of Precambrian (?) age in Rhode Island (*2*).

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13 April 1962

Enhanced Afterglow in Neon by Removal of Electrical Excitation

Abstract. An unusual increase in light output results when a neon strobe tube is suddenly short-circuited during the transient. Experimental measurements have been made of the emitted light from the discharge when the capacitor is short-circuited at different times after the initiation of the discharge.

It has long been observed experimentally that the light-time output from the neon Strobotron tube (type SN-4) shows a sudden increase of light when the current ceases. This lamp is used as a stroboscopic light source in the General Radio Strobotac type 631 where a capacitor discharges into the neon gas (1 cm), causing a peak current of several hundred amperes. The light output versus time curve resembles roughly the current versus time curve until the end of the current pulse, and then the light suddenly rises in a few microseconds to a higher value of light than was reached during the actual discharge. The subsequently exponential type of decay has small ripples, probably caused by surg-

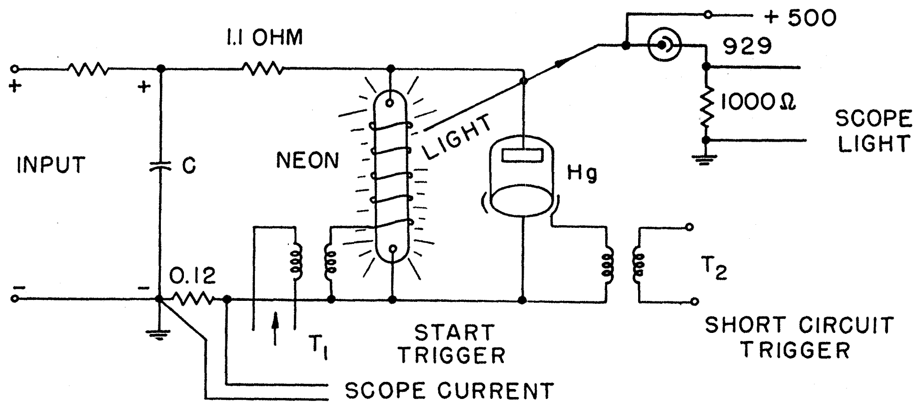

Fig. 1. Circuit used to study afterglow effects in gas discharges.

ing of the density of the gas in the cylindrical glass bulb.

Figure 1 shows a circuit used for studying the afterglow effects in gas discharges whereby the electrical excitation is suddenly extinguished at any desired condition of a capacitor discharge. With argon, krypton, and xenon gas, the light decreases suddenly to a low value and then decreases at a much slower rate to zero. However, with neon gas the light *rises* when the discharge is short-circuited under conditions described.

The neon tubes used in the experiment were cylindrical, about 33 cm long, and slightly less than 1.2 cm in inside diameter. They were filled with neon at various pressures from 5 to 20 mm-Hg, according to neon sign-tube pumping practice. The lamps were flashed by discharging a charged capacitor into them. In mid-flash they were shorted by the triggered breakdown of a low-impedance mercury arc tube (1 inch in diameter and 5 inches long) in parallel with the flash tube. The short circuit was arranged at any desired time after the start of the flash by a variable delay circuit which triggered the mercury tube into conduction after the elapsed delay time. In this manner the short circuit could be made to occur at any time between 10 and 1000 μsec after the start of the flash.

The light was studied by means of a phototube (type 929, with a type S-4 surface) with 500 volts on the plate and a 1000-ohm load resistor to insure a linear light-voltage relationship.

In every case of a shorted neon flash the light intensity increased momentarily at the instant the circuit was shorted. This was true whether the short circuit occurred at the beginning of the flash or at the end. The light from the mercury tube was shielded from the phototube.

Figure 2 shows light from a normal neon flash lamp when flashed from 50 μf charged to 900 volts (broken curve). Superimposed are a number of other light curves which were each obtained when the neon lamp was short-circuited at a different time. The solid lines show what happened to the light intensity subsequent to the instant of the short circuit. For each shorted flash, the light intensity followed the broken curve up to the instant of the short and then followed the solid curve.

It can be seen from the figure that a short circuit occurring near the time of a normal intensity peak resulted in a light pulse of about twice the normal intensity and one-third the normal duration.

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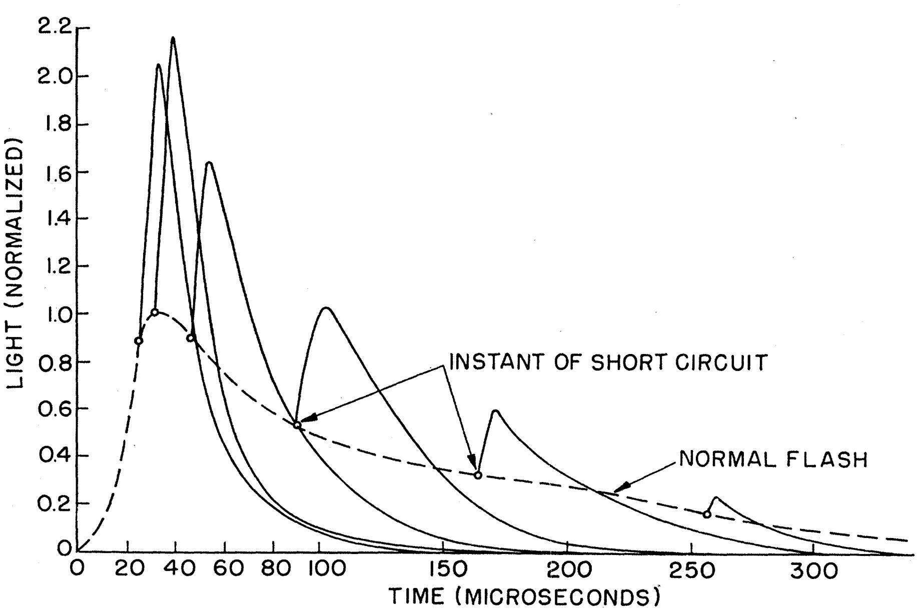

Fig. 2. Effect of short-circuiting on the intensity of light from a neon flash lamp. Broken curve, light intensity before the short; solid curves, light intensity subsequent to the short.

Drive Decay: The Cause of Fast "Extinction" of Habits Learned for Brain Stimulation

Abstract. According to Deutsch's theory of intracranial self-stimulation, cessation of responding after the withdrawal of the stimulus should be a simple function of time without stimulation. To test this prediction, the lever was withdrawn from a Skinner box for varying times, then replaced and normal extinction completed. The number of extinction trials was a simple function of the time the lever was out of the box, thus confirming Deutsch's hypothesis that cessation of responding in this instance is due to a decay of a motivational excitation produced by the electrical stimulation, and not a function of the number of unreinforced trials as in normal extinction.

Lever-pressing habits learned for electrical stimulation of the brain differ from the more familiar forms of lever pressing in three ways (*1*). First, the rates of lever pressing are extremely high; secondly, the habits show almost no satiation; and thirdly, they apparently extinguish extremely quickly when the electrical current is switched off. To explain the second and third, Deutsch's theory (*2*) predicts that the electrical stimulus must act on both the drive and