Table 1. Radioactivity of acetylene prepared from the methane and carbon dioxide fractions of sewer gas.

Collection date	Methane fraction		Carbon dioxide fraction	
	Count/min minus background	Ratio CH_4/standard	Count/min minus background	Ratio CO_2/standard
3 Jan. 1955			8.67	1.10 ± 0.015
20 Jan. 1956	7.65	0.98 ± 0.016	8.93	1.14 ± 0.016
10 Apr. 1956	7.71	1.00 ± 0.016	8.81	1.14 ± 0.015
1 June 1956	7.58	1.00 ± 0.016	8.76	1.18 ± 0.015
8 June 1956	7.70	1.02 ± 0.016	8.96	1.16 ± 0.014

Table 2. Measured activity of standard samples.

Sample No.	No. of measurements	Count/min minus background	S. D. of measured values (%)
W214	17	7.73	± 1.9
W218	3	7.76	± 2.1
Lignite (background)	22	(4.69)	± 1.4

in another sodium hydroxide solution. The two fractions were further purified, converted to acetylene, again purified, aged to allow radon to decay and assayed for C^{14} using the technique developed by Suess (*2*).

The results of several collections made at different times are shown in Table 1, along with the standard deviation of each sample count.

The radioactive background of the counter was determined from the average of two measurements made before and after the sample count, using acetylene prepared from fossil carbon furnished as strontium carbonate by Meyer Rubin of the U.S. Geological Survey. Rubin also supplied samples of acetylene gas (W218) and strontium carbonate (W214) prepared from modern wood (*3, 4*). Table 2 gives average values of the counting rates obtained with the afore-mentioned standard samples. The measurements were made over the same 6-month period during which all of the sewer gas samples were assayed. In each instance, the appended standard deviation was computed from the measured counting rate. Although the standard deviations are somewhat larger than the errors expected on the basis of total count alone, we feel that they are reliable indices of the over-all accuracy of our measurements. No additional correction for chemical processing appears to be necessary since in an experiment in which three samples were collected and prepared as nearly identically as possible, the final results were well within the counting errors.

The results indicate that the C^{14} content of the methane fraction of sewer gas is in reasonable agreement with that of modern wood. However, the carbon dioxide fraction has a C^{14} content about 14 percent higher than has been found for contemporary biological carbon. Since both the CO_2 and CH_4 are presumably derived from biological decomposition, these results indicate an entirely unexpected enrichment of the carbon dioxide fraction of sewer gas.

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References and Notes

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2. H. E. Suess, *Science* 120, 5 (1954).
3. ———, *ibid.* 122, 415 (1955).
4. We wish to thank M. Rubin for supplying the three standard samples.

12 October 1956

Modified End-Window Counting Tube for Paper Chromatograms

The counting of radioactive compounds directly on paper chromatograms after autoradiography has come into increasing use by various laboratories since the development of the technique (*1*) and its extensive use for photosynthetic studies by Calvin and his group (*2*). The most successful way of counting was by the use of the mica end-window "Scott tube" (*3*). A number of disadvantages of the tube have been resolved in the design (Fig. 1) described in this report (*4*).

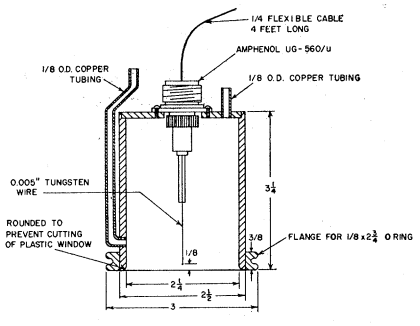

Fig. 1. Brass counting tube machined from ¼-in. brass stock tubing.

The counting tube was easily machined from stock brass tubing. The end window is constructed from DuPont Mylar of 0.25-mil thickness which is stretched tightly across the end and clamped into position with a rubber "O" ring (*5*). The brass tube and flange are rounded during machining to prevent cutting the plastic. Mylar has the advantage that it is extremely durable and cheap. If contaminated, it can be washed with ethanol or water or quickly replaced with a new window. The Mylar is porous, and air can diffuse into the tube, so a slow flow of quenching gas is kept running through the counting tube via the copper inlet.

The male plug of an Amphenol connector is machined into the top of the tube. A tungsten wire is connected to the anode, and the brass casing of the tube acts as the cathode. The male plug is then attached to the female plug of the connector with a 3- or 4-ft flexible cable to a scaler. With this convenient connector, several tubes can be kept in readiness and easily attached to the cable or scaler. It is important that the cable be freely flexible so as to allow freedom of motion and stability of the counting tube on the chromatograms.

The choice of a quenching gas with this tube is apparently not too important. With "P-10" gas (90 percent argon and 10 percent methane) counting can be done in 2400 v. The tubes show a good plateau (3-percent rise for 250 v) between 2250 and 2500 v. If "Q" gas is used, a good plateau is obtained at around 1200 to 1500 v, depending on the individual tube. The tubes are of course unshielded and give a background count of 60 to 70 counts per minute. With both C^{14} and S^{35}, a ratio of distintegrations to observed counts of about 10 is obtained. This tube has also been used successfully to count both P^{32} and tritium. Several of these tubes have been in use for more than a year and have given highly satisfactory and reproducible results (*6*).

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References and Notes

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3. M. Calvin *et al.*, *Isotopic Carbon* (Wiley, New York, 1948).
4. This research was carried out at Brookhaven National Laboratory under the auspices of the U.S. Atomic Energy Commission.
5. The glass Scott tube was also adapted to a Mylar end window recently by Paul Hayes at the University of California Radiation Laboratory.
6. I wish to thank Casimir Nawrocki of the electronics department at Brookhaven for assisttance in the design of this counting tube.

15 October 1956