ers the subseptal duct as a prolonged pharyngeal tube; one is then reminded of the lymphatic ring at the oral entrance of the pharynx. Here a kind of secondary Waldeyer ring is formed inside the nasal cavity.

Each of these animals was apparently in perfect health, yet anatomic peculiarities, together with frequency of nonexperimental pathologic changes, warrant utmost caution in evaluating findings that have been made by comparison with such "blank" or "control" animals.

An intact peripheral olfactory organ is necessary in experimental investigation of, among others, *psychologic phenomena*. In this field of research the rat has acquired an increasingly important role. Among the experiments in question are those dealing with olfactory discrimination in general, in which response with the help of olfactory cues is observed. The organ of smell is used in studying certain special drives or problem-solving behavior—for example, marking the true path of a maze with an olfactory trail. Results won in this way should not be declared valid until it is established by a postmortem histologic analysis that at the time of the experiment the organs in question were functionally normal.

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Sorption of Fumigant Vapors by Soil

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The use of toxic vapors to control such pests as the rat, soil nematode, boll weevil, and louse is well known. Fumigants are also of great value in the control of rodent pests such as the ground squirrel, pocket gopher, rat, prairie dog, and woodchuck, all of which live in underground burrow systems. Research by this laboratory in the control of burrowing rodents made a study of the persistence of toxic gases in the presence of soil highly desirable.

To our knowledge, only one similar experiment has been reported in the literature. Chisholm and Koblitsky (*2*) found that methyl bromide gas was sorbed by soil, the amount ranging from 0 to 41% in 6 hrs, depending on the type and the water content of the soil used. For example, in 1 hr moist clay sorbed approximately 10% of the methyl bromide originally present in the test chamber. This value increased to 17% after 6 hrs. Concentrations of hydrogen cyanide have been found to be reduced by cotton and jute (*6*), by orange fruit and leaves (*1*), and by wheat (*3*). The sorption of methyl bromide by wheat has also been studied (*7*). In addition, Lubatti and Harrison showed that wheat sorbed hydrogen cyanide, ethylene oxide, trichloroacetonitrile, and methyl bromide in a decreasing order of efficiency (*4*). Sorption and the moisture content of the wheat were directly proportional. Finally, the persistence of carbon monoxide in coal mines after explosions is well known.

In the experiments to be reported, known amounts of various toxic gases were introduced into a 628-liter, gas-tight chamber containing several cages freshly loaded with a sandy clay. The metal chamber had two large glass windows and an inner lining of paint which was chemically resistant. The soil had an average moisture content of approximately 11%, and the amount of surface exposed, calculated from the dimensions of the cages, was roughly 13 sq ft. During the first 5 min of each run, the gases were distributed uniformly throughout the chamber with a fan.

Successive samples of chamber air were collected at 10-min intervals for a 1-hr period and analyzed chemically for toxic content. Control experiments for each gas were also run. In these, exactly the same procedure as outlined above was used, except that no soil was placed in the cages which were in the chamber. An attempt was made to have an initial concentration of 5–10 mg of the agent/liter of chamber air in all of the experiments.

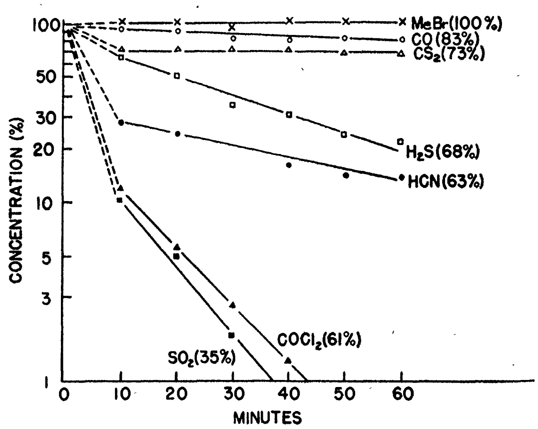

FIG. 1. Effect of soil on the persistence of fumigant vapors. Concentration is expressed as per cent of the original amount of gas calculated to be present in the chamber. The percentage after each of the curves represents the amount of gas present after 1 hr in the no-soil control experiments.

The changes in concentration of the various gases with time, shown in Fig. 1, are the average of four separate runs.

The values in parentheses were obtained in control experiments in which the chamber contained no soil. These represent the percentage of each gas, in terms of the original concentration, which was present in the chamber 1 hr after the gas had been introduced. The figures are the average of two runs for each gas.

Under the existing experimental conditions, soil had little effect on methyl bromide, carbon monoxide, and carbon disulfide. The final concentration of each of these gases was practically the same whether or not soil was used. The cause of the decrease in the amount of the relatively unreactive carbon monoxide and carbon disulfide in the absence of soil is not known.

The soil markedly sorbed the remaining four toxic gases studied. In fact, after 40 min, practically all of the sulfur dioxide and phosgene had disappeared. The fact that only 35% of the original sulfur dioxide was found after 1 hr in the no-soil tests underlines the sorbability of this chemical. Only 20% of the hydrogen sulfide and 14% of the hydrogen cyanide remained after 1 hr.

Since these data demonstrate the importance of the sorbability of a gas, an examination of the presently-used rodenticide fumigants in the light of these results may prove to be useful. One burrowing rodent, the woodchuck, is best controlled with fumigants (*5, 8*). Calcium cyanide is used quite successfully, as is carbon disulfide and also a Fish and Wildlife Service cartridge which liberates carbon monoxide upon burning. The present experiments suggest strongly that, inherent toxicity aside, the effectiveness of the latter two rodenticides is due to a considerable degree to their low sorbability by soil. On the other hand, calcium cyanide is often satisfactory because a large excess is used in practice. In this way, sufficient hydrogen cyanide is generated in the burrow over a period of time long enough to kill the animal.

The factor of sorbability should, in fact, be kept in mind whenever it is necessary to maintain a concentration of vapor in a confined space. This is true, for example, in the fumigation of wheat, cotton, fruit, etc. for the removal of injurious insects.

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Staining of the Stem Tissue of Plants by Triphenyltetrazolium Chloride

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In the course of developing a process for the manufacture of 2,3,5-triphenyltetrazolium chloride (*1, 4, 5, 6*), it has been found that portions of the cross-section of twigs from certain trees, particularly the willows, are stained by the reagent. This was not entirely unexpected in view of the findings of Kuhn and Jerchel (*2*), Lakon (*3*), Porter, Durrell, and Romm (*7*), and Mattson, Jensen, and Dutcher (*5*) on the staining of yeasts and of the seeds and fruit of various plants by tetrazolium salts.

Tips of twigs, cut in December from living trees and shrubs, were immersed in a 1% aqueous solution of 2,3,5-triphenyltetrazolium chloride. Sections from the same twig were heated in a test tube suspended in a boiling water bath for 15 min.

All of the unheated sections tested, with the exception of those of sumac and mock orange, developed a distinguishable red coloration in the cambium layer. The sumac was initially so highly pigmented that it is doubtful that any staining could be distinguished if it occurred. The mock orange showed a rusty red circle around the pith which may have been caused by the reagent or by normal enzymatic browning. The heated sections of all varieties tested exhibited neither browning nor reddening.

Most of the sections (maple, apple, plum, hawthorn, pine, spruce, cedar, etc.) required about 4 hrs for the development of the red color. The band of color usually appeared first in the cambium, but, in the maple and apple, a distinct colored band was observed around the pith as well. Considerable browning preceded the staining in most of the deciduous species. Pine, spruce, and cedar were stained irregularly over the cross-section.

In contrast to the varieties discussed above, sections of willow were stained in the cambium within 1–2 min, followed by slow development of color throughout the phloem. No color appeared in the xylem or pith. This remarkably rapid reaction of the willows suggested that there might be a fundamental difference between the cambium of the willows and that of the other shrubs. Because of the well-known ease with which willow cuttings are able to root, it was thought that the rapid reaction might be connected with this characteristic. Since, however, a rose cutting required nearly 24 hrs for the reddening of the cambium, the significance of the extremely rapid reaction of willows is still obscure.

Inasmuch as these experiments have shown that sections of a number of living trees and shrubs are stained by immersion for 4–24 hrs in a 1% aqueous solution of 2,3,5-triphenyltetrazolium chloride, that sections of twigs which have been heated are not stained, and that sections of willow are stained with exceptional rapidity, it is considered that this new application of triphenyltetrazolium chloride will be of value in determining the viability of trees, shrubs, and cuttings.

Since this laboratory is equipped and staffed primarily for chemical research, the above findings are presented in the hope that biological laboratories may find them of sufficient interest to subject the problem to systematic study.

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