on my plates in many experiments; but their number was least nearest the sewage, greater nearer the street, and greatest in the street air itself. It was clear that they came from street dust infected by horse dung, etc., and not from the sewage at all. I then constructed an experimental pipe system, such as Horrocks used, consisting of a half-S trap of 6-inch tile drain, to which an 8-foot vertical stack of the same pipe was connected. A rich emulsion of Bacillus coli culture, in soapy water was poured through the trap and Petri dishes of nutrient gelatin or agar were suspended at various points in the pipe above. Control plates were also exposed at various points in the laboratory outside. Six out of twenty-eight plates exposed in the pipe over the Bacillus coli emulsion showed colonies of this germ, fourteen colonies in all. Eight out of the twenty-four plates exposed in the pipe over the liquid infected with Bacillus prodigiosus showed this organism, seventeen colonies in all. The general effect of these experiments was, therefore, to confirm the results of Major Horrocks. My tests, like his, showed that specific bacteria are discharged into the air from the surface of foaming infected liquids, and may be carried up in connecting pipes for considerable distances. Furthermore, I found that the velocity of an air current capable of transporting bacteria in the form in which they are sprayed into the air from an atomizer is very low indeed.

Granting, then, that infection of the air above sewage may take place, how can the results of actual examinations of sewer air be explained? The idea suggested itself at once that the whole question might be a quantitative one. It might be possible that under extreme conditions sewage bacteria get into the air, but that the number discharged is so small under normal conditions that it does not appreciably affect the composition of the air of the sewer as a whole.

I next, therefore, attempted to investigate the question from this stand point and made first a careful examination of the best available quantitative methods. Horrocks's procedure of exposing open dishes of nutrient media to the air is, of course, not quantitative at all, since the bacteria which happen to fall on the plate are not related to any particular volume of air. The method adopted by most recent observers, and the one which I used in experiments reported a year ago, involves the straining out of the bacteria in a measured volume of air by drawing it through a sand filter. The bacteria are then washed out from the sand in sterile water and enumerated by the ordinary cultivation methods. During my work this year I developed a new method in which a measured volume of air is drawn into two large culture bottles, and the bacteria are allowed to settle out and form colonies of nutrient media in the bottom of the bottles. This method, although cumbrous, avoids all danger of losing bacteria by drawing them through the sand, and was used in all my latter work. A careful series of comparative tests, showed, however, that the sand method used in other investigations is essentially accurate, and earlier results may be accepted as correct in their general conclusions.

By the use of the culture bottle method I next attempted to control Major Horrocks's results from the quantitative standpoint. I prepared a rich emulsion of Bacillus prodigiosus, containing hundreds of millions of bacteria per litre, made it foam freely by beating it up with soap, and poured into a large glass bottle, or into anopen dish. The air in the bottle, or the air of the laboratory over the open dish, was examined by the culture bottle method. Out of thirty litres of air examined, five only contained Bacillus prodigiosus. In one litre three were found, and in the other four one each. Clearly the bacterial infection of the air produced by very vigorous foaming was but slight.

In these experiments there was but little splashing of the infected liquids; the bursting of bubbles from the foaming surface was the only source of air infection. I next imitated natural conditions more closely. Through the kindness of Mr. Craig I had an ordinary porcelain water-closet bowl set directly on a 4-inch cast-iron S trap, having a clean-out hole at its crown. The S trap was connected at its lower end with an ordinary 4-inch running trap. A rich soapy emulsion of Bacillus prodigiosus was poured rapidly into the water closet bowl, so as to rush down through the two traps, foaming and splashing as it went. Samples of air were collected from the clean out at the crown of the upper trap, and from the upper opening of the lower running trap, a few inches only from the foaming surface of the liquid. Everything was as favorable as possible for the discharge of bacteria into the air. Yet, out of forty-four litres of air examined, forty-three contained no Bacillus prodigiosus. One litre showed a group of eleven colonies apparently derived from a single infected droplet. It must be remembered that in these experiments I used liquids artificially infected with large numbers of specific bacteria, and caused foaming artificially by beating them up with a considerable addition of soap. Vigorous splashing was added to foaming in the last series of tests. Under these extreme conditions, as in Major Horrocks's experiments, the specific bacteria present could be detected in the air; yet the actual number present even here was extremely small.

These experiments seemed to offer a reasonable explanation of the difference between Major Horrocks's rsults and those of other observers. Bacterial infection of the air from foaming liquids may take place. Horrocks, using for the part artificially prepared emulsions and ignoring the quantitative aspect of the case, naturally obtained positive results. When the question is approached numerically, however, the amount of air infection, even under extreme conditions, is so slight that one would scarcely expect the general air of sewers and house drains to be appreciably affected under normal conditions.

The final test of experimental conclusions of this sort must always be made by an appeal to existing conditions under normal circumstances of actual use. The numerous investigations cited above have shown that the air of street sewers is indeed singularly free from bacteria. The air of house drainage systems might, however, be supposed to be worse than that of the street sewer; and with regard to their bacterial condition only the single report of Uffelmann appears to be available. As a crucial test, I therefore determined to carry out a sufficient number of examinations of house drain air to gain a fair idea of its bacterial composition. With the cordial co-operation of Mr. Craig, I have been able to complete this work and to obtain results which seem to be conclusive.

I studied nineteen different plumbing systems, five in buildings of the Massachusetts Institute of Technology, four in the wards of the Boston City Hospital, three in a block of East Boston tenements, two at the Boston City Hall, two at the Hotel Lenox, and one each in the Ames Building, in the Technology Club, and in a private residence on Newbury Street. The plumbing pipes were tapped at various representative points, on the main stack in the lower part of the building, on the projection of the main stack above the roof, on clean outs on the main house drain, or wastes from fixtures and dead ends in connection with the house drain, and in one case on the stack. From each of twenty points selected, ten litres of air were drawn off and examined for the characteristic bacteria of sewage, the colon bacillus and the sewage streptococcus.

In all, 200 litre samples of air were examined. Three samples were lost from the fact that the liquid sewage in the plumbing pipe ran into the collecting tube and over into the culture bottle, directly contaminating it with liquid. There remained then, 197 tests. Of these 193 showed no sewage bacteria present. In the remaining four cases, sewage organisms were found, the colon bacillus three times, and the streptococcus once. In each one of these four cases there was a discharge of sewage in the pipe at the point of examination, and at the moment the sample was taken, so that spray was actually splashing in the air. In each of the four cases a sample of air from the same point