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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 250,

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ORGANIC MATTER IN THE AIR.

About a year ago, at the request of the National Board of Health, the well known and very capable chemist, Prof. Ira Remsen, undertook an investigation of the methods employed for the detection and determination of the nature of the organic matter known to exist in air. A preliminary report, giving an outline of the work, but no details in regard to the methods employed, was published in the *Bulletin* of the Board last winter.

In the *Bulletin* for September 11, appears a more extended report, with details of experiments and such results as seem to have been established by them. The importance of the work, in which Mr. Remsen has been assisted by Mr. W. Mager and Mr. T. W. Day, will be appreciated by all who have any knowledge of the grave questions of public and private hygiene which hinge upon the possible influence of organic matter in the air, and the great need of some trustworthy and if possible simpler method of detecting its kind and measuring its quantity.

While air is often contaminated by carbonic acid and other gaseous results of vital, chemical, and industrial processes, the mischievous effects of "impure air," as popularly defined, most probably arise from the presence of refuse organic matters of a nitrogenous character. These, when taken back into the system, are apt to cause serious vital disturbances, and it is probable that they do cause not a few of the maladies which afflict mankind. The great problem is to discover the best method of determining the presence and nature of such impurities in air.

The first to attack the problem seriously was Dr. R. A. Smith, of Manchester, England, as early as 1870. He first endeavored to collect the organic matter in the air of city streets and foul places by washing the air in pure water. In some cases as many as a thousand volumes of air were successively washed with one volume of water, a process which required infinite patience and care, and so much time as to forbid its use as a practical method.

A different and more complicated though less laborious method of washing air, more recently devised by Mr. E. M. Dixon, Chemist of the Sanitary Department of Glasgow, has yielded valuable results, both there and at the Observatory of Montsouris, near Paris.

Something more simple and accurate, however, seemed requisite for general use; and the devising of such a method was accordingly made the first step of Mr. Remsen's investigations. Taking advantage of Chapman's suggestion with regard to the use of finely powdered pumice stone for absorbing nitrogenous organic matter from air, Mr. Remsen made a modification of Chapman's apparatus, which proved at once simple, efficient, and reliable in its results. Before each experiment the coarsely powdered pumice stone was heated to redness in a platinum crucible, then put into carefully cleansed absorbing tubes, and moistened with a little pure water.

To determine the amounts of free and albuminoid ammonia obtainable from the organic matter in the air to be examined, the air was first drawn through the pumice stone absorber by means of an aspirator. From 50 to 100 liters of air were drawn through, according to the amount of impurity. The absorption being completed, the pumice stone was conveyed to a flask perfectly cleaned with pure water; then 500 c.c. of the same water and 5 c.c. of a specially prepared sodium carbonate solution were added. Connection was then made with a clean condenser, and 100 c.c. distilled off (distillate A) and put aside for treatment with Nessler's solution. A second distillate (B) of 100 c.c. was then made, after adding to the contents of the flask 20 c.c. of a specially prepared solution of potassium hydroxide and 50 c.c. of a solution of permanganate of potassium. The first distillate Nesslerized gave the free ammonia, and the second the albuminoid ammonia, in the volume of air drawn through the absorbers.

In the course of the investigations reported upon, to determine the variations produced in the amount of nitrogenous organic matter in air by different causes, experiments were made with air contaminated with decaying meat in various stages of decomposition and dryness, air contaminated by the breath of dogs closely confined, laboratory air, etc.

Hitherto the opinion has been that the nitrogenous organic matters in bad air are the really injurious ones, and that an increase in the two forms of ammonia is sufficient to condemn the air yielding it. Mr. Remsen, however, is inclined to think that the question whether the amounts of ammonia and albuminoid ammonia yielded by air can be regarded as reliable measures of its impurities is still an open one. The main results established by these investigations he sets down as follows:

1. The nitrogenous matter of the air may be thoroughly collected by means of the pumice stone absorber described in this report.

2. The total amounts of ammonia found in experiments performed at the same time with the same specimens of air agree fairly well with one another; so much so as to warrant the use of the method for the examination of the air.

3. When free and albuminoid ammonia are determined, the results obtained do not always agree very closely, but still the agreement is sufficient to enable the experimenter to detect such variations as are likely to occur between pure and impure air.

4. Air contaminated by being drawn through water containing decaying meat does not yield more than the usual quantity of albuminoid ammonia.

5. Air contaminated by being drawn over comparatively dry decaying organic matter yields more than the usual quantity of albuminoid ammonia.

6. Air contaminated by respiration yields more than the usual quantity of albuminoid ammonia.

7. It is necessary in judging of the purity of air to take all the facts known in regard to it into consideration. The simple determination of any one constituent can never be a sufficient basis for the formation of a competent judgment.

8. It would be useless to have examinations of air made by any but the most careful workers. It would be time thrown away to have such analyses made by the average practical chemist.

Among the questions left unanswered an important one is this: Is the air which has been deprived of its nitrogenous matter also deprived of its injurious constituents? Another is this: Does the amount of organic matter in the air vary with different conditions of the air, as, for instance, with its hygrometric state?

The first question must be answered by the physiologist, not by the chemist. The effect of the air on fermentable liquids must be studied, and its effect when breathed by animals. The second question can be answered only by long continued systematic series of examinations of the air, such as are now being made at Glasgow, at Montsouris, and at some places in Germany.

THE PHILADELPHIA SHEEP AND WOOL SHOW.

An international sheep and wool show was held in Philadelphia during the latter part of September, under the auspices of the Pennsylvania State Agricultural Society. A large and interesting collection of sheep, sheep dogs, wool, and woolen manufactures was exhibited. The show of machinery was small. The chief object of the exhibition was to bring together breeders and manufacturers to promote a better understanding of their mutual interests, and to give a greater impetus to the rearing of sheep, in order that the country may grow at home the fifty million pounds of wool now annually imported by our manufacturers.

In furtherance of this object an international convention was held, beginning September 22, to discuss questions relating to sheep breeding, wool growing, and wool manufacturing. The first paper presented was by Mr. A. M. Garland, President of the National Wool Growers' Association, in relation to the breeding of sheep, and the influence of food and climate upon the quality of wool. The work of the Department of Agriculture in collecting and disseminating information with regard to flock products and the demand for them, was described by Commissioner De Luc, and discussed by a number of gentlemen prominently interested in this industry.

At an adjourned meeting the next day the Secretary of the National Wool Growers' Association and President of the New York Association read a paper on the relative advantages of our sheep-breeding States, and the breeds best adapted to them. Mr. John L. Hayes, of the Wool Manufacturers' Association, addressed the convention on the subject of the grades of wool which this country must produce in order to supply the demands of our looms, and how best to produce them.

Among the other subjects discussed were methods of shearing and handling sheep and of packing and grading wool for the market; increasing the production of the mountain lands of the Atlantic States by the systematic extension of sheep husbandry; benefits resulting from the introduction of pure blood into our native flocks; breeds capable of yielding from a given acreage the most profitable returns in mutton and wool taken jointly; management of sheep in summer and winter—of lambs most profitably for market; national registration of herds; recent inventions in wool manufacture and their relative importance; recent discoveries and inventions in the production of dyes and the art of dyeing—their relative importance.

A popular part of the show was the competitive exhibition of the working qualities of sheep dogs.

ORIGIN OF THE MERINO SHEEP.

As the ancient Greeks had no cotton nor silk and very little linen, and as sheep's wool was the principal texture from which their clothes were made, they took peculiar care to cultivate with especial care such breeds of sheep as produced very fine wool. Such breeds were those of the Greek city of Tarentum, situated on the Tarentine Gulf. In order to improve the fine quality of the wool still more, the sheep were covered with clothes in cold weather, as it was found by experience that exposure to cold made the wool coarser. Thus clothing these sheep from generation to generation resulted in a very delicate breed with exceedingly fine wool, according to the law established by Darwin in regard to selection and adaptation to exterior conditions.

This product of Greek industry was transmitted by them to the Romans, whose great agricultural author, Colunella, states that his uncle in Spain crossed the fine Tarentine sheep with rams imported from Africa, and obtained a stronger breed, combining the whiteness of fleece of the father with the fineness of the fleece of the mother, and having obtained such results the race was perpetuated. The absence of other fine textures made these Spanish sheep so valuable that in the beginning of our era they were sold in Rome for $1,000 in gold a head, an enormous price for those times, when money had much more value than now.

When the Barbarians invaded Italy these sheep were all exterminated, while the greater portion of the Roman posses-