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ADDRESS OF THE PRESIDENT OF THE ROYAL SOCIETY[1]

By Sir HENRY DALE, C.B.E.

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WE are to-day within a few weeks of the three hundredth anniversary of the birth of Isaac Newton. Wherever the progress of our Western science and philosophy has become effective, men will remember what that event was to mean for the world. Newton, as we shall hear, at the age of forty-three, when he had determined to abandon all further concern with natural philosophy, was induced at length, by Halley's friendly insistence, to give written form and system to the mathematical discoveries with which his amazing mind had been occupied over a period of some twenty years. The result was one of the greatest intellectual achievements in the history of mankind—the "Principia," providing for more than two centuries a framework for the mechanical interpretation of the universe and a basis for the building of physical science, and therewith of the material structure of our modern civilization.

We in Britain regard Isaac Newton as still, beyond challenge, the greatest of our men of science. Nor should the claim be limited to this island or to the British commonwealth of nations; for it was not till nearly half a century after Newton's death that former British colonists in North America began their development of an independent nation; and Newton is theirs as well as ours.

But, while we may proudly claim him as the countryman of all who share the birthright of the English tongue, the discoveries of science have belonged, and must belong again, to the whole world, and Newton's achievement is a part of the common heritage of all peoples. It can not be doubted that, if it had fallen in normal times, this tercentenary would have been

[1] Anniversary meeting, November 30, 1942.

has been sterilized by autoclaving. Olive oil prevents the building up of foam masses, which would cause loss of the scrubbing fluid through bubbling over. Sufficient fluid is forced up tube B (either by tilting or by applying gentle air pressure at A) and poured into the atomizing chamber until the liquid level reaches a point about five mm below the top of the capillary tube C. The apparatus is then connected with sterile precautions to the trap[7] with a short piece of rubber tubing and air is drawn through the system by means of a small suction pump[8] at a rate measured by a calibrated flowmeter.

The air enters the inlet E and is directed through nozzle D into a jet which blows across the capillary tube C, as is done in the Graeser[9] atomizer. Liquid is thus drawn up into the capillary and atomized into the air stream. The droplets so produced either fall back into the liquid in the first chamber or else are trapped in the second chamber, where the air is bubbled through the holes at the bottom of tube B.

It was found convenient to take 10- to 15-minute samples at a rate of about three quarters of a cubic foot per minute. At the end of this time the atomizer is tilted so that all the fluid is poured into the bubbling chamber and trap. The liquid may be poured back and forth to wash off any bacteria remaining on the walls of the chambers and trap. Two tenths, 0.5 and 1.0 cc portions of the fluid in the sampler are removed for blood agar pour plates. From these plate counts the total number of bacteria in the sample are computed, and since the air volume is known, the bacterial count per cubic foot of air may be calculated. It is necessary to apply a correction factor because of loss of fluid due principally to evaporation. This correction factor is nearly constant for different samplers and varies with the relative humidity. For 10 cubic foot air samples the fluid loss varies between 1.8 cc and 3.2 cc at humidities of 70 per cent. and 30 per cent., respectively, so that an average correction of 2.5 cc may be used. This loss apparently does not interfere with the efficiency of bacterial collection.

This bacterial air sampler has been tested extensively in laboratories, offices and lecture rooms, as well as in unoccupied rooms into which broth cultures of bacteria or dried dust-suspended microorganisms had been sprayed. The completeness of removal of bacteria from the air was determined by passing the air emerging from the exhaust end of the trap through various bacterial sampling devices to determine the percentage of bacteria which had escaped. The data of Table I are representative of the results obtained.

[7] Purchasable from scientific supply houses. The trap may be sealed directly to the apparatus.

[8] Suction pump was purchased from V. Mueller Company, Chicago, and was driven by a 1/6 H.P. motor.

[9] J. B. Graeser and A. H. Rowe, *Amer. Jour. Dis. Child.*, 52: 92, 1936.

TABLE I

Kind of air sampled	Arrangement of samplers	Bacteria per cubic foot
Normal air of inhabited room	Atomizer sampler with its exhaust connected to a Wheeler glass beads sampler	Atomizer sampler: 508 Wheeler sampler: 6.5
Air into which a mixture of Staphylococcus Albus and Pneumococcus Type I broth cultures was sprayed	Two atomizer samplers in series	*1st atomizer sampler:* 22,400 staphylococci 4,080 pneumococci *2nd atomizer sampler:* 71 staphylococci 51 pneumococci

Relative completeness of collection was also tested by simultaneously sampling the air of a room with several different types of bacterial collectors. Data from a typical experiment are presented in Table II.

TABLE II

COMPARISON OF EFFICACY OF BACTERIAL COLLECTION BY THE WELLS CENTRIFUGE, THE WHEELER GLASS-BEADS COLLECTOR, AND THE ATOMIZER SAMPLER. IN EACH EXPERIMENT THE COLLECTORS WERE OPERATED SIMULTANEOUSLY AT THE SAME LOCATION IN THE ROOM

Kind of air sampled	Samplers compared	Bacteria per cubic foot
Normal room air	Wells Centrifuge	9.3
	Atomizer Sampler	160.00
Room air into which a suspension of Staphylococcus Albus and Beta Hemolytic Streptococcus Group C had been sprayed	Wheeler Glass-beads Sampler	46,800
	Atomizer Sampler	53,040

On the average, the Wheeler sampler recovered 86 per cent., and the Wells centrifuge 15 per cent. of the bacteria collected by the atomizer sampler.

The atomizer type of bacterial sampler here described has been found very simple and convenient to operate. Loss of a sample through contamination or other reasons almost never occurs. This sampler can be easily made by a competent glass blower. The auxiliary equipment is inexpensive and available.

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BOOKS RECEIVED

HUMPHREYS, W. J. *Ways of the Weather.* Illustrated. Pp. 400. The Jaques Cattell Press. $4.00.

MIDLO, CHARLES and HAROLD CUMMINS. *Palmar and Plantar Dermatoglyphics in Primates.* Illustrated. Pp. 198. Press of Wistar Institute. $3.00.

SPITZ, ARMAND N. *A Start in Meteorology.* Illustrated. Pp. 95. Norman W. Henley Publishing Company. $1.50.

TOLMAN, EDWARD C. *Drives toward War.* Pp. xv + 118. D. Appleton-Century Company.