

THE ADDRESS OF THE CHAIRMAN OF THE  
PHYSICAL SECTION OF THE ROYAL SOCIETY  
(E. SWABRECK HALL), AT THE OPENING MEETING  
OF THE SESSION, 1865. TUESDAY, APRIL 4TH.

No special subject has been selected for the opening address of this session of the "Physical Section of the Royal Society of Tasmania." But I think our time will not be mis-spent if I briefly direct your attention to some recent discoveries, which have an important bearing on philosophic research, and the economic application of scientific data to the comfort and welfare of the human race. Out of many such discoveries I choose three to pass a few comments upon. It has been found that the illuminating and heat-giving rays of the sun can be completely dissevered by passing the solar ray through a solution of iodine or sulphide of carbon. The illuminating rays are thus intercepted, while the calorific rays pass through the media with such undiminished power that when concentrated to a focus gun-powder can be ignited. The magnesium wire lighted, and even platinum melted. To Professor Tyndall, of the Royal Institute of London, science is indebted for the knowledge of this important fact. For optical and other curious enquiries into the laws of heat and light this discovery will be doubtless of much value, but I do not see that it is likely to be of much practical worth in the daily business of life.

The second of my subjects, however, is one of immense practical value, and is likely to supersede all our modern means of procuring artificial light. By applying the great decomposing power of the galvanic battery, the metal magnesium has been discovered. It much resembles aluminium in its external qualities, though of much less specific gravity. It can be drawn into a fine wire, like silver, and this wire can be ignited and burnt in ordinary atmospheric air, and the light eliminated is so intense that at sea it can be seen at a distance of 28 miles. At the same time the light is so pure that the photographer is now independent of the sun light, and can procure pictures by its use, of the inside of caverns, and other places where the sun light cannot be made available. Mr. Knight, the pyrotechnist, a gentleman not likely to be easily alarmed by a blaze, informs me that having had a couple of inches of the magnesium wire given to him, he ignited it, and the intensity of the light, that suddenly burst forth, frightened him, and that he at once commenced to puff it out, fearful lest some terrible explosion was about to occur. It is, however, one of the many great advantages that will result from this interesting discovery, that danger of all kind will be much diminished by its use for domestic and public lighting. It emits no sparks, it gives forth by its combustion none of the gases so deleterious to health, that are generated in the combustion of all the hydro-carbons— as gas, wax, oil, tallow, kerosene, &c., &c. It of course consumes the oxygen of the air in a room, and liberates the nitrogen, but the result is merely a white powder, that may be collected for use, and stored in the domestic medicine chest—oxide of magnesium, otherwise magnesia. The last number of the *Builder* states that a Mr. Grant, in London, is constructing lamps in which to burn the wire, and render it of ready

household application. Two ounces and a half of the wire is said to be equal in illuminating power to 20lbs. of composite candles. It is sold in London at present at threepence per foot, but no doubt, if, as in all probability there will soon be, a great demand should arise for it, it will be manufactured at a much cheaper rate. The sources from whence it may be obtained, are perhaps more numerous and inexhaustible than coal itself. I have long been sanguine, that the electric-light might be made economically applicable for domestic and public lighting, but as yet the cost has limited its use. For sanitary ends, inasmuch as it is a generator of nature's grand aerial disinfectant, Ozone, it would surpass in its beneficial effects, the magnesium-light, with which many persons are apt to confound it. I apprehend no discovery of modern times, since coal-gas was made use of in private and public illumination, approaches any thing near in the promise of usefulness as this application of the combustion of magnesium wire.

My last subject is one of a purely sanitary nature, and refers to the well-being of those helpless infants, who cannot obtain the maternal nourishment. A loud cry has been raised throughout the civilised world, at the fearful extent of infant mortality, arising from ignorance and neglect. The greatest of modern dietetic chemists, the world-renowned Baron Liebig of Munich, from a family necessity, has been induced to direct his eminent skill to the compounding of a substitute for mother's-milk, which shall resemble, in its nourishing qualities, that best of all food for the human infant. The last number of the "Lancet" notices these efforts thus:—"With that remarkable estimation of the greatness of small things which is one of the most valuable of his many high intellectual qualities, and with a tender appreciation of the importance of small people, Baron Liebig devotes a special article in an English scientific periodical (the *Popular Science Review*) to the description of a new article of diet which he conceives to be the most fitting substitute for the natural nutriment for those children who are by circumstances robbed of their mother's milk. It is well known that cow's milk does not adequately represent the milk of a healthy woman, and when wheaten flour is added, as it commonly is, (I am sorry to say in Tasmania other farinaceous articles of less nutritious value than this, are more generally used,—corn-flour, arrowroot, sago, rice, and such like starch-abounding, stomach-oppressing, and diarrhoea-engendering viands.) Liebig points out that, although starch be not unfitting for the nourishment of the infant, the change of it into sugar in the stomach during digestion, imposes an unnecessary labor on the organization, which will be spared it if the starch be beforehand transformed into the soluble forms of (glucose) sugar and dextrine. (In which forms only the cane sugar of domestic use and the starch abounding in all cereals, can be assimilated for the uses of the body.) This he effects by adding to the wheaten flour a certain quantity of malt—"as wheaten flour and malt flour contain less alkali than woman's milk, he supplies this when preparing the soup." Cow's milk, and that of most animals whose offspring begin to move about soon after birth, has a larger relative quantity of muscle and bone-making ingredients, than human milk, while the latter has more of the saccharine and oily, or respiratory materials. Some water therefore is ordered by medical men to dilute cow's milk, though it is usually carried to an injurious excess, (Liebig only adds one-fifth of water) and some loaf sugar added. Milk-sugar is expensive even

in England, and not to be obtained at all in the drug establishments of Tasmania. The great danger to be avoided in using cow's milk, is its liability to become sour, for acescent milk given to children is the great source of the bowel complaints, which carry off so many hand-fed children, so that it has almost become an axiom with medical men, that nine tenths of such children will die within one year after birth. Moreover, "wheaten flour, and the starchy farina generally have an acid reaction, and contain less alkali than milk; while, though women's milk contains less salts than cow's milk, it possesses a stronger alkaline reaction, and contains more free alkali, which in milk is always potash." "This alkali, we must pre-suppose, is requisite in the body for the normal functions of the child." Therefore, in compounding from cow's milk, wheaten flour, malt flour, and water, a substitute for woman's milk, potash must be added. This, I think, has generally been overlooked by medical practitioners. This "soup" as Baron Liebig denominates it, is prepared as follows:—"One part of wheat flour is put into the vessel used for making the soup (an enamelled saucepan is the best), and 10 parts of skimmed cow's milk are then added gradually, in small quantities, the mixture being stirred all the while uninterruptedly, to prevent the pap forming into lumps. To this mixture a proportion of bi-carbonate of potash is added, and then made to boil, the stirring continuing all the while, and after boiling from 3 to 4 minutes, the vessel is removed from the fire.

"One part of malt flour is now weighed, and mixed with 2 parts of water, and this is poured into the hot pap, and the whole once more stirred the while.

"The vessel is then covered to prevent the contents from cooling, and left to stand for half an hour. In order to avoid a too rapid cooling of the soup, it is advisable, after the addition of the malt, to put the vessel in hot—nearly boiling—water by which it becomes thinner and sweeter. At the end of this time the whole is passed through a fine sieve, in which the bran of the malt flour remains behind.

"For those persons who are acquainted with the mashing process, it is hardly necessary to call attention to the circumstance that after the addition of the malt the temperature ought not to exceed 148 Fahrenheit.

"In the preceding directions the time reckoned for the weighing and mixing the malt-flour with water is exactly sufficient to cool down the boiling milk pap to such a degree that when the malt is added, this mashing temperature is obtained." When the soup is properly prepared, it is as sweet as milk, and any further sweetening is unnecessary. It contains the double concentration of woman's milk. After boiling, the soup will keep 24 hours without undergoing any change. The malt-flour can be obtained by grinding malt in a coffee-mill, and sifting through a sieve or flour-dredge. I have prepared this artificial mother's-milk, and made a meal, of it. It is both palatable and easily digested. A portion kept in the ordinary temperature of a room was perfectly good and sweet, and exhibited the alkaline reaction to the litmus-paper test, when tried 27 hours afterwards. Nevertheless I shall always recommend that a baby's supply shall be freshly made night and morning, and that the most scrupulous attention be given to the cleanliness of all the utensils used. The proportions I used to meet this twelve-hourly demand as nearly as

possible were :—15 fluid ounces of skimmed cow's milk, one and a half ounce by weight of wheaten flour, and 22 grains of carbonate of potash boiled together as directed. In three ounces of cold water  $1\frac{1}{2}$  ounce of malt-flour was mixed, and added to the milk-flour pap when removed from the fire. The latter was of course then quite pasty, but at the end of the half hour's malting was sweet and thin. I am confident in the verity of Liebig's statement that this food will prove excellent for the nourishment of young infants, and that "children thrived perfectly well upon it, and many a petty suffering disappeared after some weeks' use of the soup." In Munich the apothecaries of the town have been induced by the most renowned of its physicians to keep for sale a mixture of the malt-flour, and bi-carbonate of potash, milk and wheat flour being supposed to be in every house.

It is the pride of modern science that its researches are made to have a practical application to the welfare of man. I shall not therefore deem it necessary to apologise for introducing so homely a subject into the discussions of the "Physical Section of the Royal Society of Tasmania." Whatever tends to benefit our common humanity, and may eventuate in the saving of many lives, will always hold the first place in my philosophy. How necessary such like information is, may be easily learned by enquiring from the Statist how many children perish, principally from mismanagement, before attaining the age of five years. In many places in England one-half of those born do so, and even in this admirably situated city, with its most propitious climate, out of about 920 annual births, on the last seven years' average, 138 infants under one year old annually perish, and 87 more between one and five years old. Whatever exertions may conduce to lessen this, generally remediable, mortality, is true philanthropy, and the subject is not unworthy of the best exertions of the most ardent, profound, and enlightened philosophy.