THURSDAY, JANUARY 27, 1870

## DUST AND DISEASE

PROFESSOR TYNDALL'S lecture last Friday night at the Royal Institution, which we give *in extenso* in another column, has excited unusual interest, not only on account of the Professor's beautiful demonstration of the presence of organic dust in our London atmosphere, but from the manner in which he has sought to connect this presence with certain theories of disease held by part of his audience.

The revelations made by an ordinary sunbeam passing through a hole in the shutter are familiar enough; and the changes produced on the beam by a candle flame or a red-hot poker (an experiment used long ago by Dr. Wollaston for another purpose) will show in a rough manner the nature of the investigations.

Their practical result may be thus stated: London air contains a large amount of organic particles powerfully reflecting a light thrown upon them; and these particles cease to reflect light when the air containing them is submitted to the action of a high temperature, or when it is passed through a strainer or filter. Some of the appearances produced by certain modifications of the experiments are striking. Such, for example, as the disappearance of reflected light when air of a temperature below the incandescent point is made to rise through the beam showing the dust; or when certain gases are used instead of warmed air. In these cases the reflection of light from the dust particles disappears, and blackness takes its place. We are not, however, convinced that the Professor's explanation of this striking phenomenon is quite tenable. It presupposes a rapidity in the gas and air currents greater than can be followed by the more sluggish dust particles; so that these are left behind, or thrown to one side, and the rarefied air or gas deprived of dust particles enters the beam, and becomes invisible from absence of reflecting particles.

One would suppose that, sooner or later, the particles must follow the air in which they float, unless the heated air or gas become so much lighter than the particles that the latter will tend to fall downwards. This point, however, is one which admits of further demonstration.

The microscope, on its side, has not been behindhand in the same field, and has told us something more about this organic air dust. It is found to vary in character according to the objects from which it proceeds, and according to the degree of ventilation in an apartment. A microscopist, with his air analyser, would very likely have told Professor Tyndall's audience how they were breathing fragments of each other's clothes, and the scurf skin of each other's hands and faces, besides other matters brought into the Institution by the listeners, or wafted in through the windows; and if a whiff of sewer air had entered the room, living *vibriones* would probably have been among the subjects of the microscopist's demonstration. Chemistry also has been at work in the same direction, and by means at her disposal she has been able to estimate approximately the amount of organic matter in air; and this application of chemical methods is now in common use for determining the state of ventilation in inhabited buildings, as well as the comparative purity of the air in town and country. We are glad that Prof. Tyndall has enlisted optical analysis in the same useful field of inquiry. His lecture, from the perfection of his experiments, was well adapted to impress the advantages of pure air on the minds of his audience and the public at large.

We cannot help feeling, however, that it would have been well if the able lecturer had confined his statement strictly to the scientific aspects of his subject. The germ theory of disease has nothing in common with it, and yet it was referred to as if to show that the fact of organic dust existing in the air rendered the existence of "disease germs," as they are called, more probable than they were before. In scientific subjects we cannot accept mere theories for facts. Let the advocates of disease germs first prove their existence, and then possibly optical and microscopic analysis will throw light on their mode of conveyance.

In imperfect science, as in other imperfect things, the first false step may lead anywhere, as the following extract from Dr. Bryden's singularly interesting report on Indian cholera, one of the supposed germ diseases, will show:—

> "The facts of the first European invasion showed that aërial transmission did not account for all the phenomena observed, such as the transmission of cholera by fomites, and the occasional infection of attendants on the sick. Hence there was initiated (*a*) the doctrine that cholera might be propagated by human intercommunication, and, as the latest phase of this doctrine, we find the confident assertion promulgated as a truth, that cholera is always and not occasionally so propagated. To prop up this assertion it was necessary to make a second assumption or theory. And hence arose the doctrine (*b*) that cholera is multiplied in the human economy. But this also must have stood alone and unsupported, unless it could be shown how and where the multiplication took place. And this led on to the starting of the third theory (*c*), which asserts that cholera is multiplied in, and is spread around by, the intestinal evacuations of those already suffering from the disease. But even this, although urged in the most forcible manner, did not meet all difficulties; and there arose the demand that it should be supplemented by a fourth theory. In relation to this demand, the latest theory (*d*) alleges that the evacuations of an individual in whom cholera has not become apparent, and never will appear, may be the means of spreading cholera around."

By endeavouring without observation to attain to knowledge which can only be arrived at by observation, theory has, in this instance, walked round in a circle and left science outside. In great questions affecting the health and life of nations, theories are quite out of place. They do no good, cost money, and bar scientific progress.

Practically, so far as health is concerned, Professor Tyndall has given us a scientific account, not only of certain optical properties of impure air, but likewise of the benefit of several popular practices, such, for example, as lighting fires during epidemics to purify the air, the use of gauze curtains in malarious districts as a protection against fever, covering the mouth with a cloth during sleep in fever countries, and the like. He has further given us an additional means of estimating the purity or impurity of the air we breathe. He has shown that heat purifies, more or less, impure air; and that impure air can be deprived of its suspended impurity by filtering it, as is the case with water. On the real proximate aërial cause of disease, if such there be, no new light has been yet thrown either by the optician, the microscopist, or the chemist.