practice leaped from one pole to the other, universal depletion gave way to universal stimulation, and we are now slowly and carefully trying back, so to speak, endeavoring to find out cases where bloodletting does good. We are constantly encountering papers in our journals where the one point of interest is that venesection was had recourse to with or without benefit. It has been the same in lunacy practice; from all the horrors of the old system, the step to non-restraint was sudden and complete. If there are men now who advocate mechanical appliances instead of living force in avowedly exceptional cases, are they to be called advocates of a *system* of restraint, any more than are the physicians above alluded to, to be dubbed followers of the Sangrado school? In no instance ought restraint to be had recourse to, without the direct permission or instruction of the medical superintendent; neither in any case ought the patient under restraint to be left to himself by his attendants. It is useless to argue, as does Dr. Gardner Hill, that the application of a strait jacket implies a struggle. No doubt it does in certain cases, but it is not a struggle prolonged for hours, as under the existing system, and it is exactly for such cases that we claim the advantages of mechanical over active restraint. Restraint does exist now in the shape of padded rooms and attendants' hands; why no other forms should be used we are at a loss to see.

But there is another matter alluded to by Dr. Sankey, of at least equal importance. The medical staff of our large asylums is utterly inadequate to the harassing duties they have to perform; and further, those who have most of the work to do are underpaid. Until these matters are remedied reform is hopeless.—*London Medical Times and Gazette.*

ON DUST AND HAZE.

By Professor TYNDALL, LL.D., F.R.S., M.R.I.

THE learned professor began his lecture before the Royal Institution of Great Britain, by stating that a sunbeam on entering a dark room becomes visible by illuminating the particles of dust floating therein. A beam of powerful light, such as that of the electric lamp, will prove the existence of these floating particles in the air of this room, or, indeed, in that of any other, even of the best-ordered drawing-room in London, although they are invisible by the light of ordinary candles or gas. Some months

ago, when he was engaged in a course of experiments on the action of light upon various vapors, he found this dust exceedingly troublesome. The air was wholly loaded with it, and although in his experiments it was of great importance to have the air entirely free from it, it became a matter of considerable difficulty to get rid of it. An "experimental tube" was filled with air which had been passed through tubes containing fragments of glass wetted with concentrated sulphuric acid, and marble wetted with a strong solution of caustic potash; but although the air was thoroughly dried by this means, the particles of dirt were carried along with it, and a beam of light passed through the tube discovered them in quantities as great as in common air. But it was found that by passing the air over a flame before letting it enter the drying tubes, every particle of dust was destroyed, and the beam of light passed through the "experimental tube" was *invisible*, owing to the absence of any illuminated particles. What did this prove? It showed, to his own astonishment, that this floating dust consisted of particles of combustible, and therefore organic matter—that the air which constantly surrounds us, which we are continually breathing, is loaded with living organisms, which are of necessity constantly passing into our lungs—that the dirt of the air of London is organic, and not, as he had supposed, of the same nature as the sand of the desert of Sahara, inorganic, incombustible. To make this matter quite certain, Mr. Valentin, of the Royal College of Chemistry, constructed for him a gas furnace, so arranged as to heat a platinum tube and a roll of platinum gauze; the air was made to pass through this tube and gauze, so as to insure the contact of the dust with the hot metal, and the result is given by the following table:—

Quantity of air.	State of platinum tube.	State of experimental tube.
15 inches.	Cold.	Full of particles.
"	Red hot.	Optically empty.
"	Cold.	Full of particles.
"	Red hot.	Optically empty.
"	Cold.	Full of particles.
"	Red hot.	Optically empty.

That is to say, when the air was passed *cold* into the experimental tube, the floating particles were not destroyed, and passed along with the air; but when the particles were consumed by the hot platinum, the experimental tube was "optically empty," there being no floating dust in it for the beam of light to illuminate.

The following table gives the results of experiments in which the air was allowed

to pass into the experimental tube under various conditions of speed and temperature:—

Quantity of air.	State of platinum tube.	State of experimental tube.
15 inches, <i>slow</i> .	Cold.	Full of particles.
“ “	Red hot.	Optically empty.
“ <i>quick</i> .	Red hot.	A blue cloud.
“ “	Intensely hot.	A fine blue cloud.

The cloud which appeared in the experimental tube when the air was passed quickly through the platinum was the smoke of the particles burned in the furnace. He had failed in his attempts to burn the particles in the open air by intense heat, but a flame of a spirit lamp held immediately under the electric beam gave a result which caused him the most intense astonishment. In common with every chemist he had hitherto considered the flame of a spirit lamp to be entirely smokeless. What, then, was his surprise to find that, on holding the flame under the beam, volumes of intensely black “smoke” were given off, blacker than he had ever seen issue from the funnel of a steamer! He tried several other flames; he burned spirit of wine on cotton wool; he tried the flame of a Bunsen’s burner with a tall chimney, but always with the same result. Wreaths of the blackest “smoke” ascended through the beam of light, showing themselves in the distinctest manner. The question then arose—Could this blackness be smoke at all? Could no other cause be assigned to explain the phenomenon? To settle this question, he tried the flame of pure hydrogen gas, in which it was impossible that carbon could be to make real smoke. But, on this being held beneath the electric beam, the same black wreaths ascended. A mass of red-hot iron gave the same result. What, then, was this darkness which was shown to exist in cases where smoke was impossible? It was simply the darkness of stellar space—the darkness caused by the absence of organic dust, showing that pure air is dark by virtue of its own intense transparency. Nothing could demonstrate more clearly the invisibility of the medium which renders all things visible. The flame held under the beam destroys the floating particles, and a stream of pure air ascends across the horizontal beam, which, jostling aside the dust-laden air, causes a black band of pure transparent air free from illuminated dust (in appearance exactly like smoke) to take its place across the beam. But it was also discovered that it was not necessary to consume the dust in order to produce pure air. It was found that a sphere of heated copper held beneath the

beam of light produced the same “smoky” appearance, and that, too, even after the temperature of the copper had fallen below that of boiling water. Upon this it was suggested that a sphere of boiling water would produce the same result, and this was found to be the case, although in a less degree. The reason of this is simple; the heated body quickly heats the air immediately surrounding it, but not the particles; the pure hot air ascends and makes its dark track across the beam, but the particles are left behind.

The learned Professor then showed that any gas, providing it was free from these floating particles of dust, would produce the same dark mark across the beam of light. He took a common glass shade, and placed it with its mouth downwards so that the beam should pass right through it from side to side. The shade being full of the air of the room, the light was of course visible all the way through it. He then introduced into the upper part of the shade, above the beam of light, a tube connected with a reservoir of hydrogen gas. The hydrogen soon filled the upper part of the shade, and, occupying more and more space as its volume increased, it speedily filled the greater part of the shade, the beam of light in the shade fading from the sight of the spectators as the hydrogen occupied the space traversed by it. The shade being removed, the beam of light appeared instantaneously in its place, but on the hydrogen being allowed to escape, a darkness as of a cloud of smoke passed across the beam, which immediately after its passage resumed its usual unbroken aspect. A gentlemen present seemed inclined to question the success of this experiment, but the learned Professor partially repeated it, and completely proved his point. Having then observed that any other gas—*e.g.*, common coal gas—would serve equally well for this experiment, he said that, seeing that the air we are constantly breathing is so entirely laden with these particles of organic matter, the wonder is that so small a portion of it is sometimes hurtful to human life. For some time an opinion had prevailed that contagious diseases were spread by a malarialia; it was believed that matter in a state of decay entered people’s bodies and produced in them conditions of decay like to its own. It was seen that the process of fermentation went on in this way, and that a little leaven leavened the whole lump. Why, then, it was asked, should we not believe that diseases propagate themselves thus? But in 1836 an answer was given to

this question by the discovery of the yeast plant, and fermentation was shown to be a process of life instead of one of decay. In 1837 Schwann discovered that meat highly heated and excluded from air never putrefied. Putrefaction is, then, the result of something derived from the air, which has the power of propagating itself in the body, and must be a living organism such as the dust of the air has been shown to contain. The "germ theory" of the propagation of disease has been slowly gaining ground in the opinions of medical men, and, at a time when it was thought improbable by many of them, the President of this Institution was one of its ablest advocates. These germs floating in the air enter the human frame, and, growing there, produce various disorders. In this way the Asiatic cholera, from a small beginning in the delta of the Ganges, in seventeen years occupied nearly the whole world. And the action of these germs has its exact counterpart in another part of nature's field; for as an acorn will produce an oak bearing a crop of acorns each capable of reproducing its parent tree, and so a whole forest may spring from a single seedling, so a germ of smallpox lodged in the body will produce a crop of pustules each one capable of reproducing germs like to the original one. Medical men know well how important it is to exclude the air from abscesses when they are being operated on, and instruments are specially constructed for this purpose; yet although the pus extracted on the first operation is sweet, on the second and all other operations it is generally putrescent, and swarming with living organisms called *vibrios*. This is caused by the germs clinging to the trocar, and by it introduced into the abscess, flourishing therein under favorable conditions of temperature and food. The only way to "clean" the canula and trocar of these germs is to heat the instruments as highly as their temper will allow. It was an ascertained fact that the troublesome hay-fever was caused by these same *vibrios*.

Having shown that it is useless to try to blow away the dust from a beam by means of bellows, since the dust from the bellows immediately replaces that blown away, the learned Professor proceeded to experiment on the state of the human breath as it issues from the lungs. His lungs being full of the common air of the room, he breathed through a heated tube so as to cause the breath to ascend through the beam of light, at the same time preventing any cloud of condensed aqueous vapor. At first no extraordinary appearance was visible, but

soon the familiar dark clouds denoting the absence of illuminated dust appeared. He contended that this showed the history of the air in the lungs as clearly as if his skin and breast bone were transparent. The air which entered the lungs at the end of taking breath, being also the first to leave them on expiration, had not had time to deposit its dirt; but the air which entered the lungs first, and left them at the end of the expiration, having deposited its dust at the bottom of the lungs, showed its freedom from floating particles by its smoke-like track across the beam. Again, he filled his lungs with air filtered through cotton wool, and, on expiration, the dark clouds were seen from beginning to end. This proves that a filter of cotton wool will exclude these particles, as might also be seen by filling the nozzle of a common bellows with lightly packed cotton wool, and directing the air across a beam of light. Instinctively acting on this principle, a medical man, on entering an infected atmosphere, places his silk handkerchief over his mouth and nostrils; and, taking this hint, Dr. Bence Jones had tried the above experiment, substituting silk for cotton wool, and had obtained substantially the same result, though in a less perfect degree. In conclusion, the learned Professor recommended the use of a respirator of cotton wool as a means of giving pure air to the lungs to all who are likely to be breathing germ-laden atmospheres; and at the present time, when London was full of scarlatina, he would recommend these respirators as the most efficient protection; and, armed by one of these, he declared his perfect willingness to enter any atmosphere, however infected it might be by scarlatina or other diseases.—*Ibid.*

Bibliographical Notices.

"*A Treatise on Intra-ocular Tumors, from original Clinical Observations and Anatomical Investigations.*" By H. KNAPP, M.D., late Professor of Ophthalmology, and Surgeon to the Ophthalmic Hospital in Heidelberg. Translated by S. COLE, M.D., of Chicago. New York: William Wood & Co.

As is well known to many in the profession, the author of this book, Dr. Knapp, left his position in Heidelberg and has settled in New York, to practise and teach Ophthalmology. He has an European reputation as an operator which is understood