Local inquiries into Sanitary Administration.

to the most scandalous extent, had occasioned. In addition to the above there were 86 cases where local epidemics were brought under notice of the department, or complaint was made of local circumstances likely to produce disease, but where (though in many cases a medical inspector's visit would have been desirable) inquiry and advice could only be by correspondence.

LOCAL GOVERNMENT BOARD REPORTS, 1874-1876.

[The following Reports are given in full. They relate specially to the most urgent questions of the time, viz.: the relations of the Local Government Board to Local Sanitary Authorities and the relationship of the Medical Department to the Local Government Board. They also relate to the System of Public Vaccination; the Prevention of Small-pox in England; the Prevention of Diseases other than Small-pox; the prevalence of Asiatic Cholera in Europe; Filth Diseases and their Prevention; Studies of Nuisance Prevention; the International Sanitary Conference at Vienna; the International relations of Asiatic Cholera. The Scientific Investigations were carried out under the Privy Council and the Reports are therefore grouped together and follow the Local Government Board Reports.—Ed.]

LOCAL GOVERNMENT BOARD REPORTS, 1874-1876.

Annual Report of 1874.*

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD,
&c. &c. &c.

Sir,

As the officer appointed to make report to the Local Government Board, for the annual information of Parliament, in relation to matters concerning the Public Health, and to the inquiries and other proceedings which the Board, under the Public Health Act, 1858, may have directed in such matters, I beg leave to submit to you that for the past two and a half years, and particularly during the last year, the circumstances of official and administrative transition, consequent on the Acts of Parliament of 1871 and 1872, have been such that no consistent scheme of report in general relation to the sanitary interests which are under the Board's superintendence has been possible to me; and the present Report, which regards the year 1873, must necessarily, even more than its two predecessors, illustrate the difficulty of the unsettled circumstances.

Appointment of Medical Officers of Health under the Act of 1872.

2. Of the Board's business during the year 1873 in matters of concern to the Public Health, the largest and incomparably the most important part was that which related to the action of local sanitary authorities under the Act of 1872 in appointing their Officers of Health and Inspectors of Nuisances. This action, which the Legislature, at the instance of the Royal Sanitary Commission, had made obligatory on all the local authorities, and which included as its most important feature

* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. I.

that for the first time the Medical Profession throughout the country was to be brought into official use with a view to the better prevention of disease, was, at least in part, even in the terms of the statute, tentative*; and evidently the discretion to be used by each authority in its compliance with the terms of the law would, for better or worse, be of great future consequence to the local working of the Sanitary Acts, and to eventual public estimation of the new machinery. The Board throughout the year 1873 was advising local authorities in detail on particular schemes of appointment and duty for the above-mentioned sanitary offices; but this branch of business was exclusively in the hands of the non-medical officers of the Board, and I therefore do not here attempt to give any account of the proceedings or their results.

Medical Inspections in regard of local sanitary questions.

3. Of the medical inspections which were made during 1873 in regard of local sanitary questions, and which under the peculiar circumstances of the year were but 42 in number, I subjoin a detailed list [A]. In one of them the inspection related to a question of hospital-accommodation, and in one to certain manufacturing processes causing nuisance to several districts; but otherwise universally the ground of inquiry was some more or less important presence of disease; and the last column of the subjoined table will enable some judgment to be formed as to the extent to which the powers of the authorities had been exercised, and the duties fulfilled, in the particular instances referred to. I may add that, as some of these local inquiries were in cases of much sanitary interest, I propose bringing their results before you, as soon as practicable, in a separate supplementary report.

Comparisons in the sanitary conditions under which certain industries carried on.

4. One considerable inquiry, of a sort different from the above, was in progress during part of the year, but has not hitherto been completed. It has in view to examine the

* In regard of rural sanitary districts the first appointments of medical officers of Health and Inspectors of Nuisances under the Act must be for a period not exceeding 5 years.—J.S.

sanitary conditions under which certain industries are now carried on, as compared with the lung-diseasing conditions which existed in 1860–64, when special report on them was made to the Privy Council; and I have to state that during 1873 contributions towards the making of that comparison were furnished in inquiries of the Medical Department as follows: by Dr. Ballard in respect of metal trades at Sheffield, Wolverhampton, Alcester, Bromsgrove, and Birmingham; by Dr. Blaxall in respect of glove-making at Yeovil; by Dr. E. Smith in respect of tailoring and printing in London; by Dr. Thorne in respect of pillow-lace manufacture at Newport and Towcester, of machine-lace and hosiery manufacture at Nottingham, Radford, and Basford, of straw-plaiting at Tring and Berkhampstead, of silk-weaving at Leek, of silk-weaving and watch-making at Coventry, and of hosiery manufacture at Leicester and Hinckley.

Public Vaccination.

5. The business of the Board as to vaccination in 1873 regarded, as usual, the following matters:—(*a*) the proceedings of local authorities and officers under the Vaccination Acts; (*b*) the provisions by which the national supply of vaccine lymph is maintained; and (*c*) the arrangements which give effect to the Order of Council regulating the qualifications of public vaccinators. (*a*) In superintendence of local proceedings under the Vaccination Acts, the Medical Department inspected 1,617 vaccination-districts in 354 Unions or parishes: each district-inspection involving, first, an inquiry into the state of vaccination in the district; secondly, where requisite, a notification to the authority as to defects found in the local administration of the Acts, with advice as to the changes required; and thirdly, in suitable cases, a recommendation of the vaccinator for pecuniary award, under section 5 of the Vaccination Act, 1867, out of moneys voted by Parliament for the purpose, and of which in 1873 an amount of 8,508*l.* 17*s.* 4*d.* was thus distributed. Particulars of the vaccination-inspections of 1873, and of the awards made to public vaccinators, are subjoined [A]. (*b*) Acting as National Vaccine Establishment, the Medical Department supplied vaccine lymph in answer to

9,569 applications. Particulars as to the sources whence this lymph was derived, and as to the applicants who received it, are given, with other statistics of the National Vaccine Establishment [A]. The stations supplying lymph for the public service were as usual specially inspected. (*c*) The several educational vaccinating stations, established with reference to the Order of Council which regulates the qualifications of public vaccinators, require in this relation to be inspected on behalf of the Board, and were, as usual, so inspected in 1873; but as they are for the most part stations which also supply lymph for the public service, and as the efficiency of a station for the latter purpose greatly concerns its efficiency for the former, the inspection of them in the one relation conveniently combines with inspection of them in the other, and in practice the two objects are attained in single inspections.

Prevalence of Asiatic Cholera in Europe.

6. Lastly, I have to report that in 1873, and particularly during much of the second half of the year, Asiatic cholera was more or less prevalent in many parts of continental Europe, and sometimes—as at Paris, Havre, Rotterdam and Antwerp—in places which have constant and easy communication with England. In our relations to cholera on the continent of Europe there are at present some points of interest on which I may have occasion to submit to you a supplementary report: but I need not here do more than refer to the Board's actual proceedings as to cholera during the year on which I am reporting. In July 1873, in view of the then circumstances, the Board issued (instead of an Order which had been issued in 1871 by the Lords of the Council) an amended Order, prescribing rules for the detention and examination of ships suspected of choleraic infection, and for dealing with cases of actual infection [A]. The Board also circulated among the local sanitary authorities of England a memorandum [A] which at the Board's desire I had prepared, on the precautions generally proper for local adoption under the circumstances; and particular communications on the subject of local arrangements were also had by the Board with several of the sanitary authorities of

ports. In a few cases, namely, three times in the Thames, twice at Liverpool, once at Southampton, and at least once at Swansea, the local arrangements were tested by infectious arrivals; and in most of these cases, as well as in several instances of false alarm, local inquiry was made by inspectors from the Medical Department: Dr. Buchanan, Mr. Radcliffe, Dr. Gwynne Harries, and Mr. Power.*

The above account refers, as I have stated, to a period of official and administrative transition, during which it is impossible to represent the Local Government Board as directing inquiries under the Public Health Act, 1858, in any definite relation to the new sanitary system of the

* In one case, among those which particularly concerned London, the danger was extremely great. On the 28th July, a ship from Hamburg landed at Blackwall a body of 82 Danish and Swedish emigrants, in destination for New Zealand. During the voyage no sort of illness, except sea-sickness, had been noted among them, and therefore no objection to their landing had been raised under the Board's recent Order; but almost immediately afterwards, when to await re-shipment, they had settled themselves in various lodging-houses in Whitechapel, and were legally in the position of ordinary residents in London, it became evident that cholera was among them; and the Board's first information of this state of the case was due to the courtesy of a private medical practitioner who had been called to the sick. As soon as his letter was received by the Board, communication on the subject was had by the Medical Department with the authorities and others who were concerned, and by great exertions of all, under a state of law in which everything depended on voluntary exertions on one side and absence of objection on the other, the emigrants by 31st July (the day on which they were to have been re-shipped for New Zealand) were collected and placed in isolation on the port authority's hospital-ship "Rhin" off Gravesend, to remain there under medical care. Then the houses where they had been temporarily lodged, and which meanwhile had been under close observation by the Whitechapel officer of health, Mr. Liddle, were finally disinfected. Of the 82 emigrants, 28 sickened and 8 died; but to our own population there was no extension of the disease. The removal was managed by the emigration agent, to whom the great importance had been explained of getting all the emigrants together into suitable quarters where their state of health could be medically watched and cases of incipient cholera be isolated; but this action, taken by him with the co-operation of the recently appointed able health-officer of the port, Mr. Harry Leach, was without any support from law. That he was able to do as advised, and to do it in such a way as to transfer an immense danger from the heart of London to a comparatively safe distance, was due to the goodwill of the port-authority, who made their Gravesend ship available for the relief of Whitechapel; and it seems to me that by acting in that liberal spirit the Corporation of the City helped London out of a serious difficulty. Dr. Buchanan, assisted in part by Dr. Gwynne Harries, was the inspector who visited in this important case.—J.S.

country; but with the end of the year 1873, that period of transition may be deemed to have nearly accomplished itself; and I may hope that, before the next season arrives for the submission of the Annual Report under the Act of 1858, it may have become possible to begin in a really useful sense such new succession of reports as the changed conditions of sanitary administration seem henceforth to require.

The Local Government Board as a Central Board of Health.

If, in that hope, I may venture to indicate from beforehand the purposes which it seems to me the reports under the Act of 1858 must in future be expected distinctively to fulfil, I would say that, whatever else they may be expected to do, at least they must be expected to set forth the knowledge which the Board, through its department of sanitary inquiry, obtains, with regard to the *practical effect of the laws which are in force for the prevention of disease throughout England.* It is the common conviction of persons who have most studied the subject, that the deaths which occur in this country (now about half a million a year) are by fully a third part more numerous than they would be if existing knowledge of the chief causes of disease were reasonably well applied throughout the country; and I need hardly add that, if thus some 125,000 cases of preventable suffering annually attain their final record in the death-register, that vast annual total has the terrible further meaning that each unit in it represents an indefinite (often very large) other number of cases, in which preventable disease, not ended in death, though often of far-reaching ill-effects on life, has also during the year been suffered. The Local Government Board, viewed as a Central Board of Health, and the more than fifteen hundred District-Authorities which, each with its appointed Medical Officer of Health, locally administer the health-laws, may be regarded as having had their respective functions assigned to them in special and systematic relation to that state of things; and it will be peculiarly with regard to that relation, namely, as rendering account of the central share of the responsibility, that the future Annual Reports of the holder of my office will, I apprehend, have their essential meaning.

In the sanitary administration of England, there are certain prescribed cases (chiefly in regard of local powers of rating,

mortgaging, and bye-law making) where the local action cannot be taken without previous express approval of the Central Authority; and no doubt the central authority, in its exercise of that responsibility, has often been able to influence very advantageously the course which Local Authorities have proposed to take. Also it possesses, in supposed reserve for great epidemic emergencies, a power to issue directions for certain purposes under the Diseases Prevention Act, 1855. But with exception of such special cases, the function of the Central Authority in regard of local sanitary action is primarily one of mere observation and inquiry. Not itself authorised to interfere in such action except where the results are at fault, it watches and interrogates results; and it is distinctively in this relation to the sanitary interests of the country that the Local Government Board will be represented by its ordinary proceedings under the Public Health Act, 1858. For the eventual test of local sanitary administration will be the success with which it prevents disease; and, in each case where the preventable disease is not prevented, the Local Government Board can, by skilled inspection under the Public Health Act, 1858, satisfy itself as to the circumstances and causes of the failure: giving thereupon such skilled advice, or proceeding in certain extreme cases to issue (under § 49 of the Act of 1866 or under the Diseases Prevention Act) such orders and directions, as the particular occasion may require.

What standards of success in Disease-Prevention ought to be taken as satisfactory by the local authorities which now have to act in that matter, and by the central authority which has to superintend their action, is a question on which I need not here submit more than very few general observations. Our large annual total of preventable deaths receives probably from most or all of the fifteen hundred sanitary districts of the country contributions, larger or smaller, which in their respective degrees are evidences of sanitary unsuccess; and I would therefore point out, as of very important bearing on the whole tone of sanitary administration, that, in the death-accounts which have henceforth to be critically examined by both Central and Local Authorities, figures which arithme-

tically make but little show may, for administrative purposes, have immense meaning. One or two deaths by enteric fever, noted in a Quarterly Return of the Registrar-General in regard of some village or small country town, may in hundreds of instances correspond to long-continued local conditions of scandalous filth and unwholesomeness: one or two deaths by scarlatina or small-pox, almost unnoted in regard of some considerable town, may represent the beginning of what, three months later, will be a terrible epidemic, agitating the community with distress and fear, and adding prodigiously to the whole year's death-rate of the place; and it is with reference to considerations like these, that records of even single deaths will now have to be medically read and interpreted. In regard of such epidemic visitations as are aptest in this country to excite local alarm, and to be felt as conclusive appeals for central interference, it may appear a mere truism to say that, in proportion as the disease is present, the time for preventing it is past: but for practical purposes it is indeed all-important to remember that sanitary administration has its hopes of success in preventing, not in arresting, great epidemics; and that, if warnings are not taken from the smaller excesses of disease, catastrophes, not further warnings, may be next to come. It seems almost unnecessary to add that a method of procedure which waits for death as its ground of action may peculiarly dispense with cumulative proofs; and that, as no one preventable death can any longer be remedied in regard of him who has suffered it, so the record of it may the more emphatically claim to be read as a protest on behalf of others.

The vigilance which the Local Government Board has to exercise in regard of the local prevention of disease in England will of course not universally need to express itself in the form of inspections. As regards the Board's giving of advice or assistance to local sanitary authorities and their officers, clearly this would be limited, first, by the fact that, unasked, it could not properly have place except where the local results showed need for it; and secondly, by the consideration, that, in the large and permanent interests of sanitary government, a maximum of local self-reliance and a

minimum of central intervention are in themselves important aims. And even as regards mere inquiry into the facts of what is locally going on, correspondence (often bringing in the reports of local officers) will in some cases afford the Board all adequate information for its purpose.

On the other hand, and provided due regard be had to the above considerations, the advantage which may be gained to the sanitary progress of the country by inspections conducted, at least for many years, on a sufficiently large scale, under the Public Health Act, 1858, can hardly, I think, be overestimated. It has, I believe, been the experience of the Local Government Board in those branches of its administration which do not concern the public health (as particularly in its poor-law and common municipal business) that the personal agency of Inspectors of the Board, as distinguished from mere inquiry and advice by letter, is, in a very large proportion of cases, essential to the success of the work: first, in order that the Board may competently understand the local conditions or proceedings which it desires to judge; and secondly, in order that, in a degree and with an effect which no letter-writing can attain, it may make to the local authorities with which it has concern precisely such representations, and may give them precisely such advice, as the particular local circumstances require. The Board would probably not expect experience of a different kind in its future, essentially medical, province of sanitary superintendence; and indeed, as regards this province, my own experience enables me to say with certainty that it is peculiarly one in which clerical, as compared with inspectorial agency, would show itself inadequate to the purpose. By skilled inspections under the Public Health Act, 1858, on such a scale as practically to represent a central audit of local death-accounts, and an exertion of central influence or authority in favour of more active or better-directed local efforts in places where human life had not been sufficiently cared for, the Local Government Board would be in reality, though only in the limited sense which the law prescribes, a Board of Sanitary Superintendence for England.

Briefly then, as regards the Annual Reports to be hereafter made under the Public Health Act, 1858, the state of the

case, as I apprehend it, will be this. The Local Government Board will from time to time determine what degree of central vigilance as to the local prevention of disease shall be represented by its proceedings under the Act, and will regulate in accordance with such standard of work the staff by which the work has to be executed. It will be for the holder of my office annually to lay before the Board a report of the proceedings so taken: substantially a report on the new sanitary administration of the country, as examined by the Board from the standpoint of results; and which, so far as means for it exist, would aim at exhibiting, for the information of Parliament, what, year by year, are the chief existing excesses of disease in the several sanitary divisions of England, and what the relation of such excesses to insufficiencies of law or administration. Incidentally to the above, which I have regarded as the essential business of future annual reports under the Act, it would probably be of advantage to the public service that the reporter should use the same annual opportunity for submitting to the Board, with a view to publication, such new knowledge as the Medical Department might during the past year have acquired with reference to the prevention of disease, and such new memoranda of advice on sanitary subjects as the growing experience of the Department might be held to justify.

From among the many points of local relation which the Board's sanitary superintendence must include, there is one which in conclusion I will specially mention: not indeed without confessing that, in love and honour for my own profession, I regard it with warm personal interest; but believing that I may, nevertheless, without partiality describe it as of fundamental interest to the working of the scheme of recent legislation. While watching, from the point of view of results, the action taken by local authorities throughout England for the better prevention of disease, the Board will be superintending the exact province of work for which the respective local authorities under the Act of 1872 are required to appoint their Medical Officers of Health; and the inspections under the Public Health Act, 1858, will therefore, so far as they extend, give the Board knowledge of the working of

that new institution in the various forms in which it is being tried throughout the country, and in which, in regard of about half the number of cases, the trial is with the Board's part-payment and particular responsibility. Such inspections, too, as bringing the Board's Medical Department into direct relation with the local Officers of Health, and giving the Department opportunity to contribute any assistance in its power to the success of the local institution, will, where they extend, represent an object which the Royal Sanitary Commission, in making the recommendations on which the Public Health Acts of 1871 and 1872 were founded, put forward as an element of their scheme. As regards that intention of the Royal Sanitary Commission, I need hardly say that, to any holder of my office, it must always be among the highest of ambitions to be able to see the experience of this Department really conducive to the information and influence of younger fellow-labourers in other parts of the same great field of public service; and it would be affectation in me to deny that, during many early years of the new organization, relations in that sense between the central and local services may often be of important, and sometimes of indispensable, use to the latter. I would, however, also express my confident expectation that, though from the nature of the case the relation in these earlier years must chiefly consist in assistance which the central office can so render, succeeding years will more and more bring the central office under obligation to local contributors of knowledge, and to local illustrations of progress. And year by year it will surely grow to be among the most useful, as it must also be among the happiest, duties of the Annual Reporter under the Public Health Act, 1858, to represent, for the information of all the Officers of Health of the kingdom, such additional fruits of scientific observation, and such new evidences of practical success, as will have come to the Board's knowledge from among their number.

I have the honour to be,
Sir,
&c., &c.

[The following Cholera Memorandum is the last issue of an official memorandum which in earlier forms had been issued by Mr. Simon in 1866 and 1871.—Ed.]

Appendix No. 5.

Memorandum on Precautions to be taken against the Infection of Cholera.

Precautions against Cholera.

1. As Asiatic Cholera is now prevailing in parts of the Continent of Europe, and may probably extend (or perhaps has already extended) to places which are in frequent and rapid communication with England, it is not unlikely that, within the next month or two, cases of the disease may be brought into the ports of this country.

2. The Order, now about be issued, of the Local Government Board will give power to local Sanitary Authorities to deal with any such cases, if they arrive, in a way to protect the population, as far as practicable, against surprise. But as cases of choleraic infection have widely different degrees of severity, it is possible that some such cases, slightly affected, will, notwithstanding the vigilance of local Authorities, be landed without particular notice in English sea-board towns, whence then they may advance to other, and perhaps inland, places.

3. Former experience of Cholera in England justifies a belief that the presence of imported cases of the disease at various spots in the country will not be capable of causing much injury to the population, if the places receiving the infection have had the advantage of proper sanitary administration; and, in order that all local populations may make their self-defence as effective as they can, it will be well for them to have regard to the present state of knowledge concerning the mode in which epidemics of Cholera (at least in this country) are produced.

4. Cholera in England shows itself so little contagious, in the sense in which small-pox and scarlatina are commonly called contagious, that, if reasonable care be taken where it is present, there is almost no risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But cholera has a certain peculiar infectiveness of its own, which, *where local conditions assist*, can operate with terrible force, and at considerable distances from the sick. It is characteristic of Cholera (and as much so of the slightest choleraic diarrhœa as of the disease in its more developed and alarming forms) that *all matters which the patient discharges from his stomach and bowels are infective*. Probably, under ordinary circumstances, the patient has no power of infecting other persons except by means of these discharges; nor any power of infecting even by them, except in so far as particles of them are enabled to taint the food, water, or air, which people consume. Thus, when a case of Cholera is imported into any place, the disease is not likely to spread, unless in proportion as it finds, locally open to it certain facilities for spreading by *indirect infection*. In order rightly to appreciate what these facilities must be, the following considerations have to be borne in mind:—*first*, that any choleraic discharge, cast without previous thorough disinfection into any cesspool or drain, or other depository or conduit of filth, infects the excremental matters with which it there mingles, and probably, more or less, the effluvia which those matters evolve; *secondly*, that the infective power of choleraic discharges attaches to whatever bedding, clothing, towels, and like things, have been imbued with them, and renders these things, if not thoroughly disinfected, as capable of spreading the disease in places to which they are sent (for washing or other purposes) as, in like circumstances, the

patient himself would be; *thirdly*, that if, by leakage or soakage from cesspools or drains, or through reckless casting out of slops and wash-water, any taint (however small) of the infective material gets access to wells or other sources of drinking-water, it imparts to enormous volumes of water the power of propagating the disease. When due regard is had to these possibilities of indirect infection, there will be no difficulty in understanding that even a single case of Cholera, perhaps of the slightest degree, and perhaps quite unsuspected in its neighbourhood, may, *if local circumstances co-operate*, exert a terribly infective power on considerable masses of population. Precautions against Cholera.

5. It might be supposed that, under those provisions of the Sanitary Acts which relate to precautions against dangerous infections of disease, security could be taken, as regards the infective discharges of Cholera, against various kinds of personal conduct which would be dangerous to the public health; above all, that, under those provisions or otherwise, the universal disinfection of such discharges could be enforced. Undoubtedly everything possible in this direction ought to be done wherever a case of Cholera is known to exist: too much importance cannot be attached to the precaution of thoroughly disinfecting, without delay, all discharges from the stomach and bowels of persons suffering under the disease, and of disinfecting, or destroying all bedding, clothing, towels, and the like, which such discharges may have imbued: and of course neither choleraic discharges, nor any slops which may contain traces of them, should ever (even when supposed to be disinfected) be cast into any position from which they may get access into drinking-water. But, although the duty of observing those precautions is one which ought never to be neglected, populations cannot prudently stake their lives on the chance that it will be completely fulfilled for them. Apart from all questions of negligence, the degrees of Cholera are too many, and the slight and incipient cases far too apt to escape observation, for any such defence against its infection to be more than partial. And therefore the main object for endeavour must be TO SECURE EVERYWHERE SUCH LOCAL CIRCUMSTANCES THAT THE INFECTIVE MATERIAL, THOUGH NOT DISINFECTED, WOULD BE UNABLE TO SPREAD ITS INFLUENCE AMONG THE POPULATION.

6. The dangers which have to be guarded against as favouring the spread of Cholera-infection are particularly two. First, and above all, there is the danger of WATER-SUPPLIES which are in any (even the slightest) degree tainted by house refuse or other like kinds of filth; as where there is outflow, leakage or filtration, from sewers, house-drains, privies, cesspools, foul ditches or the like, into springs, streams, wells, or reservoirs, from which the supply of water is drawn, or into the soil in which the wells are situate; a danger which may exist on a small scale (but perhaps often repeated in the same district) at the pump or dip-well of a private house, or, on a large and even vast scale, in the source of public waterworks. And secondly, there is the danger of breathing AIR which is foul with effluvia from the same sorts of impurity.

7. Information as to the high degree in which those two dangers affect the public health in ordinary times, and as to the special importance which attaches to them at times when any diarrhœal infection is likely to be introduced, has now for so many years been before the public, that the improved systems of refuse removal and water supply by which the dangers are permanently obviated for large populations, and also the minor structural improvements by which separate households are secured against them, ought long ago to have come into universal use.

So far, however, as this wiser course has not been adopted, temporary security must, as far as practicable, be sought in measures of a palliative kind.

Precautions against Cholera.

(*a.*) Immediate and searching examination of sources of water-supply should be made in all cases where the source is in any degree open to the suspicion of impurity: and the water both from private and public sources should be examined. Where pollution is discovered everything practicable should be done to prevent the pollution from continuing, or, if this object cannot be attained, to prevent the water from being drunk.

(*b.*) Simultaneously, there should be immediate thorough removal of every sort of house refuse and other filth which has accumulated in neglected places; future accumulations of the same sort should be prevented; attention should be given to all defects of house-drains and sinks through which offensive smells are let into houses; thorough washing and lime-washing of uncleanly premises, especially of such as are densely occupied, should be practised again and again.

(*c.*) Disinfection should be very freely and very frequently employed in and round about houses, wherever there are receptacles or conduits of filth; wherever there is filth-sodden porous earth; wherever anything else, in or under or about the house, tends to make the atmosphere foul.

In the absence of permanent safeguards, no approach to security can be got without incessant cleansings and disinfections, or without extreme and constant vigilance against every possible contamination of drinking-water.

8. In view of any possibility that the infection of Cholera may again be present in this country, it is desirable that in each locality the public should ascertain to whom it practically has to look, in case of need, for its collective safety against such dangers as the above. The responsibility is, in a large proportion of cases, mixed. The most critical of all its branches, the responsibility of providing for the unpollutedness of water-supplies, is, in many very important places, in the hands of commercial companies; and it is to be hoped that these companies, informed, as they must be, of the calamitous influence which some of their number have exerted in previous epidemics of Cholera, will remember, if the disease shall again be present here, that each of them, in its daily distribution of water, has hundreds, or even thousands, of human lives in its hands. But, except to that extent, the responsibility for local defences against Cholera, both as regards water-supply and as regards local cleanliness and refuse removal, is vested in the local Sanitary Authorities, Urban and Rural. These Authorities are all, by law, so constituted, as to represent, in their respective areas of jurisdiction, the will of the local rate-paying population; and each such population has had almost absolute means of deciding for itself whether the district which it inhabits should be wholesomely or unwholesomely kept. It is greatly to be wished that the former of these alternatives had, from long ago, been the desire of every local constituency in the country; and it may fairly be believed that, in considerable parts of the country, conditions favourable to the spread of Cholera are less abundant than at former times of visitation. But it is certain that in very many places the conditions of security are wholly or almost wholly absent; and it is to be hoped that in all this large class of cases, the Authorities, under present circumstances, will do everything which, in the remaining time, can be done, to justify the trust reposed in them by the Legislature for the protection of the public health.

9. It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this memorandum refers cannot in any event be regarded as wasted trouble and expense. The local conditions which would enable Cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of Cholera, create and spread

other diseases: diseases, which, as being never absent from the country, are, in the long run, far more destructive than Cholera: and the sanitary improvements which would justify a sense of security against any apprehended importations of Cholera would, to their extent, though Cholera should never re-appear in England, give amply remunerative results in the prevention of those other diseases.

JOHN SIMON,
Medical Officer of the Board.

Local Government Board,
July 5th, 1873.

Supplementary Report of 1874.*

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

SIR,

IN my recent Annual Report, when adverting to the list which I then submitted of inspections made under you by this Department during the year 1873, I stated that some of the cases had been of so much sanitary interest that I would, as soon as I could, bring them more particularly under your notice in a separate Supplementary Report.

My reference was especially to three very instructive outbreaks of Enteric or Typhoid Fever which had been investigated within the year: but I find that with them I can advantageously associate two other of our departmental cases which have had an exactly similar interest; and I accordingly beg leave to draw your attention to the subjoined reports of the Inspectors by whom the five outbreaks were investigated.†

---

* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. II.

† Report by Dr. Blaxall on an outbreak of enteric fever in the town of Sherborne, Dorsetshire.

Report by Dr. Buchanan on an outbreak of enteric fever in Caius College, Cambridge.

Report by Dr. Ballard on an outbreak of enteric fever at Armley in the Borough of Leeds.

Report by Dr. Ballard on an outbreak of enteric fever at Moseley and Balsall Heath, near Birmingham.

Report by Mr. J. Netten Radcliffe and Mr. W. H. Power on an outbreak of enteric fever in Marylebone and the adjoining parts of London.

Enteric Fever, in regard of its mode of origin, seems to me the type of so vast a quantity of preventable disease as to claim, in an administrative point of view, the earliest and most vigilant attention of the Local Government Board. I therefore, at the opportunity of bringing the present special instances under your notice, and by way of preface to them, would submit to you some observations in which I have sought to embody the general experience of this Department with regard to Enteric Fever and the diseases which in preventability are most akin to it. I also annex, as of very valuable aid to the purpose of these observations, Mr. Netten Radcliffe's report of the results of a large inquiry, on which he has recently been engaged, with regard to that branch of local sanitary administration which is most concerned with the prevention of Enteric Fever.*

I have the honor to be, Sir,

&c., &c.

Filth-Diseases and their Prevention.

I.

1.—In the subject-matter of Preventive Medicine, considered with reference to the administrative needs of England at the present time, Enteric Fever, with the diseases which are allied to it in mode of origin, must necessarily, I think, stand as first topic: and I avail myself of this earliest opportunity to submit to the Local Government Board some observations on that class of diseases.

That very much disease is preventable, is the *raison d'être* of sanitary authorities.

2.—In my recent Annual Report, the vast amount of injury which is suffered day by day in this country through diseases

* Report by Mr. J. Netten Radcliffe on certain Means of preventing Excrement Nuisances in Towns and Villages.

well known to be preventable was referred to in regard of the responsibility which it imposes on all who have undertaken to serve in the new sanitary organisation of the country; and I submitted that "the Local Government Board, viewed as a "Central Board of Health, and the more than fifteen hundred "District-Authorities which, each with its Medical Officer "of Health, locally administer the Health Laws, may be "regarded as having had their respective functions assigned "to them in special and systematic relation to that state of "things."

Among the consequences of preventable disease, only the deaths can be counted.

3.—I do not pretend to give any exact statement of the total influence which preventable diseases exert against the efficiency and happiness of our population; for it is only so far as such diseases kill, and even thus far but very imperfectly, that the effect can be represented in numbers. Of the incalculable amount of physical suffering and disablement which they occasion, and of the sorrows and anxieties, the often permanent darkening of life, the straightened means of subsistence, the very frequent destitution and pauperism, which attend or follow such suffering, death-statistics, to which alone I can refer, testify only in sample or by suggestion.

Rough estimate of the mortality which is preventable:

4.—That the deaths which we in each year register in this country (now about half a million a year) are fully 125,000 more numerous than they would be if existing knowledge of the chief causes of diseases, as affecting masses of population, were reasonably well applied throughout England, is, I believe, the common conviction of persons who have studied the subject. The statistical considerations which in the first instance suggest that conclusion have so long and so admirably been put before the public in the successive Reports of the Registrar-General that I need but very briefly, and only by way of illustration, advert to them. Looking at England as a whole, we see that of each 100 persons who die, not quite 10 have reached the standard old age of seventy-five years; and that of each 100 children born hardly 74 complete five years of life. We next see what appears to be a widely different

expectation of life in different districts of the country: that while, for instance, in a considerable proportion (about a seventh of the number) of the districts into which England is divided for registration-purposes, the death-rate of infants in the first year of life, ranges from 8 to 12 per cent., there is a still larger proportion of districts in which it ranges even from 19 to 30; and that, under the influence of these Herodian districts the infant death-rate of England as a whole stands at the high average of 18. Similarly, taking the death-rate of the population at all ages living, we find that the present general English death-rate of about 22½ per 1,000 per annum, covers on the one hand local death-rates ranging from 13 to 17, and on the other hand local death-rates which range even to far above 30. Primâ facie, then, it would seem that influences hostile to life must be operating in parts of England far more vehemently than in other parts; and we turn to the registered "causes of death" to learn from them, if we can, under what peculiarities of local assessment life is so differently taxed or mulcted in the different parts of this one country. Here of course we have to proceed with caution; for alleged causes of death may be registered on very imperfect non-medical testimony; and even medical certificates (since rapidly growing knowledge cannot be equally distributed in a very large and wide-spread profession) may in variable proportions be so inexact or arbitrary in their naming of the causes of death as to be unavailable for comparisons in this respect. With due caution, however, cases of this sort can be set aside, or the fallacies which they would introduce be guarded against; and when, with such caution, different districts are compared in regard of the causes of death registered in them, this finer sort of comparison adds very greatly to the force of the rougher comparisons which were first made; for, so far as the register of "causes of death" can intelligibly answer us, it says that certain sorts of disease—and those just the sorts which we in other ways know to be the most preventable, are very greatly more fatal in some districts of England than in others. This statistical conclusion, as based on the local death-returns which are made to the Registrar-General, was to some extent indicated by Dr. William Farr more than

30 years ago in the earlier annual reports of the General Register Office, and was afterwards more fully established and discussed in an important paper by Dr. Greenhow which I had the honour of laying before the General Board of Health in 1858.* From the passing of the Public Health Act of that year, the unequal distribution of different diseases in England became matter for detailed medical investigation and advice under the Privy Council; and in proportion as particular districts have been medically inspected with regard to the prevalence in them of the particular diseases to which attention had been drawn, so has evidence become more and more complete, with regard to the dependence of vast annual excesses of disease and death on causes which in the most moderate sense may be called removable.

preventable, namely, under action of law.

The causes of disease to which I here refer as removable are exclusively such as contravene Public Hygiene: such, namely, as affect more or less in common the mode of life of masses of population, and such as in most, if not in all instances, are already understood to be under ban of law. Doubtless much disease is also produced, and much life consequently wasted, through causes which are within the province of Private Hygiene; causes, which either are not of massive operation, or may at least easily be escaped at individual option, and which the law does not, and generally could not, take within its scope; but to such causes I do not advert as removable in the sense of my present argument.

Of removable causes of disease, the chief is uncleanliness:

5.—Among causes which injuriously affect the Public Health of England, considered as a total, certain operate only in particular districts: as, for instance, some large adjacency of malarious or water-logged land, or some prevalent injurious industry: while others, though no doubt in widely different degrees, appear to be of general, perhaps nearly universal, operation. Foremost in the latter class, and constituting therefore in my opinion objects which claim earliest attention

* "Papers relating to the Sanitary State of the People of England: with an Introductory Report by the Medical Officer of the Board on the Preventability of certain Kinds of Premature Death."—J.S.

in the sanitary government of England, two gigantic evils stand conspicuous :—

first, the omission (whether through neglect or through want of skill) to make due removal of refuse-matters, solid and liquid, from inhabited places ; and,

secondly, the licence which is permitted to cases of dangerous infectious disease to scatter abroad the seeds of their infection.

In certain very important cases, injury—immense injury, accruing to the public health, arises from a co-operation of these two evils: arises, namely, through the special facility which (as I shall presently illustrate) certain forms of local uncleanliness provide for the spreading of certain specific infections ; and the influence which uncleanliness almost necessarily exerts in that way against the public health, make so large an addition to the influence which it exerts in other ways, that, in total power, uncleanliness must, I think, without doubt, be reckoned as the deadliest of our present removable causes of disease.

and particularly in the degrees which constitute Filth.

In stating this opinion of its fatal influence, I do not refer to it in its minor degrees, as compared with high standards of cleanliness or chemical purity, but refer chiefly to such degrees of it as fall, or ought to fall, within the designation of FILTH :—to degrees, namely, which in most cases obviously, and in other cases under but slight mask, are such as any average man or woman should be disgusted at: such as, eminently, the presence of putrescent refuse-matter, solid and fluid, causing nuisance by its effluvia and soakage. Also in imputing to Filth, as thus illustrated, that its effluvia are largely productive of disease, I do not ignore that disease is also abundantly caused by air which is fouled in other ways. Particularly I do not forget the effluvia of overcrowding: that, within dwellings which are populated beyond their means of ventilation, the foulness of air, due to the non-removal of the volatile refuse of the human body, is as strictly within the physiologist's definition of Filth, and as truly a nuisance within the scope of sanitary law, as any non-removal of solid or liquid refuse: but for the purpose of my present observations, the question of overcrowding is something to be set aside as

distinct, and the word "Filth" is therefore here used distinctively in that sense which suggests subject-matter for sewers and scavenging.

Old general knowledge of the hurtfulness of Filth.

6.—It has been among the oldest and most universal of medical experiences that populations, living amid Filth, and within direct reach of its polluting influence, succumb to various diseases which under opposite conditions are comparatively or absolutely unknown ; and the broad knowledge that Filth makes Disease is amply represented in the oldest records which exist of legislation meant for masses of mankind. The exacter studies of modern times have further shewn that by various channels of indirect and clandestine influence (some of which I shall presently illustrate) Filth can operate far more subtly, and also far more widely and more destructively, than our forefathers conjectured. The later almost equally with the former knowledge, the finer almost equally with the more general, is indispensable for sanitary administration in modern times; and Filth is little likely to be guarded against with that thoroughness of detail which present science shows to be necessary, unless the detail follow some intelligent appreciation of the ways in which Filth becomes destructive. This more exact knowledge, though it owes its origin to medical observation, and will no doubt constantly be receiving additions from the same source, is such as at least all well-educated persons of the general public may be expected gradually to acquire and apply; and I believe that our newly instituted Medical Officers of Health will be rendering not their least service to the public, when they shall make their own possession of this branch of medical knowledge, and their consequent power of interpreting many obscure productions of disease, subservient to the education of the laity among whom they act.

Modern, more particular, knowledge of its modes of hurtful operation.

7.—An important suggestion of modern science with regard to the nature of the operations by which Filth, attacking the human body, is able to disorder or destroy it, is: that the chief morbific agencies in Filth are other than those chemically-identified stinking gaseous products of organic decomposition

which force themselves on popular attention. Exposure to the sufficiently concentrated fumes of organic decomposition (as for instance in an unventilated old cesspool or long-blocked sewer) may, no doubt, prove immediately fatal by reason of some large quantity of sulphide of ammonium, or other like poisonous and fœtid gas, which the sufferer suddenly inhales; and far smaller doses of these fœtid gases, as breathed with extreme dilution in ordinary stinking atmospheres, both give immediate headache and general discomfort to sensitive persons temporarily exposed to them, and also appear to keep in a somewhat vaguely depressed state of health many who habitually breathe them: but here, so far as we yet know, is the end of the potency of those stinking gases. While, however, thus far there is only the familiar case of the so-called *common chemical poison*, which hurts by instant action and in direct proportion to its palpable and ponderable dose, the other and far wider possibilities of mischief which we recognise in Filth are such as apparently must be attributed to *morbific ferments* or *contagia;* matters which not only are not gaseous, but on the contrary, so far as we know them, seem to have their essence, or an inseparable part of it, in certain solid elements which the microscope discovers in them: in living organisms, namely, which in their largest sizes are but very minute microscopical objects, and at their least sizes are probably unseen even with the microscope; organisms which, in virtue of their vitality, are indefinitely self-multiplying within their respective spheres of operation, and which therefore, as in contrast with common poisons, can develop indefinitely large ulterior effects from first doses which are indefinitely small. Of ferments thus characterised, the apparently essential factors of specific chemical processes, at least one sort—the ordinary septic ferment*—seems always to be present where putrefactive changes are in progress, as of course in all decaying animal refuse; while others, though certainly not essential to all such putridity, are in different degrees apt, and some of them little less than certain, to be

* For convenience I use the singular number, but have no intention of implying that ordinary putrefactive changes have only one ferment which can be considered habitual to them.—J.S.

frequent incidents of our ordinary refuse. As, apparently, it is by these various agencies (essential and incidental) that Filth produces "zymotic" disease, it is important not to confound them with the fœtid gases of organic decomposition; and the question, what infecting powers are prevalent in given atmospheres, should never be regarded as a mere question of stink. It is of the utmost practical importance to recognise in regard of Filth, that agents which destroy its stink may yet leave all its main powers of disease-production undiminished. Whether the ferments of disease, if they could be isolated in sufficient quantity, would prove themselves in any degree odorous, is a point on which no guess needs be hazarded; but it is certain that in doses in which they can fatally infect the human body they are infinitely out of reach of even the most cultivated sense of smell, and that this sense (though its positive warnings are of indispensable sanitary service) is not able, except by indirect and quite insufficient perceptions, to warn us against risks of morbid infection. Even as regards the positive notices which we receive by the sense of smell with regard to putrefactive decomposition, we must not assume that the diffusion and potency of septic ferment in the air necessarily go pari passu with the diffusion and offensiveness of the fœtid gases:—Witness, on a very large scale, the experience of London in the summer of 1858; when as persons who were then freqenting Westminster may well remember, our tidal river, enormously charged with decomposing sewage, stank week after week in a degree which excited much public alarm as to the possible consequences of the nuisance, and even led to an immediate interference of the Legislature; but when, though the quantity of sulphuretted hydrogen in the river-atmosphere was such as rapidly to blacken the ordinary chemical test-papers, as well as to affect in the same way the lead-paint of vessels on the river, and was enough also to produce among persons much engaged on the river such signs of sulphide-poisoning as I have above mentioned, the particular ailments

* See the word "speedily" in the preamble of the amending Metropolis Local Management Act, 21 & 22 Vict., c. 104.—J.S.

which attest the working of septic ferment on the human body were in even less than average prevalence among the unwilling subjects of this large experiment.*

Filth-ferments in their relation to air :

It must be remembered that gases on the one hand, and the particulate ferments on the other, stand in widely different relations to air and water as their respective media of diffusion. The ferments, so far as we know them, shew no power of active diffusion in dry air: diffusing in it only as they are passively wafted, and then probably, if the air be freely open, not carrying their vitality far: but, as moisture is their normal medium, currents of humid air (as from sewers and drains) can doubtless lift them in their full effectiveness, and, if into houses or confined exterior spaces, then with their chief chances of remaining effective: and ill-ventilated low-lying localities, if unclean as regards the removal of their refuse, may especially be expected to have these ferments present in their common atmosphere, as well as teeming in their soil and ground-water.

and to water.

Considerations like some which I have stated in regard of infective air apply equally to infective water. In the latter, just as in the former, the zymotic malignity is but indirectly and most imperfectly suggested to us by qualities which strike the common sense, or by matters which chemical analysis can specify. As any unbrutalised sense of smell will turn with disgust from certain airs, so will it, and common taste and sight, be repelled by certain waters; and as the chemist can shew certain foulnesses in the one, so he can shew certain foulnesses in the other; but these tests, it must always be remembered, are tests only of the most general kind. Confessedly they do not touch the *corpus delicti*, but only certain conditions to which it is or may be collateral; and their negative findings are consequently not entitled to the same sort of confidence as their positive. Chemical demonstration of unstable nitrogenous compounds in water is a warning which of course should never be disregarded: but till chemistry shall have learnt to identify the morbific ferments

* The particulars of this very interesting experience are given in my Second Annual Report to the Privy Council, in a paper for which I was indebted to Dr. Ord, Physician to St. Thomas's Hospital.—J.S.

themselves, its competence to declare them absent in any given case must evidently be judged incomplete, and waters which chemical analysis would probably not condemn may certainly be carrying in them very fatal seeds of infection.

Excess of disease in filthy places not always due only to the Filth

8.—Populations under the influence of Filth are in many cases suffering not only from that influence, but also from other removable causes of disease; and in any endeavour to estimate at all exactly, as for administrative judgment, the injury which is derived from Filth, evidently those additional influences should as far as practicable be made matter of separate account. In one case a filthy neighbourhood may be so poor that mere privation is an appreciable cause of disease in it. In another case, the population may be so badly housed in respects which by themselves would not be classed as Filth,—may be so overcrowded in their dwellings, or be inhabiting such close or ill-built quarters, that this has to be counted as causing disease. In a third case, some particular collective occupation, injurious to the adults and adolescents who follow it, may be creating disease additional to that which the Filth produces. In a fourth case, swarms of infants and young children, whose mothers are engaged away from home in some local industry, may be suffering disease from neglect and mismanagement: and so forth. And evidently if one would see what harm Filth can do in its own ways, one must discriminate it as far as possible from such concomitants as the above.

but notwithstanding mixed cases, the hurtfulness of the Filth is certain.

In filthy urban districts, where the foul air, comparatively incarcerated in courts and alleys and narrow streets, can act with most force in regard to masses of population, the population always shews an increased mortality under several titles of disease. Such miscellaneous increase of mortality affects probably all ages, more or less, but a distinctively large proportion of it attaches to the children. Apparently the mere influence of the Filth (apart from other influences) in such a district will be causing the infants and young children to die at twice or thrice or four-times their fair standard rate of mortality; and this disproportion, which becomes even more striking when the chief epidemics of ordinary childhood

(measles and whooping-cough and scarlatina) are left out of the comparison, seems to mark the young lives as finer tests of foul air than are the elder and perhaps acclimatised population.

In trying to analyse the death-statistics of filthy districts, we soon find that, with regard to many of the separate elements in the miscellaneous mortality, we cannot argue in exact scientific terms: partly because very large quantities are registered under names which have no definite nosological meaning,—e.g. "convulsions," "teething," "atrophy," "consumption"; partly also because some kinds which we can fairly identify by name (e.g. pneumonia) are such as we do not always ætiologically understand; and sometimes we may be only able to establish the broad fact that, within the area of Filth, the deaths, in total amount, are greatly more numerous than ought to be, and that the excess (or in mixed cases a certain share of the excess) can only be accounted for as the effect of the Filth. Though, when that broad conclusion is reached, more detailed conclusions may at first sight scarcely seem wanted for practical purposes, yet there is advantage in establishing the details of each case as exactly as the circumstances will allow; not only because it greatly concerns the progress of preventive medicine that all our attributions of cause and effect should be in the spirit of exact science, but also because in regard to filthy rural districts the argument from general death-rates would often be insufficient to carry conviction: and I therefore proceed to speak with some particularity of individual diseases which can be traced to Filth.*

Of diseases distinctively due to Filth, the most characteristic are the diarrhœal.

9.—In all filthy districts, one particular class of diseases seems specially apt to stand in relief: the diseases, viz., which, in respect of their leading symptom, may be generalised as

* I would note that, writing here on these diseases only for immediate practical purposes, I am obliged to leave unnoticed various of the more scientific aspects of the subject, as I must thus leave undiscussed the very interesting question of the influence of particular soils and seasons in favoring epidemics of Filth-Disease, I would the more especially refer to the very valuable and suggestive writings of Professor v. Pettenkofer, of Munich, on this branch of the study of Cholera and Enteric Fever.—J.S.

diarrhœal. These diseases, in their relation to Filth, deserve very special attention: first, on their own account, as extremely large causes of death; and secondly, because an exact knowledge of their method of production is likely to throw comparative light on the pathology of obscurer filth-diseases.

Common diarrhœa, and its relation to Filth.

A certain large quantity of endemic diarrhœa is medically spoken of as "common," in contrast with such so-called "specific" diarrhœal diseases as cholera and enteric fever. Perhaps in a certain sense all might equally claim to be called "specific:" since, no doubt, each distinct effect has essentially its own distinct cause: but at least provisionally the contrast of terms is convenient, because much "common" filth-produced diarrhœa (with perhaps much else of the miscellaneous mortality of the same districts) may reasonably be ascribed to infection with the "common" septic ferment which is an attribute of all filth. Among the effects which arise under experimental septic infections, as likewise in cases of accidental septicæmia in the human subject, acute catarrh of the mucous membrane of the intestines is an extremely prominent fact. The mucous membrane of the intestinal canal seems peculiarly to bear the stress of all accidental putridities which enter the blood. Whether they have been breathed or drunk or eaten, or sucked up into the bloodvessels from the surface of foul sores, or directly injected into bloodvessels by the physiological experimenter, there peculiarly the effect may be looked for: just as wine, however administered, would "get into the head," so the septic ferment, whencesoever it may have entered the blood, is apt to find its way thence to the bowels, and there, as universal result, to produce diarrhœa.

Enteric fever and its relation to excremental infection.

10.—It seems certain, however, that in the high diarrhœal mortality of filthy places, infections, of the sorts already recognised as "specific," exercise always a very great influence: and in the studies which have made a basis for the suggestions of preventive medicine in relation to Filth, none have hitherto been so instructive as the study of these "specific" filth-infections. To them I would now

particularly advert; referring first to the disease which of late years has for sufficiently sad reasons become well known to the public of this country under the name of Enteric or Typhoid Fever.

Since the year 1849, when Dr. (now Sir William) Jenner made known his conclusive and masterly discrimination of this specific form of fever, successive studies have tended with singular uniformity to connect it in regard of its origin with nuisances of an excremental sort.* In illustration of that fact in the natural history of enteric fever, I may refer to an abstract which I append of the experience of the Medical Department during the four years 1870–3 in this particular branch of disease-production: and such illustrations might be multiplied to any desired extent. The experience is, not only that privies and privy-drainage, with their respective stinkings and soakings, and the pollutions of air and water which are thus produced, have in innumerable instances been the apparent causes of outbreaks of enteric fever, but, further, that they have seemed capable of doing this mischief in a doubly distinctive way: first, as though by some aptitude which other nuisances of organic decomposition, though perhaps equally offensive, have not seemed equally or nearly equally to possess; and secondly, as though this specific property, so often attaching to them in addition to their common septic unwholesomeness, were not, even in them, a fixed property. The explanation of this experience, the explanation of the frequent but not invariable tendency of privy-nuisances to infect with enteric fever, has seemed to consist in the liability of such nuisances to carry with them, not invariably, but as frequent accidental adjuncts, the "specific" contagium of any prevailing bowel-infection: for presumably the privies of a population receive (inter alia) the diarrhœal discharges of the sick; and it has long been matter of fair pathological presumption that in any "specific" diarrhœa (such as eminently is enteric fever) every discharge from the bowels must teem

* The very able writings of Dr. Murchison, dating from a paper by him in the Medico-Chirurgical Transactions of 1858, have been of particular influence in that contention.—J.S.

with the contagium of the disease.* Medical knowledge in support of this presumption has of late been rapidly growing more positive and precise; and at the moment of my present writing I have the gratification of believing that under my Lords of the Council it has received an increase which may be of critical importance, in a discovery which seems to give us for the first time an ocular test of the contagium of enteric fever: in the discovery, namely, of microscopical forms, apparently of the lowest vegetable life, multiplying to innumerable swarms in the intestinal tissues of the sick, penetrating on the one hand from the mucous surface into the general system of the patient, and contributory on the other hand, with whatever infective power they represent, to the bowel-contents which have presently to pass forth from him.† Adverting then summarily, in an administrative point of view, to the present state of medical knowledge and opinion as to the way in which enteric fever spreads its infection in this country, I would say that it is difficult to conceive, in regard to any causation of disease in a civilised community, any physical picture more loathsome than that which is here suggested: that apparently, of all the diseases which are attributable to Filth, this, as an administrative scandal, may be proclaimed as the very type and quintessence: that, though sometimes by covert processes which I will hereafter explain, yet far oftener in the most glaring way, it apparently has an invariable source in that which of Filth is the filthiest: that apparently its infection runs its course, as with successive inoculations from man to man, by instrumentality of the

* This is the argument of the late Dr. John Snow: which though urged by him more particularly in relation to Asiatic Cholera, was meant by him to have general application, and was expressly applied by him to enteric fever. In the latter relation it has from 17 years ago been constantly and very powerfully urged by Dr. Wm. Budd, of Clifton. From the beginning of our European experiences of Cholera the doctrine of the specific infectiveness of the discharges in the disease had been argued by Dr. von Gietl of Munich, to explain, as he maintained, the atmospheric diffusion of the epidemic influence —J.S.

† This discovery (as I believe it to be) of the microphyte of enteric fever is the work of Dr. Klein, Assistant-Professor in the Brown Institution, and arose in one of the *Scientific Investigations in aid of Pathology and Medicine* which I have the honor of superintending under my Lords of the Council. The details of the subject are still undergoing investigation at Dr. Klein's hands.—J.S.

molecules of excrement which man's filthiness lets mingle in his air and food and drink.

Cholera, and its relation to excremental infection.

11.—It seems certain that the distribution in England of an immense quantity of other specific disease must exactly follow that disgusting type. The local affinities of Asiatic Cholera, when present in this country, have always been so close to those of enteric fever, in respect of its association with circumstances of excremental filth, and the lines of pathological argument on this association (even apart from evidence which has been alleged on the direct communicability of cholera to the lower animals) are so parallel in the two cases, that no reasonable doubt can, I think, be entertained as to the substantial dependence of cholera-epidemics in this country on the opportunities which are ever widely open for the above-described filthy method of infection. Indeed, with regard to the manner of spread of the entero-zymotic diseases generally, it deserves notice that the whole pathological argument which I am explaining grew among us in this country out of the very cogent facts which our cholera-epidemics specially supplied, and to which the late Dr. John Snow, twenty-five years ago, had the great merit of forcing medical attention: an attention at first quite incredulous, but which, at least for the last fifteen years, as facts have accumulated, has gradually been changing into conviction.

Similar relation of other diseases.

12.—The argument which applies to the bowel-discharges of Cholera and Enteric Fever, and which, in regard of them, rests on a very large quantity of detailed evidence, seems to extend by extremely strong analogy to every disease, whether nominally "common" or "specific," in which the human intestinal canal is the seat of infected changes: chiefly perhaps to such diarrhœal and dysenteric infections as are exclusively or distinctively intestinal, but likewise, I apprehend, more or less, to every general infection (such for instance as scarlatina) in proportion as it inclusively infects the bowels: and it would thus seem probable that air and water, having in them the taint of human excrement, must often carry with them, whithersoever they pass, the seeds of current morbid infections.

Powers of common septic infection to produce disease.

13.—But though hitherto, for convenience of argument, I have referred specially to the influence of human excrement in determining the spread of "specific" infections from man to man, and provisionally as if man's body were the sole birth-place of the several contagia which afflict his kind, assuredly that intermediary influence is but part, and it may be but a very subordinate part, of the faculty by which Filth produces disease. While it is indeed true as regards some contagia that at present we know them only as incidents of the human body, wherein we see them in case after case multiplying their respective types with a successivity as definite and identical as that of the highest orders of animal or vegetable life,—and while thus it is at present true, for instance, of small-pox or syphilis, that a case arising independently of a previous like case is hitherto practically as unknown to us as the parentless production of dog or cat, our knowledge with regard to other very important contagia is growing to be of larger scope. I would mention it as among the most hopeful advances of modern preventive medicine, that some diseases, which, in the sense of being able to continue their species from man to man, are apparently as "specific" as those which I have above-named, seem now beginning to confess in detail a birth-place exterior to man, a birth-place amid controllable conditions in the physical nature which is around us, a birth-place amid the "common," putrefactive changes of dead organic matter. Referring again now to what I have not pretended to be able to analyse in detail—the excess of miscellaneous, and in great part nominally "common," disease in filthy neighbourhoods, I would particularly wish to connect with that subject a reference to our growing scientific knowledge in the matter of the "common" septic ferment. The pathological studies of late years, including eminently certain very instructive researches which Professor Sanderson has conducted under my Lords of the Council, have clearly shewn that in the "common" septic ferment, or in some ferment or ferments not hitherto to be separated from it, there reside powers of disease-production as positive, though not hitherto as exactly defined, as those which reside in the variolous and syphilitic contagia. Experimentally we know of this ferment, that, when it is enabled by

artificial inoculations to act in its most effective way on the animal body, and even more when it has received a curious increment of strength which its first propagation within the living body seems to bestow on it, it shews itself one of the most tremendous of zymotic poisons. It rapidly in the one animal body develops disease which then is communicable to another: febrile disease, with inflammations numerous and intense, and including in marked degree one of the acutest known forms of intestinal inflammation and flux: disease exactly corresponding to certain very fatal and unfortunately not infrequent infections to which lying-in women, and persons with accidental wounds and the wounds of surgical operations, are most subject, but which also sometimes occur independently of such exceptional states; infections, chiefly known under the names of erysipelas, pyæmia, septicæmia and puerperal fever; infections, which we sometimes see locally arising anew in unquestionable dependence on Filth, but of some of which, when arisen, it is perfectly well known that they are among the most communicable of diseases. And a further, perhaps still more instructive, teaching of the artificial infections is this: that the "common" ferment, which in its stronger actions quickly destroys life by septicæmia, can in slighter actions start in the infected body chronic processes which will eventuate in general tubercular disease. I need hardly point out that the above facts, extremely suggestive though they are, must of course, in relation to my main argument, be applied only under certain reserve; that evidently the exact conditions of the physiological experiment are not reproduced in ordinary life; and that against the common septic ferment, as presented in fouled atmosphere or fouled drinking water, the living human body in its normal state can apparently make considerable (though presumably not unlimited) resistance. But after all such reserves the truth remains, that, looking well at the pathology of human life under residence in foul air, we find ourselves again and again reminded of these results of physiological experiment: often seeing phthisis and other tubercular and like diseases gradually developed, as though under gradual overpowering of the limited normal resistance to the septic ferment; or

seeing—and particularly where some exceptional bodily state (wounded or puerperal) gives opportunity, the sudden invasion of erysipelas or other septic infection, not in discoverable dependence on any human infectant, but conceivably a filth-inoculation from the air.* The line of reflection thus suggested is one which I cannot now follow further, but of which the practical interest seems to be extremely great. For, while the excessive production of fatal disease in filthy neighbourhoods is a fact as to which there can be no doubt, and of which the immediate significance is deplorable, the ulterior suggestion is this: that so far as Filth in any instance produces anew such a disease as erysipelas or puerperal fever on the one hand, or phthisis or other tubercular disease on the other, the mischief first done is of a sort which entails certain possibilities of extension: such, namely, that in the one instance by accidental contagion, as in the other instance by hereditary transmission, it may, for aught we know, indefinitely extend beyond the sphere in which Filth first produced it.

II.

Forms in which Filth is found producing disease:

14.—Having in the above statements explained what I believe to be the present knowledge of my profession with regard to the diseases which Filth is apt to produce in the human body brought under its influence, and with regard therefore to the exact dangers which each prevalence of Filth implies, I now turn to the more administrative aspects of the matter, and may begin by referring to the chief forms in which Filth is apt to be about us.

Filth operating where it stands:

15.—There are houses, there are groups of houses, there are whole villages, there are considerable sections of towns, there are even entire and not small towns, where general slovenliness in everything which relates to the removal of refuse-matter, slovenliness which in very many cases amounts to utter bestiality of neglect, is the local habit: where, within or just outside each house, or in spaces common to many

* See in Sixth Report to the Privy Council, observations on the so-called "traumatic infections" in their relations to Hospital Hygiene.—J.S.

houses, lies for an indefinite time, undergoing fœtid decomposition, more or less of the putrefiable refuse which house-life, and some sorts of trade-life, produce: excrement of man and brute, and garbage of all sorts, and ponded slop-waters: sometimes lying bare on the common surface; sometimes unintentionally stored out of sight and recollection in drains or sewers which cannot carry them away; sometimes held in receptacles specially provided to favor accumulation, as privy-pits and other cesspools for excrement and slop-water, and so-called dust-bins receiving kitchen-refuse and other filth. And with this state of things, be it on large or on small scale, two chief sorts of danger to life arise: one, that volatile effluvia from the refuse pollute the surrounding air and everything which it contains; the other, that the liquid parts of the refuse pass by soakage or leakage into the surrounding soil, to mingle there of course in whatever water the soil yields, and in certain cases thus to occasion the deadliest pollution of wells and springs. To a really immense extent, to an extent indeed which persons unpractised in sanitary inspection could scarcely find themselves able to imagine, dangers of these two sorts are prevailing throughout the length and breadth of this country, not only in their slighter degrees, but in degrees which are gross and scandalous and very often, I repeat, truly bestial. And I state all this in unequivocal language, because I feel that, if the new sanitary organisation of the country is to fulfil its purpose, the administrators, local and central, must begin by fully recognising the real state of the case, and with consciousness that in many instances they will have to introduce for the first time, as into savage life, the rudiments of sanitary civilisation.

Filth operating at a distance.

16.—A second point, which equally with the above needs to be recognised by all who are responsible for the prevention of Filth-Diseases, is: that Filth does not only infect where it stands, but can transmit its infective power afar by certain appropriate channels of conveyance; that, for instance, houses which have unguarded drainage-communication with cesspools or sewers may receive through such communication the same filth-infections as if excrement stood rotting within their

walls; and that public or private water-reservoirs or water-conduits, giving accidental admission to filth, will carry the infection of the filth whithersoever their outflow reaches. Thus it has again and again happened that an individual house, with every apparent cleanliness and luxury, has received the contagium of enteric fever through some one unguarded drain-inlet; or that numbers of such houses have simultaneously received the infection, as an epidemic, in places where the drain-inlets in general have been subject to undue air-pressure from within the sewer. And thus equally on the other hand it has again and again happened that households, while themselves without sanitary reproach, have received the contagium of enteric fever through some nastiness affecting (perhaps at a considerable distance) the common water-supply of the district in which they are.*

Chief sources of excremental infection illustrated.

17.—When an epidemic of enteric fever, or of cholera or diarrhœa, has been traced (as in general it quite easily can be) to some gross excremental pollution of air or water, the primary source of such pollution will usually be under one or more of the following three heads, viz.—faults of public sewerage, faults of indoor water-closets and other apparatus of house-drainage, and the fault of bog-privies.

(1.) In regard of sewerage;

18.—The public sewerage may be at fault in either of two ways: first, in absence of sewers, so that slop-waters and other liquid filth, if not disposed of on the private premises, have to pass without proper tubular conveyance along public ways, either free on the general surface, or in open and

* For illustrations how the infection of houses with Filth-diseases (and specially with enteric fever) is promoted by imperfect ventilation of sewers, I may refer to the case of Windsor, which I gave in my first Annual Report to the Privy Council, or to the cases of Croydon and Worthing which Dr. Buchanan describes in appendix to my Ninth Report, and of course these illustrations of infection on an epidemic scale would apply à fortiori to individual cases where the drain-inlets of houses are left untrapped. To illustrate the relations of polluted public water-supplies to the dissemination of cholera and enteric fever, I may refer to the collection of cases which I gave in my Twelfth Report.—J.S.

generally very irregular channels meant only for rain-water, where necessarily they must more or less stagnate and stink and soak: secondly, in the existence of sewers which in themselves are more or less mischievous.

(*a.*) want of sewers;

With regard to non-provision of sewers in inhabited areas, apparently there often is an assumption that sewers may properly be dispensed with in cases where water-closets are not in use; that sewers (*i.e.* public drains of tubular type) are only wanted where the intention is to convey privy-refuse; and that, for the mere slop-waters of the population, the open way-side gutters which are meant for rain-water will suffice. This assumption can only rest on ignorance of what "slop-waters" really are, in respect of the filth which is contained in them; and its wrongness is sufficiently evident to anyone who observes how extremely offensive are in general such way-side gutters as are allowed to receive liquid refuse from groups of houses. Such refuse at its worst is a very condensed form of sewage, and even at its best is such as cannot without nuisance be let loiter and soak by the way-side. As soon as the point is passed at which houses can be expected to dispose of their own liquid refuse on their own ground, the point is reached at which proper public channels for the conveyance of such refuse should be provided; and the irregular way-side channels which may perhaps quite properly suffice for rainfall, cannot, I apprehend, in relation to slop-waters, be deemed such "sufficient sewers" as the law requires local authorities to provide.

(*b.*) faults in sewers;

Demerits in existing sewers can in some essential respects be judged by common observation. As the object of a sewer's existence is to prevent the stagnation of filth in and about houses and frequented places, and to guard against the dangerous pollution of air and soil which the filth, if not effectually conveyed away, must occasion, so, of course, any sewer which itself occasions any such stagnation and pollution is (in proportion as it does so) unsuccessful; and a sewer which stinks at its open gratings is, pro tanto, giving evidence of such unsuccess. The indispensable conditions of success in a sewer are, first that the flow of sewage to its outfall shall be, as perfectly as possible, continuous and complete and scouring,

not ponded and leaking and depositing; and, secondly, that the sewer shall have perfect ventilation. A sewer in which these conditions are fulfilled will scarcely, if at all, under ordinary circumstances, cause appreciable odour at open (untrapped) gullies in the street; the air in it, if at times compressed, will not easily exert at the duly guarded inlets of house-drains any such pressure as can make way for it into houses; and in cases where accidental defects of house-drains unfortunately permit sewer-air to enter houses, the sewer-air will be at its lowest degree of dangerousness. It is a great security for such perfect ventilation of sewers as is essential to the safety of houses, that, in addition to whatever special ventilating-shafts are provided, street-gullies should as far as practicable be left untrapped: and complaint of nuisance from any such gullies should not necessarily be taken as reason for trapping them. In case of such complaint, the presumption is that from original ill-construction or some other cause the sewer does not properly fulfil its object, but has filth accumulated and stagnant in it as in a cesspool, and has its ventilation at least relatively in defect; and the nuisance which such a sewer occasions in the public way, is far less important than the risk incurred by the inhabitants of houses which drain into the sewer. Merely to trap street-gullies in any such case would be greatly to increase the danger to houses; the use of charcoal trays in gullies, in the hope to disinfect their effluvia, has repeatedly proved dangerous in the same way: and I accordingly think it an essential principle, that the evil of a stinking sewer should always be dealt with at its root. Thus, a sewer which is imperfectly ventilated should have perfect ventilation provided for it; a sewer which, though fairly constructed, is from poorness of current not completely self-scouring, should at due intervals have extrinsic flushing: and sewers which, with radical ill-construction, are virtually but cesspools under the street, should without delay be abolished.

(2.) in regard of house drainage and water-closets;

19.—Secondly, a very large danger to the public health, and particularly to the better-off classes of society, has of

late years consisted in the recklessness with which house-drains, receiving pipes from water-closets, sinks, cisterns, baths, &c., in the interior of houses, and often actually within bedrooms or the adjoining dressing-rooms, have been brought into communication with sewers. Among architects and builders there seems to have been very imperfect recognition of the danger which this arrangement must involve, in even either of unskilful first construction or of subsequent mismanagement or want of repair. Then, in regard of construction, an almost unlimited trust has been placed in artisans who not only could hardly be expected to understand certain of the finer conditions (as to atmospheric pressure) which they had to meet, but who also in not a few instances have evidently failed to apprehend that even their mechanical work requires conscientious execution. Under influence of the latter deficiency there have been left in innumerable cases all sorts of escape-holes for sewer-effluvia into houses, and disjointed drains effusing their filth into basements: while under the other deficiency, house-drainage, though done with good workmanlike intention, has often, for want of skilled guidance, been left entirely without exterior ventilation, and sometimes has in addition had the over-flow pipes of baths or cisterns acting as sewer-ventilators into the house: and all this not infrequently in places where the sewer itself, from which so much air has been invited, has been an ill-conditioned and unventilated sort of cesspool. It is almost superfluous to say that under circumstances of this sort a large quantity of enteric fever has been ensured; and I should suppose that also a very large quantity of other filth-disease must have sprung from the same cause. Then there has been the vast quantity of interior air-fouling which arises from mismanagement of drain-inlets, or from non-repair of worn-out apparatus: as when sink-traps, injudiciously made moveable, have been set aside; or when pipes under temporary disuse, having evaporated all water from their traps, or leaden closet-pipes, with holes corroded in them, have been left fouling the house with a continuous eructation

of sewer-air.* Again, in poor neighbourhoods, water-closets have in many cases been constructed with scanty and ill-arranged water-service to flush them, or have even been left to only such flushing as the slop-water of the house, or other water thrown in by hand, might give: and again and again these ill-watered and often obstructed closets have been found acting on a large scale as causes of disease. Again, a different sort of danger, and one which seems capable of wide operation, has been seen to arise where water-closets receive their flushing-service from the mains of a so-called "constant" supply: for supplies called constant must not only sometimes intermit for purposes of necessary repair, but also in some cases are habitually cut off during the hours of night; and the danger is that, during times of intermission, if there be not service-boxes or cisterns between the privy-taps and the mains, privy-effluvia and even in some cases fluid filth will be (so to speak) sucked from closet-pans into water-pipes. This danger, which hitherto has been little known to the public, but which it is important to have well understood, is illustrated by two remarkable reports which I subjoin, respectively by Dr. Blaxall and Dr. Buchanan, on outbreaks of enteric fever thus occasioned. Dr. Blaxall's report [A] is of particular interest, as it represents, I believe, our first departmental discovery of this cause of disease in actual operation;† and Dr. Buchanan's [A] seems to me of remarkable value, not only as being in itself a model of exact ætiological inquiry, but as illustrating the filth-causation of enteric fever clandestinely affected, under circumstances where primâ facie any filth-disease would have seemed impossible.

* Dr. Andrew Fergus of Glasgow in papers of much sanitary interest contributed by him to the Edinburgh Medical Journal (February 1872 and February 1874) adduces evidence to show that the ordinary corrosion of leaden pipes from closets and sinks is a chemical effect of sewer-air, and that it goes on with greatly increased rapidity in cases where the pipes are unventilated.—J.S.

† I am glad to note, as corroboration from a source which I highly esteem, that, while Dr. Blaxall was recording the observations which he had made at Sherborne in evidence of the above mode of production of enteric fever, Dr. Alfred Carpenter of Croydon was recording independent observations which he had made in that town to the same effect. *See* "Public Health," July, 1873.—J.S.

(3.) in regard of accumulative privies.

20.—Thirdly, while it cannot be denied that ill-devised and ill-managed water-closets and their accompaniments have caused (and particularly among the better-off classes of society) filth-diseases to a very large extent, a far larger range of mischief throughout England has attached to the other kinds of privy-arrangement: and of all the filth-influences which prevail against human life in this country, privies of the accumulative sort operate undoubtedly to far the largest extent.

By what standard should they be judged?

The intention and, where realised, the distinctive merit of a system of water-closets is, that in removing excremental matters from a house it does so with perfect promptitude, and in a perfectly neat and complete manner, not having any intervals of delay, nor leaving any residue of filth, nor diffusing any during its operation; and where the water-system is not in use, these objects ought still as far as possible to be secured. Thus, in the absence of water-closets, evidently any reasonable alternative system ought to include the following two factors, brought into thoroughly good mutual adjustment: first, proper catchment-apparatus in privies; and secondly, proper arrangements for privy-scavenage. The essential conditions of a proper catchment-apparatus are that it, as well as all adjacent underworks of the privy, shall as far as practicable be unabsorbent; that it shall absolutely preclude soakage or leakage of filth into soil or buildings or water; that it shall not admit rainfall or slop-waters; that it shall be so limited in size as not to allow of any needlessly offensive accumulations of matter; and that, whether moveable or fixed, it shall easily admit of thorough cleansing. The essential conditions of proper privy-scavenging are, that it shall be strictly methodical; that from beginning to end it shall be so conducted as to occasion the least possible nuisance, public or private; that its performance shall be at such short intervals as invariably to precede the putrefaction of the excrement; and that there shall be associated with it all such acts of thorough cleansing as the catchment-apparatus and other underworks of the privies may require. Further, in order that the fulfilment of these conditions may be possible, it is essential that the location

and approaches of the privy should be definitely adapted to acts of scavenage.

Their actual relation to that standard.

Now, hitherto, in places not having water-closets, the general practice has flagrantly contravened those conditions. Either it has had no other catchment-apparatus than the bare earth beneath the privy-seat, and has trusted that this (receiving the excrements and often also the house-slops on to its natural surface or into a hole dug into it) would absorb and drain away the fluid filth, and serve during months and years as heaping-place for the remainder; or else it has had, as supplement to the privy, a large enclosed midden-stead or cesspool, partly or entirely of brickwork or masonry, intended to retain large accumulations of at least the solid filth, with or without the ashes and other dry refuse of the house, and in general dividing its fluid between an escape-channel, specially provided, and such soakage and leakage in other directions as the construction has undesignedly or designedly almost always permitted. Privies, such as these, have not been meant to have their filth removed except when its mere largeness of bulk (exceeding or threatening to exceed the limits of the privy-pit or cesspool or midden) might mechanically make removal necessary, or else when there might happen to arise an agricultural opportunity for the stuff; and public scavenging in relation to such privies has either had no existence, or has been adapted to the supposition of an indefinite local tolerance of accumulation. All this accumulation, with its attendant exhalation and soakage, and at intervals the shovelling and carting away of its masses of fœtid refuse, and the exposure of the filth-sodden catchment-surfaces of privy-pits and middens, has been, as needs hardly be said, an extreme nuisance to those in whose vicinity it has been; and sometimes with the aggravating condition that, because of the situation of the privy, each filth-removal must be through the inhabited house. What nuisance this system at present constitutes in innumerable populous places, including some of our largest towns, can indeed hardly be conceived by persons who do not know it in operation; and the infective pollutions of air and water-supply, which it occasions to an immense extent in towns and villages throughout the country, are

chief means of spreading in such places some of the most fatal of filth-diseases.

Excremental infection which has caused disease may require careful search to expose it:

21.—Such are the three heads, under one or more of which will commonly be found the true explanation of outbreaks and prevalences of entero-zymotic disease in the different districts of this country; and outbreaks which from time to time have arisen in seeming dissociation from such causes as I describe have again and again, under minute examination, resolved themselves into new illustrations of the general rule. For administrative reasons it is highly important that cases which seem exceptional should be thoroughly studied; and especially as regards enteric fever (because it apparently obeys so very sharply defined a rule of causation) I would advocate the strictest scrutiny of any origination which may seem not to have been excremental. Present knowledge seems very positively to say that the degree and extent in which enteric fever shall remain unexterminated from England will express the degree and extent in which sanitary administration shall have failed in rudimentary duties; and since, in particular local applications of this test, the prevalence of enteric fever in any district will primâ facie impugn the sufficiency of the local administration, it becomes of the more importance that the habits of the disease should be well understood, and that every mystification of unexplained facts should as far as possible be removed. An unexplained outbreak of enteric fever will sometimes mean, as in one very instructive case reported [A], that the locality where the disease occurs has had in it, as its own local property, some curiously unsuspected liability to filth-infection: but on the other hand there are circumstances under which the excremental nuisance of one district may exceptionally do its mischief in another. This possibility might of course be illustrated by any such conductions of filth as I have noted in a former passage of these observations; but I wish here to draw particular attention to the possibility, now well-established, of filth-infection being transmitted even on a large scale from district to district in particular articles of food, and especially in the article of milk. In 1870, Dr. Ballard, now of this Depart-

(l se as in case reported;

and in various epidemics produced by infected milk supply.

ment, but who at that time was working with high character as Officer of Health for the parish of Islington, was able to shew that an outbreak of enteric fever, which had attacked in ten weeks 70 families and 175 persons in part of his district, coincided with the use of milk supplied from a particular dairy, where shortly before the outbreak there had been cases of enteric fever, and where apparently the infected house-drainage must have had easy access to an underground water-tank on the premises. There could be little reasonable doubt as to what in this epidemic had been the infectant; and since Dr. Ballard's connexion with this Department it has twice happened to him to be able very clearly to trace the same method of infection at work in considerable outbreaks of enteric fever which he has been investigating; one in 1872 at Armley in the borough of Leeds, the other in 1873 at Moseley and Balsall Heath near Birmingham. A like case on a very large scale, and in some respects of unique interest, occurred also last year in London, chiefly in and about Marylebone, and was investigated elaborately by Mr. Netten Radcliffe, assisted in some stages of the inquiry by Mr. Power. A special interest of this case, as regards the point to which I have been adverting, is that here a great outbreak of enteric fever occurred at a distance of forty or fifty miles from the sanitary jurisdiction in which its true cause was contained; and the case is of the more value because the outbreak, as it happened to be in London, and happened also to have struck at its first blow in the houses of more than a dozen physicians and surgeons, had from the first its circumstances very attentively noticed by an unusual number of competent observers deeply interested in a right knowledge of them. I subjoin [A] the instructive reports which relate to these three epidemics of enteric fever, respectively referable to supplies of milk. There is in each case every reason to believe that the epidemic was due to excremental pollution of the dairyman's well; and it is solely in that point of view that I here insist on the cases. How the dairyman's water was enabled to spread its influence to his milk, and by what proportionate admixture it did so, are questions of little importance to my present subject-matter. The essential point is, that the water

with which a dairyman washes his pails, and of which a very variable quantity may under varying circumstances remain in them as an addition to his milk, is not likely to be of better quality than that which he and his local sanitary authority consider good enough for his own drinking; and that in regard of this and many like possibilities of casual filth-infection, the general public are in intimate sanitary partnership with various of their purveyors of food.

III.

To prevent Filth-Diseases, Filth must be prevented.

22.—In order to the prevention of Filth-Diseases, the prevention of Filth is indispensable. Truism though this may seem, I think it needs to be expressly insisted on, as against any belief that districts, allowed to become filthy, can off-hand be made wholesome by disinfectants. To chemically disinfect (in the true sense of that word) the filth of any neglected district, to follow the body and branchings of the filth with really effective chemical treatment, to thoroughly destroy or counteract it in muck-heaps and cesspools, and ashpits, and sewers, and drains, and where soaking into wells, and where exhaling into houses, cannot, I apprehend, be proposed as physically possible; and the utmost which disinfection can do in this sense is apparently not likely to be more than in a certain class of cases (see § 39) to contribute something collateral and supplementary to efforts which mainly must be of the other sort. This opinion, as to the very limited degree in which chemistry can prevail against arrears of uncleanliness, does not at all discredit the appeals which are constantly and very properly made to chemistry for help in a quite different sphere of operation; with regard, namely, to the management of individual cases of infectious disease, and to the immediate disinfection of everything which comes from them.* In this

Disinfectants can only give a very subordinate assistance.

* As regards certain procedures on a small scale, we know that, with well-circumscribed matter to work upon, and with chemical action precisely adjusted to its task, we can absolutely kill any given contagium. Taking, for instance, a bit of glass which has on it a charge of vaccine or variolous matter, we know that, if we *sufficiently* heat it in the flame of a lamp, or *sufficiently* treat it with certain strong officinal chemicals which act in a like manner, we annihilate the power of infection; and we know that, in the sick-room where lies a patient with any dangerous infectious disease—say diphtheria, small-pox, or enteric fever, we

latter use of disinfectants, everything turns on the accuracy and completeness with which each prescribed performance is done; but such accuracy and completeness are of course only to be ensured where operations are within well-defined and narrow limits; and in proportion as disinfection pretends to work on indefinite quantities or in indefinite spaces, it ceases to have that practical meaning. Again and again in the experience of this department a district has been found under some terrible visitation of enteric fever, from filth-infection operating through house drains or water-supply; but with the local authority inactive as to the true cause of the mischief, and only bent on practising about the place, under name of disinfection, some futile ceremony of vague chemical libations or powderings. Conduct such as this, referring apparently rather to some mythical "epidemic influence" than to the known causes of disease, and savouring rather of superstitious observance than of rational recourse to chemistry, is eminently not that by which filth-diseases can be prevented; and, contrasting it therefore with means by which that result can be secured, I would here specially note a warning against it.

The essential preventive is cleanliness;

23.—In order to reduce that vast quantity of preventable disease which has its type in enteric fever, and in relation to which each individual case of enteric fever which occurs ought to be regarded as having an important local significance, the one essential condition is CLEANLINESS. That local sanitary authorities, proceeding to act upon this principle,

can to some extent imitate the above acts. Provided that real skill shall direct, and real conscientiousness shall execute, what has to be done, every tangible discharge which passes from the patient, every sheet or towel or handkerchief which any discharge from him has fouled, can be treated with heat or other disinfectant in a way to give at least comparative security against any outward spreading of his infection. It is greatly to be hoped that, with time and with progress of general education, the systematic doing of such acts as these will in each sick-house be considered an imperative duty of good citizenship, and may at last be so fully understood in that light as to be made, as far as practicable, an obligation at law: for disinfection in that sense (however remote we may now be from any sufficient adoption of it) would undoubtedly, if adopted, make chemistry an important ally to cleanliness in combating the filth-diseases of England; but such disinfection, the whole value of which is in its precision, differs diametrically from the pretended district-disinfections to which my text refers.—J.S.

with a clear intelligence of what cleanliness really means, and with sincere resolution to enforce it in their respective districts, can within a few years reduce by some tens of thousands the annual mortality of England, is, I think, at least as certain as that such ought to be the aim of their existence.

in the highest degree in which it can be attained.

24.—The perfection of cleanliness would be that all refuse-matters should from their very beginning pass away inoffensively and continuously: and the principles of approximation to that ideal must evidently be, first to provide to the largest practicable extent for the continuous outflow of refuse as fast as produced, and secondly (so far as continuous outflow cannot be got) to provide for the closest possible limitation and the completest possible innocuousness of such refuse as is unavoidably detained. Rules like these present themselves as mere transcripts from Nature to those who know as physiologists how the animal body, in its individual working, deals with the refuse of its own vital actions: and the individual body, hindered in its respiration or other excretory acts, may serve to picture the inevitable unhealthiness of any community, whether large or small, which lets its decaying refuse-matters gather about it.

Cleanliness not possible for communities, except with method and organization for certain collective services.

25.—Wherever human beings are settled for residence, the cleanliness which is indispensable for healthy life can only be secured by strict method. Even where houses stand single and with wide space around them, the householder cannot safely neglect that sanitary obligation in regard of the refuse of his one household: the slop-waters, the cooking-waste, the various house-sweepings, the human fæces and urine, the excrements of domestic animals, &c.: and the obligation becomes more and more important in proportion as dwellings are gathered together on comparatively small areas.

The law does not allow any holder of premises, whether in town or country, to neglect that obligation to any injurious extent; and it is the express intention of the law that each local Sanitary Authority, rural or urban, should in its respective district see strictly to the enforcement of the

obligation, and give all proper aid to its due fulfilment. Each Authority is bound by law to see that the drains, water-closets, privies, and ash-pits in its district are so constructed and kept as not to be a nuisance: and with reference to these and various other matters of concern to health, each Authority is bound by law to make from time to time (either by itself or its officers) inspection of its district for the purpose of ascertaining what nuisances exist calling for abatement under the provisions of the Nuisances Removal Act, and the Authority must enforce those provisions against the nuisances. In order that residents may have necessary common facilities for disposing of their refuse, the Authorities are bound by law to make such sewers as may be necessary for effectually cleansing and draining their districts: and they may either themselves undertake or contract for the removal of refuse from premises and the cleansing of privies, ash-pits, and cesspools, or may make bye-laws imposing these duties upon the occupiers of the premises.

In the detailed application of the law different districts and parts of districts require, at the hands of their Authorities, a management graduated according to circumstances: certain circumstances requiring only the general supervision of the Authority, while others require, in higher and higher degrees, that the Authority should itself intervene and operate. The holder of outlying rural premises, will generally be able to consume his own refuse-matters satisfactorily on his own or some closely adjacent land: and the sanitary Authority, in regard of such cases, has only to make sure that the essential objects of the Nuisances Removal law are attained. Even here, however, it will always be requisite to see, as regards labourers' cottages and other like cases, that refuse is not thrown or accumulated in situations where its effluvia or soakings can be offensive or injurious; and the relation of privies, piggeries, cattle-stalls and dung-heaps, and of their several outflows, to the walls of dwellings and to sources of water-supply, must always be cautiously observed. In proportion as dwellings are aggregated, and populations increase, in villages, towns, and cities, it becomes more and more difficult for refuse to be properly disposed of by the separate

action of individual householders. In very early stages of such aggregation, the Authority finds itself called upon to provide common sewers for the joint liquid refuse of the localities, and more or less common scavenging, not only for the public ways but in aid of the defæcation of private premises; and these collective services require to be more and more developed in proportion as populations become more and more urban. In proportion as such facilities are not given, more and more vigilance is wanted under § 20 of the Sanitary Act, 1866, to see that nuisance do not arise from individual mismanagement of house-refuse,—that, in places unprovided with sewers nuisance be not caused by slop-water,—that, in places where water-closets are impossible, nuisance from bad privy-management do not exist,—that, in places to which scavenging does not extend, nuisance from filth-accumulation do not arise on individual premises. On the other hand, with the growth of the collective services, the Authority more and more finds that (greatly to the advantage of the public health) it has become the preventer rather than the remover of nuisances; and so universally is this the fact that, bearing it in mind, Sanitary Authorities, when proceeding to think systematically of their duties, will generally find it advantageous to regard the prevention rather than the removal of nuisances as their main administrative problem.

Removal of refuse has two main divisions: sewerage and scavenage.

26.—Sewerage and scavenage between them have to do all the work of each Local Authority in carrying off the refuse of the district: the privy-refuse, the ashpit-refuse, the slop-waters, and in certain cases trade-refuse and the refuse of domestic animals. Sewerage and scavenage—assisted, as regards the matters which are within their range, by proper bye-laws, and supplemented, as regards the matters which are outside their range, by proper enforcement of the law against nuisances,—they, thus assisted and supplemented, and of course with adequate supply of water, are the two essential agencies of all local cleanliness. In proceeding to settle any scheme for their local application, the question first to be decided is, which of the two is to deal with privy-refuse;

but whichever way this decision is to go, a clear view must always be had as to the eventual disposal of both sorts of refuse.

All disposal of refuse-matters must be so managed as not to make nuisance.

27.—All Local Authorities collecting refuse-matters, whether by sewerage or by scavenging, have of course to dispose of them in ways which shall not cause, or shall cause as little as possible, any nuisance in relation either to air or water: and this (sometimes difficult) obligation is at present urging itself on the notice of many Local Authorities as virtually a new problem with regard to the outfalls of liquid refuse. The obligation, not to cause nuisance by sewage outfalls, exists in an infinite range of magnitudes: from the vast sewage-tunnels of London on the one hand to the little village-sewer and its occasional flushings on the other; but, whether as to village slop-waters or to great urban sewage-floods, equally it has to be provided that no avoidable atmospheric nuisance shall be produced by the outfall, and that all natural water-courses (or at least all such as may be giving domestic supplies) shall be protected as far as practicable from pollution. Along the coast-line of England there may be cases in which those conditions will be most conveniently and cheaply attained by letting the sewage run as mere waste (subject to such precautions and with such engineering arrangements as may be necessary) into river-estuaries or into the sea: but this course, in the cases where it is possible, is not by any means necessarily to be preferred: for sewage contains the essential elements of fertilisation for land, and land ought always to be considered its proper destination except where from particular local circumstances this use of it would involve too much cost to be profitable. In the large majority of cases throughout England an option of entirely wasting sewage as above does not exist: on the contrary, the obligation not to cause nuisance by sewage-outfalls will be found in general to involve as its consequence that the sewage must be purified by land; which generally will in return by increased fertility yield more or less pecuniary set-off against the cost of such constructions and service as the use of that method of sewage-disinfection may require. Evidently, then, the management

of sewage-outfalls is a matter for serious consideration by Local Authorities: so that on the one hand each inhabited area may best eliminate every sort of fluid refuse which it produces, and that, on the other hand, the required prevention of outfall-nuisances may be economically as well as effectually attained. To improve public knowledge on the means of attaining those objects has for many past years been the object of continuous elaborate study under successive Royal Commissions; and it is to be desired that all persons who have to deal responsibly with the disposal of refuse-matters should be acquainted with the practical conclusions to which that study has led, as particularly represented in the very valuable reports of the Rivers Pollution Commission, 1868.

Disinfection of sewage.

28.—As regards means for disinfecting sewage the Commission reports that purification in such degree that the outflow may properly be allowed to pass into the running waters of the country, can be got under certain conditions by the action of land upon the sewage, but not in any other practicable way; and that, in order to the required action of land on sewage, two methods are available: the method by *agricultural irrigation* and the method by *intermittent filtration*.

Of these two methods neither can in practice be so applied as not to include some participation of the other: for filtering beds have of course more or less irrigated surface, and irrigated fields have of course more or less downward filtration: but, except so far as there is this accidental overlapping, the methods contrast with each other in respect of the natural forces to which they chiefly appeal; and, while they both effect the purification of sewage, their collateral results are widely different. The irrigation-method bases itself on the *appropriative* action which a certain surface of cultivated land with growing crops on it exerts over organic matters supplied to it as manure: the case for it exists in proportion as there is suitable land in the comparatively large extent which suffices to utilise to the utmost the fertilising power of sewage: and the intention is that this land, while disinfecting the sewage, shall also yield adequate pecuniary return in

irrigated crops. The filtration-method, on the contrary, bases itself on the *destructive* influence which a certain cubic quantity of well-aerated porous earth, receiving organic matters at intervals on its surface, and discharging them below, will exert on them as they gradually sink (followed again by air) through its thickness: it requires plots of suitably-placed porous land, deeply under-drained, to be used in rotation as disinfecting-ground for the sewage delivered on to them; and the method is such that, though more or less vegetable produce may be obtained from the comparatively small area of land which suffices for these filtration-plots, the fertilising powers of the sewage are of necessity in great part sacrificed.

In view of the sanitary intention of these processes, Local Authorities adopting either of them must, of course, see that it effects its proposed action completely, and that it does not cause any nuisance of its own. In choosing localities for irrigation or filtration, in designing the works for either purpose, and in the day-by-day management of such works, every possible care must be taken that all populations within range of influence of the works shall be safe from injury, whether through air or through water; and as regards the latter, it must be particularly cared for that the quantity of land, and the details of the application of sewage to it, shall be such as will, under all variations of seasons and weather, always effectually purify the sewage before it can have access to any watercourse. The standard of the Rivers Pollution Commission, on the presumption that rivers are not to supply drinking-water, is, that irrigation-land at the rate of at least an acre for every 100 of the population, or filtration-land at the rate of an acre for every 3,000 of the population, will give to sewage such degree of purification as to justify its being allowed to pass into rivers; but with what least quantity of land (properly used) the purification of sewage will be so complete that the out-flow of the land shall be safe drinking-water, is a question which has yet to be answered by local experiences.

Limits of the utility of sewers, as

29.—Among the conclusions of the Commission, there are two which may particularly assist the judgment of Local

regards what must, and what may be conveyed by them.

Authorities as to getting full use of sewerage in populous places. First, namely, with reference to the present state of the case as to excremental refuse, it appears that the ordinary sewage-problem as to the means of preventing nuisance from the outflow of populous places, is not materially lighter in places where water-closets are few or none, and where systems which purport to withhold privy-solids from the sewers are in use, than it is in places where water-closets are general. It appears that in all places of the former class the sewage has in fact under the existing arrangements universally received a very large proportion of human refuse: and that apparently the mere house-slops and street-washings of populous places (not to mention other sources of pollution) must in themselves, under any conceivable system, constitute a highly offensive outflow, requiring substantially the same treatment as the sewage into which water-closets empty. And secondly, the Commission reports that, for populous places which are also seats of manufacture, it would generally be possible, without materially complicating the sewage-problem, to allow the fluid refuse of industrial processes, with few exceptions, to pass into the sewers to be disposed of as common sewage: the special exceptions which are named being the refuse of workers in metal and of manufacturers of gas, paraffin oil, pyroligneous acid and animal charcoal: that, subject to some such exceptions as these and to proper regulations, the discharge of fluid industrial refuse into sewers would generally not render the sewage more difficult of use, and would in some cases, in respect of certain contained refuse-matters, greatly increase the agricultural value of the sewage.

Sewers and drains as means of cleanliness.

30.—Of sewers and drains, with regard to the technic of their construction, I of course do not pretend to speak. All rules applicable to this matter are given in a special Memorandum issued by the Board for the assistance of local officers, which, as having been prepared by Mr. Rawlinson, the Board's Chief Engineering Inspector, has the authority of an unequalled experience; and my reference to sewers and drains is only in regard of their sanitary results. In proportion as

they are skilful or unskilful appliances, so they become powerful influences for good or for evil; and in this point of view, I would urge the necessity of such works (even though on the smallest scale) being always planned with adequate skill and executed under trustworthy supervision. In the same point of view I would also urge the importance of using as channels for liquid refuse none but properly constructed sewers and drains, and of therefore superseding by such constructions, as soon as practicable, the many now existing mere gutters, or ditches, or rude irregular works of brick or stone, which, originally meant only for rain-water, are incapable of fulfilling in an effective, cleanly and wholesome manner, the purpose for which modern sewers are designed. This recommendation applies not only to cases where the channels receive privy-drainage, but likewise (for reasons previously explained) to cases where they receive only slop-water: and equally in both cases it must be provided that any sewer which is not completely self-scouring shall at due intervals have effective flushing. With regard to the smaller relations of the subject, as represented in the collection of village-slops, useful information will be found in an appended report by Mr. Netten Radcliffe (to which I shall hereafter more particularly refer) on means of preventing excrement-nuisances in towns and villages.

Shall water-closets be adopted?

31.—The choice between a water-closet system and a system of so-called dry-privies, is necessarily in each case a question for local judgment on grounds which in great part must be purely local.

Their advantages where certain conditions can be fulfilled;

32.—The advantages of the former where it can be adopted and will be properly worked, are—as regards the supremely important object of getting the refuse continuously and completely removed, too evident to require advocacy. Those advantages however may fail to be realised if the system be adopted without due circumspection; and the conditions which ought to be kept in view in order to avoid any such failure are apparently these three:—

first, that the closets will universally receive an unfailing sufficiency of water properly supplied to them;

secondly, that the comparatively large volume of sewage which the system produces can be in all respects satisfactorily disposed of; and,

thirdly, that on all premises which the system brings into connexion with the common sewers, the construction and keeping of the closets and other drainage-relations will be subject to skilled direction and control.

as to water-supply;

(*a.*) The water-supply of a place should not be deemed sufficient for a system of water-closets unless it be such that each ordinary water-closet can be flushed as often as it is used. If the supply be professedly "constant" it must be really constant, subject only to the occasional short interruptions which may be necessary for repairs and the like, and against the possible dangers of which proper precautions must have been adopted; if, on the contrary, it be confessedly intermittent, and therefore require domestic storage of water, the supply of water (sufficient to fill all house-cisterns) should be at least once in every period of 24 hours; and in any case proper mechanical arrangements to prevent waste of water and to secure the water-pipes against entrance of privy-air will be necessary.

as to sewers;

(*b.*) In order to a satisfactory discharge of privy-sewage, properly constructed sewers, with properly located outfall, are of course indispensable: sewers which would also convey the slop-waters, and generally the rain-fall, or more or less of the rain-fall,* of their drainage-area. It may sometimes be the case that sewers already existing and in all respects satisfactorily working as provision for slop-waters and surface-drainage, are of such construction and with such outfall-arrangements as to be suited also for the addition of privy-sewage, or capable at very moderate expense of being rendered so: for as slop-waters partake (in greater or less degree) of the offensive qualities of privy-sewage, sewers which are to convey them require the same sort of care as to construction and outfall-arrangements as if privy-sewage were also to be

* In some districts special arrangements for the discharge of storm-waters may be necessary; and in some it may be desired to effect as far as practicable a diversion of all clean rainfall from the sewers: but the consideration of questions of this sort will be special to the localities where they arise.—J.S.

conveyed. If existing slop-water sewers are offensive or inefficient in the service in which they already act, or if their outfall is such as already to cause nuisance or water-pollution, evidently no such additional service as the conveyance of privy-sewage can be claimed of them in their actual state: but in this class of cases (and according to the degree of offence or inefficiency) the local sewerage would be judged to require reform, even apart from any question of water-closets; and in connexion with any such reform, especially in towns which have or ought to have common waterworks, there will be favorable opportunity for considering whether a system of water-closets should be adopted.

as to communications;

(*c.*) No premises ought, either through water-closets or in any other way, to be brought into drainage-connexion with common sewers unless they can be made reasonably secure against the dangers of sewage-infection. Part of such security would consist in the fact of the sewers themselves being such and in such state as they should be, especially with regard to scouring and ventilation; but a further, very essential, part would depend on the proper situation, construction, and keeping of the drains and drain-inlets of individual premises. In this latter respect, the following conditions ought to be insisted on:

that every private drain be properly trapped and ventilated in relation to the common sewer, and be itself also properly constructed;

that every private drain, having inlets within a house, have ascending from its head or heads into some suitable high position in the open air, and where it cannot infect the interior, a ventilating-pipe or ventilating-pipes of sectional area amply proportionate to its own;

that all slop-water pipes from within houses be provided at their sinks or other inlets with fixed traps, but further, that, as far as practicable, they be separate from privy-pipes, and made to open over trapped drain-gratings outside the house, not direct into privy-pipes or drains;

that no overflow-pipe from any cistern which furnishes domestic tap-water, nor from any cistern inside a house, be allowed to open directly into any drain or privy-pipe, but be made (as above) to end open in the outer air;

that in cases where water-closets are supplied on a "constant" system, and where generally there will not be storage-cisterns, the entrance of privy-air into water-pipes be prevented by the adaptation of special service-boxes (which also will act as waste-preventers) to all such privies as have not cisterns.

as to users; (*d.*) In considering the admissibility of water-closets, it has always to be remembered that the working of an ordinary water-closet is easily deranged, and that water-closets, when out of order, and especially if in the interior of houses, are apt to become very dangerous nuisances. The ordinary water-closet is therefore a thoroughly ineligible form of privy for those who are unlikely to take proper care of it, or are from poverty unable to give it such occasional repairs as it may require.

as to location. (*e.*) Among such classes of population it is of course unfit that any form of in-door privy should ever be sanctioned: but even in the best-ordered houses the occasional danger of in-door water-closets must not be disregarded. Water-closets ought never to stand where they cannot have outside windows: they ought if possible to stand as projections from the body of the house, and with windowed lobbies dividing them from it.

Where water-closets not to be adopted, what are the best alternatives for cleanliness?

33.—It must be assumed that, even in large towns, Authorities, exercising their discretion on skilled advice given to them, will sometimes pronounce against the local adoption of a system of water-closets; and even if it be assumed that the number of such cases will eventually be small, yet, at least for the present, great importance attaches to the question of other means by which privy-nuisances in large towns can be prevented. And it is the more necessary that all such means should be well understood and as far as possible perfected because permanently it must at any rate be the lot of many small towns and of most villages to depend on them rather than on water-closets.

In a former section of these observations I described at some length the extremely filthy and dangerous arrangements which frequently, or I fear I should say generally, exist in

places where water-closets are not in use. Modern experience, however, has shown, and the fact is of the highest sanitary importance, that such arrangements are not the necessary alternative to a system of water-closets; but that, failing a water-system, both large and small populations can obtain under other and amended systems of privy-management a complete or comparatively complete freedom from excremental nuisance and injury.

Former and present departmental inquiries. Evidence to that effect was given five years ago in two most valuable papers which I had the honor of submitting to my Lords of the Council as appendices to my 12th Annual Report: one by Dr. Buchanan on the earth-closet system, the other conjointly by him and Mr. Netten Radcliffe on the privy-systems of various northern towns; and from that time till the present the information collected in these two reports has been the basis of all advice which I have given in the matter to which they relate. Recently, under the Local Government Board, the present state of experience in the same important branch of nuisance-prevention has been made matter of new and large investigation by Mr. Netten Radcliffe; and I have the honor of submitting to you [A] his comprehensive and thoroughly practical report on the subject.

Mr. Netten Radcliffe's present report. 34.—The improved systems which Mr. Netten Radcliffe describes start universally with abolishing all such filthy catchment-provisions as I have referred to, and then, in order to meet the sanitary requirements, provide more or less as follows:

Pail-Privies: having as their aim that excremental matter, unaltered, shall be removed from the privies at so short intervals as not to have become offensive; and adopting as means to this end the use of moveable receptacles, which systematically at short intervals are to be changed, clean for dirty, by the scavenger; and which, for the prevention of nuisance in this process have close-fitting air-tight lids to be applied to the foul pails under removal.

Ash-Privies: wherein the professed purpose of the north-country midden (to deodorise excrement by covering it

with dry house-refuse) is, under strict precautionary conditions, accepted; the intention being, that the space beneath the privy-seat (but no further space) should be converted by careful masonry into a non-porous catchment-chamber, planned in slope and otherwise with particular reference to ease and frequency of systematic scavenging, and necessarily of but small size; and into which chamber, and direct upon the excrement, the ashes of the house are to be thrown, either down the hole of the seat, or with the seat hinged and lifting for the purpose, or otherwise.

Earth-Privies: as introduced by the Rev. H. Moule: purporting to effect under strictly defined conditions such applications of earth to excrement as shall render the latter inoffensive, forming with it a manure which not only can without offence be stored where it is produced, but can also, after being stored and dried, be used in the privy again and again with the same effect as new earth, and with some progressive increase of manurial value.

Charcoal-Privies: intended to utilise, on the general plan of earth-privies, the still higher disinfectant powers of charcoal, and thus to reduce to a minimum the quantity of disinfectant required: and purporting to have the further advantage that the excrements themselves can be made contributory to the supply of the charcoal.

In certain cases, Local Authorities have special responsibilities as to privies, viz.:

35.—With general reference to the duty of filth-prevention in inhabited areas, it is necessary to observe that the actual management of privies tends to become a function of Local Authorities, first, in proportion as dry privies of any kind are in use in their districts, and, secondly, in proportion as the districts contain dense settlements of ignorant and dirty population.

where dry privies are in use;

(*a.*) The dry systems, if they are to be generally available in any populous district, must always be vigilantly superintended, or in most cases actually managed, by the Local Authority, and must be managed with forethought and

competent skill. The Authority must in the first place decide as to the type of construction to which it will require householders to conform in regard of the placing of privies, and in regard of the plan of their privy-fixtures: not allowing privies to be so placed that the use of them will be a nuisance to houses or will make the privy-scavenage needlessly difficult or offensive, and carefully regulating the plan of the privy-fixtures (whether for earth-privy, charcoal-privy, pail-privy, or ash-privy) in the ways best calculated to prevent nuisance and facilitate scavenging. If the earth-system be adopted the Authority must prepare and supply the earth; if the pail-system be adopted, the Authority must supply the pails; and whether earth-system, pail-system, or ash-system, be adopted, the Authority must (except in individual cases) scavenge the privies and dispose of the refuse which is removed. Pail-privies and ash-privies in towns should be scavenged as far as practicable daily, and even where the population is least dense, at intervals not exceeding a week. Whether the Authority in acting as above shall act through its own officers and servants or through contractors will be a matter of local discretion; but, so far as it acts through contractors, it must of course see strictly to the execution of the contract, and in all cases it will have to make such bye-laws as are wanted to give effect to its system.

and where poor populations are thickly aggregated.

(*b.*) Sometimes even in country districts, but with more and more frequency in proportion as districts are urban and populous, particular poor neighbourhoods require that their privy-accommodation, whatever be its sort, should be specially cared for, and sometimes (which must be under urban powers) actually provided by the Authority.

Construction of privies for large joint use by lowest class;

(*c.*) Though ordinary water-closets (and particularly within doors) are not proper for the use of dirty and ignorant populations, water-closets, specially constructed with regard to such classes of population, and managed or constantly superintended by the Local Authority, seem the best of all yet discovered privy-contrivances for the uncivilised quarters of towns: and in this respect the experience of Liverpool deserves attention, as shewing that freedom from privy-nuisances can be attained in even the lowest of urban quarters

on condition that a proper system of trough water-closets is managed by an efficient Local Authority.

and the supervision of such privies.

(*d.*) Whenever privies of any kind are used in common by many families, or are for general public use, it is essential that the Local Authority should have them under constant supervision, and that (whether they are or are not of a sort to require scavenging of contents) the cleanliness of the privy itself should be systematically and strictly cared for. In cases where the use of the privy is common to all comers, servants of the Authority must of course keep it clean: and in cases where the use is common only to a defined group of houses or families, a definite understanding should be had as to the performance of the duty, either by the using families in regular rotation, or by their landlord or someone else on their joint behalf; and some appointed officer of the Authority must see strictly to the performance of the duty. Also in either case the privy must be protected against wilful damage, and wilful or negligent fouling: and vigilance should be used (particularly when the privies are first coming into local use) to detect, with a view to future prevention, any such abuses of the convenience.

Cleanliness as regards (so-called) dry refuse;

36.—In cases where the water-closet system is in full work, and where consequently no excrement-removal has to be done by cart, necessity still remains (at least in populous places) for a certain quantity of other scavenging. In order that nuisance shall not arise from the so-called dry refuse of houses, regularity and frequency of removal are first conditions; and in populous places such removal needs, of course, to be done as a systematic act of the Authority.

must advert to the putrescent quality of parts of it;

(*a.*) It has to be assumed that the dust-heap of each household contains almost invariably more or less of decomposing moist organic matter: the refuse or professed refuse (often far too lavishly so professed) of the different comestibles of the house: the peelings and other waste-bits of vegetables, the guts and other waste-bits of fish or birds, and so forth: and the necessity for frequent removal has to be estimated, not by what the mere fire-ash and other dry dust would require, but by the extreme offensiveness of these usual

adjuncts. Households, not of the poorer classes, can, with proper management, keep their dust-heaps comparatively free from organic refuse: the larger households, namely, by daily utilisation of their kitchen-waste, and many smaller households by burning theirs on the kitchen fire. But the moderate amount of care which would serve in these ways to prevent nuisance is in a large proportion of the cases absent, and in other cases, immensely numerous, the suggested prevention would be quite impossible: for the domestic power of burning refuse is limited by the poverty which must spare fuel, and many large towns have masses of poor population to whom such fires as would consume even the scant potato-peelings or spoilt cabbage-leaves of the house are luxuries entirely unknown. Scavenging-arrangements in relation to house-refuse in towns must therefore be framed with special reference to the fact that such refuse soon becomes highly offensive, and that, except where good domestic management exists, any two-days' retention of it makes a nuisance. It has to be remembered too as an actual fact, though representing a state of things which ought as far as possible to be resisted, that so-called dust-heaps in poor neighbourhoods very often contain some, and not rarely a good deal of excremental matter: cast there sometimes in mere dirty indolence, and sometimes because of a shameful want of other privy-accommodation.

must not let it accumulate or get wet;

(*b.*) House-refuse, awaiting removal, ought especially not to be exposed to wet. Liquids of course ought never to be thrown with it; and the ash-heap or fixed or moveable receptacle, used for ashes, ought always to be protected against rain. A moveable ash-tub, standing under a shed, is perhaps generally the best receptacle for dry-refuse, is particularly suited to the crowded parts of towns, and is the only proper arrangement for cases where the refuse must be carried through the house. If a fixed dust-bin be used, its walls should be smooth and impermeable, and its location and construction such as to give every facility for sweeping out. No receptacle should be of unnecessary size, but merely large enough to contain such accumulations as must occur in the proper intervals of removal.

may in some cases advantageously burn it.

(*c.*) It is not requisite in this place to say anything with regard to the eventual utilization of dry-refuse. But it may be convenient here to note, with regard to cases where utilisation is not in view, that accumulations of offensive refuse may sometimes advantageously be burnt: namely, with the addition, if necessary, of lime, ashes, or other drying material, and with an admixture of cinders or small coal: and that this process (which gives an ash useful for deodorisation) may, in proper situations, be conducted either in coking-ovens, or in suitably-disposed open heaps.

Cleanliness as regards public ways;

37.—I perhaps hardly need note that the due scavenage of public ways is among the requisites for such local cleanliness as the public health requires. The filth of ill-kept streets contains, with the inorganic detritus of road and wheels, large quantities of the dung and urine of horses and occasionally other cattle: while in the courts and alleys of poor neighbourhoods, and even in many obscure streets, the case is made worse by an admixture, sometimes not small, of human excrement: and it is therefore essential that street-refuse should share the general obligation of filth to be promptly and properly removed. In quarters which will admit of it (and especially in poor neighbourhoods) the use of the hose in aid of the shovel and broom may be of great service.

and the sanitary importance of good pavement.

Public ways cannot be kept clean unless they are of suitable surface (so paved, namely, as not in any avoidable degree to favor the imbibition or other retention of filth) and are provided with proper rain-channels. In poor neighbourhoods this requires special attention: the extension of good pavement into all courts and alleys, whether legally public or private, is essential to their means of cleanliness: and generally with regard to all yards and curtilages, whether of rich or poor, the provision of impervious pavement on ground which adjoins houses is a valuable security in the same direction. The same rule applies to the basement of houses in regard of parts on which slop or other dirt is apt to fall.

Cleanliness as regards offensive sorts of

38.—The general sanitary obligation to prevent injurious action from refuse-matters includes of course that sufficient

regard shall be had to the conduct of those sorts of business which produce animal or vegetable refuse, or are in any other way apt to give putrescent effluvia or putrescent outflow. Thus, for instance, slaughtering-places, whether in towns or in villages, always require particular attention, as to their means of water-supply and drainage and ventilation, as to their having proper receptacles and regular prompt removal for all their refuse-products, as to their not occasioning any filthy soakage within or without their limits, and generally as to their being kept in a clean state and (as far as can be) without offensive odor. So of course, in populous places, all keeping of animals requires to be looked after with reference to the due removal of the refuse, and with reference also to animals not being kept (as great numbers of pigs often are) in situations so contiguous to houses that their keeping must necessarily be a nuisance: and, whether in towns or villages, no offensive outflow or soakage should be allowed from any cattle shed or pig-sty which would not be allowed from a human privy. The action of Local Authorities, or of contractors under them, in collecting and disposing of the solid house refuse and surface-filth of districts, requires, of course, the same sort of care as other sorts of business which deal with putrescent matter; as particularly as regards places of temporary deposit for collected refuse, and processes which the refuse may there have to undergo, the sites should be so chosen, and the processes so conducted, as not to cause avoidable nuisance.

business, and the keeping of animals.

Abatement of refuse-nuisances when found existing.

39.—In a different point of view to that of the preceding observations, I have yet to mention one more function which has to be discharged by those who would reduce the prevalence of Filth-diseases in England. In an earlier page I noted that, in proportion as a district should be well cared for in such respects as have now been explained, nuisances would so largely be prevented in it that comparatively few could present themselves for removal. Exceptionally however even under such circumstances, and abundantly of course in districts which have been ill-cared for, the abatement of various refuse-nuisances, and particularly the removal of

accumulated refuse, is a duty which has to be performed in order (so far as may still be possible) to the prevention of disease; and I have therefore here to advert to it in that sense.

With reference to houses which are said to have offensive smells, or which Inspectors find in a stinking state, it cannot be too distinctly understood that cleanliness and ventilation and dryness are the proper deodorisers of houses, and that artificial deodorisers will no more serve in their stead than, in regard of persons, perfumes could serve instead of soap and water. As against old frowsy and mouldy states, something supplementary may be got by free washings with hot lime-wash, or, in close spaces, by fumigation with sulphurous acid: but truly to deodorise a house is, to see that no house-refuse (not only no excremental matter, but also no other kind of dirt or refuse, nor any foul old wall-papers or other hangings) remain in or about it; and to see that all proper washings and limewashings be duly done; and to see that its basement be thoroughly dry; and to see that the air within it be not in any part stagnant, but always in course of renewal from without. Similarly, where the complaint is of drainage-odor within a house, search should be made whether the filth which house-drains are meant to carry away is retained in or near the premises in ill-made drains or in cesspools, or perhaps is leaking from house-drains within the house; or whether, inside the house, the inlets of drains and sinks are not properly trapped, or the pipes themselves have holes in them; or whether, outside the house, the ventilation of the drains and sewers is insufficient.

Where offensive matters have been allowed to accumulate in large quantities, the disturbance of them for removal (as in the emptying of ill-conditioned privies or cesspools) ought to be with special precautions; both in order to reduce the mere offensiveness of the process, and also to obviate, as far as may be, the dangers which the effluvia may represent. For the latter purpose, chemicals of an antiseptic sort are perhaps those which will be most generally applicable, and may be such, or in such combination, as also much to deodorise the filth; but, for the limitation of stink, privy-refuse should, at least in populous places, always be removed with special apparatus. Various refuse-heaps and mud-heaps, which for a time it may be impracticable or inexpedient to remove, should be covered, to the depth of two or three inches, with a layer of freshly-burnt vegetable charcoal in powder, or with a layer of clean dry earth, or with a layer of freshly-burnt lime; and earth near dwellings, if it has become foul by the soakage of decaying or vegetable matter, should be treated on the same plan.

Cleanliness as regards water supply;

40.—Finally, it will be evident that, as the use of impure water is a chief way by which filth-infections get entry to the human body, so, for the prevention of filth-diseases, a very strict insistence on purity of water-supply is quite essential. And this in my opinion is a matter with regard to which no sort of compromise should be considered safe. When proper local arrangements shall have been made for dealing with the excremental and other organic refuse-matter of inhabited places, many water-supplies which now are a daily danger to life will through that reform become comparatively safe: streams namely at once, and wells after sufficient lapse of time; but I venture to repeat that in this matter a very strict standard of cleanliness is in my opinion essential to safety.

from streams;

As regards running waters, the reports of the Rivers Pollution Commission seem to have clearly shewn that the fouling of natural watercourses by direct infusion of liquid refuse is a nuisance which, at least in all ordinary cases, Local Authorities may reasonably be required to suppress by application of the sewage to land; and though conditions are not yet defined under which streams, otherwise safe as drinking-water, can, without detriment to their potability, receive the outflow from sewage-receiving land, it may, I think, fairly be expected that to fulfil satisfactory conditions in that respect will in general be of no insuperable difficulty. Whether in particular cases populations may be so circumstanced that they cannot refrain from polluting streams, is a question which would in each separate case have to be judged on its own merits: only, if they must pollute the water, let the water be frankly recognised as unclean. Thus, regarding rivers as sources of

drinking-water, one of two positions ought, I submit, to be consistently aimed at: either that, being a necessary source of domestic water-supply, the river shall be absolutely protected against pollution; or else that, being (in whatever degree) used as a sewer, it shall be classed as not fit to supply drinking-water.

from wells; As regards wells, two cases must be distinguished. In the case of densely inhabited areas, it is certain that, however rightly the refuse-disposal may be conducted, the surface-wells can never be other than most dangerous sources of supply; and deep wells (which of course can only be trusted on condition that they are demonstrably protected against the chances of downward pollution) are only possible under certain geological conditions. It must therefore often be, that considerable centres of population will not be safely supplied with water unless the water come from outside the inhabited area; and in regard of the origin and course of any such extrinsic supply, the town population ought to be extremely vigilant. Among comparatively scattered populations, wells (and in great part surface-wells) must often be the source of supply: and it is of the greatest importance to discriminate between such as may and such as may not be safely used, and to ensure for all those which are to continue in use the completest attainable protection against dirt. Wells, adjacent to such privies and other filth deposits as are now common in rural districts, are probably at present the chief means by which enteric fever spreads in such neighbourhoods; and however much the system of refuse-disposal in such districts may be improved, it can scarcely be hoped that surface-wells contiguous to dwellings (such as particularly the shallow dip-wells attached to cottages) will ever be safe against pollution. It is therefore greatly to be desired that, in each village, there should as far as practicable be common centres of supply; if possible, springs or deep wells; and, in any case, with the most careful protection against foulings by slovenliness or by accident. In rural districts which (for geological or other reasons) cannot have safe water-supplies by springs or wells as above, arrangements for the collection and storage of rain-water, with every possible care

that the water shall be collected and stored without pollution, are necessary to meet the wants of the population; and the receptacles which must be part of any such system ought, if practicable, to be above ground.

Reminder, that the preceding observations have aimed only at one group of removable causes of disease.

41.—Throughout the above observations I have always, I hope, sufficiently shewn that, while regarding Filth as the deadliest of our present removable causes of diseases, I am far from regarding it as the only evil influence against which Sanitary Authorities have to contend; and though the object of my present Supplementary Report has been only to advert to the means by which enteric fever and the diseases ætiologically akin to it may be prevented, I would in conclusion observe, that, however admirable may be local arrangements of sewerage and scavenage and water-supply, and however complete in consequence may be the extinction of the diseases which arise exclusively from Filth, other excesses of disease will still have to be extinguished by such other preventive measures as are appropriate to their modes of production. On that subject I do not here pretend to enter: but having above (§ 5) specially named one influence as being, like Filth, of most destructive and probably universal operation throughout England, I would here specially, though but in a word, revert to it. And as regards that deplorable facility with which dangerous contagions of disease are allowed so generally to diffuse themselves in this country, often no doubt by co-operation of Filth, but also often independently of it, I would finally urge, as of interest to all districts, that, side by side with such endeavours for strict cleanliness as it has been the object of my preceding observations to recommend, the utmost vigilance should likewise everywhere be used with regard to all first cases of infectious disease, and everything be done, which the state of the law permits, to prevent the scattering of seeds of contagion.

Annual Report of 1875*.

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD,

&c. &c. &c.

SIR,

IN accordance with the Statute under which I have the honour to act, I submit to you the following statement with regard to proceedings of the Local Government Board in the year 1874 in matters concerning the Public Health.

I beg leave to premise that during 1874 the Medical Department of the Board had less than usual working-power for the purposes to which this Report will relate; principally, because (for temporary reasons) one of the inspectorships was being applied to the Poor-Law purposes of the Board; but partly also, I regret to add, because two of the staff were interrupted in their work, each for several weeks, by illness; and partly, too, because one of the staff had to attend, and this likewise for several weeks, at an International Sanitary Conference held at Vienna.

The proceedings which I have particularly to describe, as taken by the Board through the Medical Department, are of two sorts:

one, not of an immediately administrative intention, but having for its immediate aim to collect and methodise information, wanted for general public use or for the increase of the Board's own efficiency, with regard to moot sanitary questions on which the Board has to advise or direct;

the other, on the contrary, consisting in practical communications with Local Authorities, with an immediate view to the better prevention of disease in each of the respective jurisdictions.

* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. IV.

I.

1. Under the first head I have to report that in 1874 Mr. Netten Radcliffe visited 49 carefully-selected places in Great Britain, including on the one hand several of the chief centres of population, and on the other hand several country-places, with a view to collect all best contemporary experiences as to the means of preventing Excrement-Nuisances in towns and villages. Mr. Radcliffe's report, when complete, seemed to me to have so much immediate interest for local Authorities who might be in difficulty on the matters to which it refers, and was also so essentially connected with the subject-matter of my Supplementary Report of last year —the subject namely of Filth-Diseases and their Prevention, that I asked and was favoured with your permission to annex it to that report, presented to Parliament at the end of last session, instead of keping it back for this year's presentation. As I have already in that connexion turned to account the valuable contents of Mr. Radcliffe's report, I need not now further advert to them; but I would beg leave to express my grateful sense of the service which Mr. Radcliffe rendered, in devoting himself for many months with indefatigable patience to details which only the hope of real public usefulness could make attractive.

I. *Non-administrative business.*
1. Studies of Nuisance Prevention.

2. As another non-administrative work of the Board in the Medical Department, I have to refer to the cognisance which is kept up of the progress of Foreign Epidemics; partly with regard to any existing possibilities of their extending to this country or its dependencies, and partly with reference to the quarantine-conduct of other countries. In this branch I have of late years had constant assistance from Mr. Netten Radcliffe, who notes for the office all information received from Her Majesty's Indian, Colonial, and Foreign Secretariats, with regard to the epidemics and quarantines of other countries. In 1866, when submitting my 8th Annual Report to the Privy Council, I presented a report by Mr. Radcliffe, bringing down to that date an account of such foreign

2. Foreign Epidemics.

movements of Cholera as were of interest to this country; and Mr. Radcliffe is now compiling a continuation of that account in a paper which I hope shortly to lay before you in a supplement to the present report.

As regards the foreign epidemics of 1874, I am glad to be able to report further subsidence of the continental Cholera-wave which was seriously threatening us in 1871 and 1872, but has since that time been retreating, and appears now to be at its lowest ebb. On the other hand, I have to state that during 1874 Levantine Plague came into unusual mention in some of the foreign correspondence: that in one of the Yemen provinces of Arabia, among the high-lying villages of the Assur country, which had been visited by the disease in 1816 and 1853, there were considerable outbreaks of plague in 1874; that in Tripoli, too, a small outbreak of plague again affected the encampments of Benghazi, where already there had been an outbreak in 1858; that in the lower Euphrates Valley, where the Hindieh marsh-country had had an outbreak in 1867, the Afij marsh-country (on the opposite side of the river) suffered in 1874 a severe outbreak; and that, at least of the last, the consequences are not yet ended: for the disease spread in both directions, from Kerbela to Samawa, producing very large mortality, and at the date of my present report is still continuing.* Plague has now for so long been comparatively unknown in the countries where it used to be most fatally endemic, and European interest in it has in consequence become so nearly obsolete, that, in hearing of outbreaks such as the above, we are without sufficient standards for prognosticating as to their relative importance. Undoubtedly however, the above-mentioned concurrence of outbreaks is exceptional; and if it expresses that plague is really for the time tending to re-development in the countries which formerly bred it, the facts may be of general interest, if only with reference to the derangements of traffic which could hardly fail to arise, were

* In the winter 1870–1, there had been an outbreak of plague in Persian Kurdistan, where previously none had been observed since 1835; and when the Hindieh outbreak of 1867 occurred, plague had not been observed in Mesopotamia since 1834.—J.S.

plague again to show itself in any considerable port of the Red Sea or the Mediterranean.

3. With reference to the International Sanitary Conference, which at the invitation of the Austrian Government was held last summer at Vienna, I have here only to note that Her Majesty's Secretary of State for Foreign Affairs, in consultation with the Board, thought it desirable that an officer of this Department should attend the Conference; and that Dr. Seaton, first Assistant Medical Officer of the Board, was detached for this important and interesting service.

3. International Sanitary Conference.

II.

The ordinary administrative relations of the Board with Local Authorities in matters directly concerning the Public Health may be divided into those which concern the prevention of *small-pox*, and those which concern the prevention of *other diseases*.

II. *Administrative proceedings.*

So far as there may be question of comparison between these sections of work, it is requisite to notice the fact (though desirable not to over-rate its significance) that, in regard of small-pox far more minutely than in regard of other diseases, the Legislature has dealt with the *machinery* of the preventive process: the prevention of small-pox having involved compulsion of so distinctive a kind, that, in respect of this, an exceptional quantity of detail comes into the statute-book. If, however, the broad intentions rather than the details be compared, there seems to be no difference of spirit between the law which (for the prevention of small-pox) requires local Authorities, by themselves or their officers, to enforce the vaccination of infants, and the law which (for the prevention of enteric fever and other filth-diseases) requires local Authorities, by themselves or their officers, to enforce the removal of nuisances; and the public is as deeply concerned in the one case as in the other to see that due effect is given to the law by the local Authorities appointed to administer it.

1. For prevention of Small-pox.

1. The prevention of *Small-pox* is an object for which the Board communicates with local Authorities systematically through the Medical Department.

The 647 Boards of Guardians of England and Wales, who, within their respective Unions or Parishes, are the local Vaccination Authorities of the Kingdom, have at work under them, first, for the performance of the vaccinations, more than 3,000 medical practitioners acting as *Public Vaccinators*, and secondly, for the non-medical parts of the business, about 1,400 so-called *Vaccination-Officers;* each Public Vaccinator, and also each Vaccination-Officer, having, under the local Authority, a special area of duty to himself. This local machinery for the prevention of small-pox is subject in certain respects to regulation and control by the Local Government Board, and is superintended and periodically inspected by the Medical Department of the Board with regard to its efficiency of work: the Board in this respect continuing the system which the Lords of the Council, when in sanitary supervision of the country, had established. The local Authorities are required to conform to certain general rules as to the qualifications of persons whom they would appoint to be Public Vaccinators, and as to the attendances which shall be prescribed to these officers: the aims being, in the first respect, that each Vaccinator shall have given proof of being competent to discharge the special duties of the office;* and, in the second respect, that such attendances shall be given as will best facilitate the performance of vaccination with due succession of well-selected lymph.† The Public Vaccinators are required to conform to certain "Instructions" embodying rules of recognised professional sanction, with regard to the precautions which give to vaccination the completest attainable safety and effectiveness.* The Vaccination-Officers—who have as their chief functions to secure obedience to the compulsory intentions of the law, and to keep such records and give such notices as are necessary for this purpose, act in all respects under regulations of the Local Government Board, and are required to make such half-yearly reports as may account, in regard of vaccination, for all children whose births have been registered in the respective areas of duty.

* The necessity for express provision in this sense had long been shown by the experience of the London Small-Pox Hospital, as set forth by Mr. Marson and was abundantly explained in my earlier Reports to the Lords of the Council with reference to their Lordships' Regulations in this matter.—J.S.

† The necessity for special care to secure this object is explained in a departmental memorandum which I prepared for my Lords in 1859, and which is still in constant use under the Local Government Board, on the sub-division of public vaccination as affecting the supply of vaccine lymph.—J.S.

The periodical returns made by the Vaccination-Officers throughout the country form the basis on which the Board must mainly rely for its means of estimating the quantitative success of the Vaccination-Laws. The first annual collection of such returns under the Act of 1871 was completed early in 1874; and I subjoin [A] a tabular abstract of them, digested, with requisite explanations, by Dr. Seaton. It will be seen that of the 821,856 children registered as born in England and Wales in the year 1872, all up to a margin of $5\frac{1}{10}$ per cent., have been exactly accounted for by the Vaccination Officers; and I concur in Dr. Seaton's opinion that, when due regard is had to the difficulties of the case, as explained in his note on the appended table, the nearness with which the first year's returns approximate to completeness is such as the Board may deem satisfactory.†

The central Department's inspection of the proceedings of the local Vaccination-Authorities and their officers has since 1867 been so planned that, for ordinary purposes, each vaccination-jurisdiction and each separate duty-area within it, may be visited by a medical Inspector once in every two years; and this probably is the least amount of inspection with which the Board can fairly inform itself that effect

* Of these "Instructions" (which of course, in the light of increasing knowledge, require re-consideration from time to time) a second and amended issue took place in 1871, it having then been found that one particular class of precautions needed to be more insisted on than before.—J.S.

† Shortly after the passing of the Vaccination Act of 1871, the Local Government Board issued under that Act instructions as to the duties of the Vaccination Officers; but under the Act of 1874, these required to be somewhat modified, and a new Order was in consequence issued. The former instructions are given in the first Annual Report of the Board, Appendix A., No. 27. For convenience of reference, the Order under which the officers at present act is subjoined in my present Appendix.—J.S.

is being given to the intentions of the Legislature. The Inspector ascertains the practical working of the local contracts for vaccination, inquires in detail as to the local observance of the regulations which have been made with regard to public vaccinators and vaccination-officers, and (as a final check in regard of those regulations which tend to govern the quality of vaccination) visits and examines such proportion as may be requisite of the children whose names stand on the vaccinator's register as having been "successfully" vaccinated by him. On the results of the above inspections depends the distribution of the money which Parliament votes for public vaccinators; it being characteristic of this grant, that it is not voted on the footing of mere *largesse* in aid of local rates, but has its appropriation expressly limited by the principle of payment on results. The institution of this important influence in favour of the efficiency of public vaccination dates from the Report of the Select Committee of the House of Commons in 1866 on the Vaccination-Laws; and the enactment which on the recommendation of that Committee was made part of the Vaccination Act of 1867 is as follows:—§ 5. "On reports "made to the Lords of Her Majesty's Council with regard "to the number and quality of the vaccinations performed "in the several vaccination-districts of England, or any of "them, the said Lords may from time to time, out of "moneys provided by Parliament, and under regulations to "be approved by the Lords Commissioners of Her Majesty's "Treasury, authorize to be paid to any public vaccinators, "in addition to the payments received by them from "guardians or overseers, further payments not exceeding in "any case the rate of one shilling for each child whom the "vaccinator has successfully vaccinated during the time "to which the award of the said Lords of the Council "relates."

In 1874, from causes which I have above mentioned, the vaccination-inspections by the Medical Department fell unavoidably short of their usual amount; but they extended to the proceedings in 275 vaccination-jurisdictions, including the work of 1,357 public vaccinators; and particulars as to these

inspections, and as to the awards of money (amounting to 8,204*l.*) which were made out of the Parliamentary grant, are given [A].

Incidentally to the superintendence of public vaccination, provision has to be made for maintaining and distributing the public supplies of Vaccine Lymph, and with regard to the arrangements under which candidates for appointment as public vaccinators obtained the authorised Certificates of Proficiency in Vaccination required of them under the regulations of the Board. In 1874 the vaccination-stations which are concerned with those special objects underwent their usual special inspection, so far as the circumstances of the year would allow; and the Medical Department during the year supplied vaccine lymph in answer to 10,478 applications. Particulars as to the sources whence this lymph was derived, and as to the applicants who received it, are given, with other statistics of this section of subject-matter [A].

In any attempt to judge how far the Board's superintendence and inspection are improving the national defences against small-pox, it is necessary to remember that, though endeavours to improve the quality of public vaccination have to some extent been in progress for the last 15 years, the inspections which were made in the first half of this period, and which proved the necessity for great reforms in the whole system, were powerless to introduce such reforms, and that a really effective mechanism for securing the good quality of public vaccination did not exist till the passing of the Vaccination Act of 1867; that similarly, though compulsory vaccination dates nominally from 22 years ago, our really effective mechanism for securing the quantitative enforcement of the law dates only from the passing of the Vaccination Act of 1871; that though, under the administration of these recent laws as superintended by the Board, the quality of public vaccination in England is now continuously becoming better and better, and the proportion of infants left unvaccinated in successive years is continuously becoming smaller and smaller, hitherto only the youngest of the population can have directly participated in those improve-

ments,* and the benefit of the improved quality of their vaccination (in giving them a comparatively permanent security against fatal small-pox) is one which, from the nature of the case, cannot be tested in them till they are much older. The results may be very clearly foreseen which a continuance of the system must have on our national liabilities to small-pox; but at present, as regards effects already demonstrable, we can only refer to the greatly diminished proportion of small-pox among young children, as compared with that of other countries, or as compared with our own in previous times; and on this point some very striking evidence will be found in Dr. Seaton's annexed report [A] on the incidence of the terrible epidemic which began in England in the autumn of 1870 and continued till the spring of 1873.

The small-pox which the United Kingdom suffered during those 2½ years was part of a world-wide prevalence of the disease. A generalisation, which from the earliest times has been familiar to the medical profession, is, that the same diseases at different periods of time make epidemics of widely differing degrees of malignity; and as regards the present matter, it seems universally testified by skilled observers that no small-pox epidemic in living memory had been (if I may so express it) of equally malignant intention with that which is here in question. Both in tendency to spread and in severity of individual attacks, it tested to the very utmost the value of such defences as had been provided against it by vaccination; killing the unvaccinated in far more than ordinary proportion; killing also in unusual proportion persons (especially those beyond the period of puberty) whose previous vaccination had been imperfect; and even prevailing more or less against many vaccination-defences which would have borne the stress of any ordinary epidemic. The small-pox deaths in England during the 2½ years of this

* It may be noted, however, that the re-vaccination of the young, as they reach puberty, is an essential part of every perfect system of vaccination; and that, as no such re-vaccination on a large scale is possible, except from the basis of a well-regulated system of infantine vaccination, so the reforms which have been made in infantine vaccination in England, tend in an indirect way to material service beyond the limits of the infant population.—J.S.

epidemic were 44,433 in number; and while, to persons who were agitating against the practice of vaccination, it seemed a momentary triumph to boast how "in spite of vaccination" this very sad mortality had befallen us, to others, and particularly to such as were well-informed in the history of small-pox, the reflexion occurred, that *except for vaccination* this epidemic would presumably have caused such frightful and demoralizing mortality as the worst pestilences of past centuries used to bring with them: mortality, in comparison with which even those 44,433 deaths were but few. To demonstrate how true was the latter opinion was of course not possible at the time; for it would require that accumulated statistics of the epidemic (statistics which could not be obtained till two or three years had elapsed) should be investigated with particular regard to the influence which vaccination had exerted; but in a case of this immense interest it seemed due to the general public that the investigation should when possible be made, and the teachings of so great an epidemic be set forth; and such is the purpose of Dr. Seaton's laborious and valuable report which I have the honor of bringing under your consideration. Rendering an account of the late epidemic in each of the three divisions of the United Kingdom, and in various countries and chief towns of continental Europe, and combining with such small-pox statistics as can be given in each case particulars as to the local laws and arrangements for vaccination, Dr. Seaton shows that the experience of this epidemic was in harmony with all previous experiences as to the protective power of vaccination. The belief which governs the vaccination system of this country—(that properly performed infantine vaccination, duly renewed at puberty, will virtually extinguish small-pox as a fatal disease among such populations as have recourse to it)—has long rested on so vast a basis of well-established facts as not to have needed, for scientific completeness, that any further facts should corroborate it; but, for persons not already familiar with the proofs which gave rise to our present practice, Dr. Seaton's instructive report may adequately serve instead of those proofs to justify our practice as it stands. Anyone can gather from the report

the convincing illustrations which it contains, how unabatedly terrible is still the force of small-pox in the present age unless its ravages have been precluded by vaccination; and in adverting to that fact I am glad to be able to connect with it the gratifying reflexion that against this one preventable disease England is now employing with systematic efficiency, and with success which is in constant increase, those happily adequate means of resistance which the genius of an English surgeon first added to the resources of mankind.

2. For prevention of other diseases.

2. With regard to the prevention of *Diseases other than Small-pox*, the Board during 1874 communicated through this Department with 56 Local Authorities.

The areas of separate sanitary jurisdiction in England and Wales are at present 1,558; that is to say, in addition to the 39 which are Metropolitan, there are 930 urban and 589 rural jurisdictions; and the jurisdictions which were visited by Medical Inspectors last year with reference (general or partial) to the administration of the Sanitary Acts, were 17 rural and 39 urban.* Of these 56 inspections I subjoin [A] a tabular list, with an abstract of the chief facts which in each case the Board's Inspector reported; and two of the reports are appended *in extenso*, as probably typical in their respective sorts of subject-matter,—one by Dr. Buchanan [A] relating to the want of hospital-accommodation in Birmingham and Aston for cases of infectious disease,† and one [A] by Dr. Ballard on the sanitary state of the Upper Sedgley Sanitary District.

The above communications neither enable me to submit to you any adequate materials for discriminating as to the progress of disease-prevention in the districts of England, nor, I apprehend, can have represented an exertion of the

* In one of the 39 urban jurisdictions (Cambridge) the inquiry related only to one particular institution in the town.—J.S.

† The immediate occasion of this inquiry was a great prevalence of small-pox in the town; but it was mere accident that an epidemic of that disease, rather than one of scarlatina, relapsing fever, or typhus, illustrated the serious want of hospital accommodation, and I therefore class the inquiry in my present section rather than as relating specifically to small-pox prevention.—J.S.

Board's influence in favour of sanitary progress in more than a small fraction of the cases where such progress is urgently wanted.

That progress (more or less) is being made in a considerable number of the jurisdictions of England is, I think, not to be questioned. There is presumption to that effect in the constantly increasing annual amount of the loans contracted by Local Authorities for permanent improvement-purposes which in the main are sanitary, and in which works of sewerage and water-supply largely predominate. In the six accounts from 1858 to 1864 the loans thus contracted under the Sanitary Acts averaged somewhat less than 330,000*l.* per annum; in the six from 1864 to '70 they more than doubled this amount, having averaged per annum nearly 692,000*l.*; thence to the end of 1872 (29 months) the annual average exceeded 884,000*l.*; and in the last two years the respective amounts have been nearly a million, and nearly a million and a half of money.* Other general evidence points in the same direction; as, for instance, in various cases the desire of rural Authorities to acquire special (so-called urban) powers for dealing with the more populous parts of their districts;† and in many individual cases the reports of the local Officers of Health give every assurance which could be desired that good sanitary work is advancing, sometimes even rapidly advancing, in the places reported on. It is certain that in regard of the sanitary requirements of the country there has been, during the last two or three decennia, such growth of knowledge in the public mind as must have given to great numbers of persons a new sense of responsibility in the matter; and here, as in other departments of public conduct, the better knowledge as it grows, the convictions of duty as they ripen, must tend to

* The highest sum stated in any previous amount was 1,266,581*l.* borrowed in the period from Aug. 1, 1870, to Aug. 19, 1871, which immediately preceded the passing of the Local Government Board Act. In regard of the very large amount (1,457,496*l.*) borrowed in 1874, it is satisfactory to notice that in it the borrowings of rural authorities amounted to nearly 120,000*l.* All the amounts of loan which I have stated are exclusive of loans under Local Acts.—J.S.

† The cases in which urban powers as above were granted to rural authorities numbered 10 in the year 1873, and 44 in the year 1874.—J.S.

bear practical fruit. I feel sure that, under influences such as those, very many local Authorities throughout the country are at the present time exerting themselves for sanitary purposes in a degree which, ten or twenty years ago, they would have thought quite unnecessary; and I daresay that, in an appreciable proportion of these cases, the results, either actually or in not very distant promise, are such as may be deemed fairly adequate to the circumstances.

Thus far, however, we have only what is favourable in the facts. Of the larger—I fear very much larger proportion of cases, in which facts of an opposite kind would show themselves to a competent local inquirer, the Board is hitherto not systematically cognisant, except as having before it such evidence as the Quarterly Returns of the Registrar-General contain that preventable death in vast quantities goes on unprevented. These Quarterly Returns are conclusive as to the insufficiency of sanitary endeavour in a very large proportion of our local jurisdictions; and the evils which remain undealt with may to some extent be inferred from the facts which come to light (as abstracted in my Appendix) in those cases where the Board authorises medical inspection.

Among the influences which from day to day needlessly waste human life in this country, there are, as is now well known, two which immensely predominate; first, in extreme frequency, such *local conditions of filth and nuisance* as express the failure and in many cases the utter neglect, of local Authorities to fulfil definite obligations which the Sanitary Acts impose on them; secondly, almost everywhere, such *reckless disseminations of contagion* as express in part that penal checks against the wrong are hitherto of little stringency, but express also, and perhaps principally, that local Authorities fail to use with adequate skill and vigour the resources which are in their option to use against the evil. As regards these two most important sections of subject-matter, I have no hesitation in saying that, for many years to come, they will require the utmost intelligence and activity of local Authorities throughout the country to achieve what claims to be

done for the due protection of human life.* And it was with reference to the innumerable local insufficiencies which I know to exist in those two great fields of disease-prevention, that I above expressed my opinion as to the proportionate unimportance of such proceedings as the Board has been taking through this Department.

Evidently it is for the Board alone to determine how far it holds itself responsible for taking cognisance of local successes and unsuccesses in regard of the prevention of disease, and for influencing or endeavouring to influence towards better sanitary administration those local Authorities in whose districts the unsuccess betrays itself. I am of course aware that this question is not one to be judged from an exclusively sanitary standpoint, but is part of the general ordering of our civil government, and that justly to decide regarding it is the function, not of medicine, but of statesmanship. In appealing, however, to the latter, I trust that I may not be speaking with an improper prejudice in favour of that great human interest for which it is the privilege of my office to be permitted to speak, if I assume on its behalf that, among the many administrative purposes for which central government in this country claims to criticise and influence and in certain cases control the action of local Authorities, none can be of more national importance than those which relate to the prevention of disease,—none, in regard of which it can be more essential that local disobedience to positive law should not be tolerated,—none, in regard of which it can be more desirable that, so far as occasion exists, and to the extent of existing knowledge and skill in the subject-matter, the detailed influence and advice of central government should be given to promote throughout the country the real intentions of the Legislature. And in behoof of these last-mentioned considerations (though with all due reserve and diffidence as regards those to which I first adverted) I have thought it essential to

* With reference to this aim in one of its divisions, I last year submitted an endeavour which I had made to codify for general use the experience of this Department in the matter of Filth-Diseases and their Prevention; and in respect of the other division, I hope it may be possible at some future time similarly to codify our experiences as to Contagion.—J.S.

put before you, as matter of proportion, how slight, except in regard of small-pox, is the cognizance which the Board hitherto takes, and how far apart are its exertions of skilled influence, in regard of those local defaults of disease-prevention which annually cost many tens of thousands of lives.

In my last Annual Report, submitting to you some remarks with regard to the relations of the Board to local Sanitary Authorities, and particularly with regard to such of those relations as attach to the Medical Department, I explained the scope and spirit of such medical inspections as I would recommend the Board to adopt as its means of sanitary superintendence. Presuming as principles, first, that local government in proportion as it fulfils its purpose must be exempt from central interference, and secondly, that central interference where admissible must rather be little than much, I submitted, as within those principles, that the Board's intervention should proceed methodically from the basis of local death-accounts: from the evidence, namely, which is afforded in such accounts as to the degrees in which preventable disease has not been prevented. And, while recognising of course that in certain of these cases the object of the Board's intervention could be attained by correspondence, I particularly dwelt on the very great advantage which, at least for many years to come, would in my opinion be gained to the sanitary progress of the country by central inspection systematically organised with reference, so far as needful, to such local defaults as a class:—"By skilled in-"spections under the Public Health Act, 1858, on such a "scale as practically to represent a central audit of local "death-accounts, and an exertion of central influence or "authority in favour of more active or better-directed local "efforts in places where human life had not been sufficiently "cared for, the Local Government Board would be in reality, "though only in the limited sense which the law prescribes, "a Board of Sanitary Superintendence for England." Such examination of local sanitary proceedings as is hitherto undertaken by the Board is on the basis above suggested; but with regard to the question of its present proportion to local shortcomings, I may state that the quantity of medical

inspecting-force available to the Department for this branch of service is but about equal to the employment of three Inspectors; that the sanitary jurisdictions of England are, as above enumerated, 1,558; and that the mortality, other than by small-pox, to be accounted for (of course in very different proportions) by the 1,558 local Authorities, as due to causes more or less under control of law, and as principally attaching to those two great fields of disease-causation which I have specially mentioned, amounts, in the common estimate of informed persons, to at least 120,000 deaths per annum.

With regard to about 900 of the 1,558 jurisdictions, the Board is entitled to receive copies of the reports of local Officers of Health, appointed under the Order of the Board, and paid in half from funds provided by Parliament; and there are considerable parts of the country with regard to which it may be ascertained from such reports that the local Authorities are already receiving excellent advice from highly-qualified officers whom they have appointed, and that in many cases they are duly acting upon such advice. But as regards the relations of the Central Board to the facts of sanitary unsuccess which become known to it, the following three considerations have to be remembered: first, that in certain cases local Authorities, though provided with admirable Officers of Health, may be entirely disregarding their advice; secondly, that in very many of the cases in which the Board is entitled to receive copies of the reports of the local officers, those which come to hand are of little or no assistance to the Board in the sense which is here in question, but rather give reason to believe that the local officer might be very materially assisted by the visit of a medical Inspector of the Board; and thirdly, that, with regard to about 658 of the 1,558 jurisdictions, the Board (as not paying part of the local salaries) is not entitled to receive copies of the local reports.

It importantly concerns the second of these considerations to notice that, at the time when the Legislature suddenly made it an obligation on each of the local Sanitary Authorities of England to appoint one or more Officers of Health, the members of the Medical Profession who had given such

study to sanitary science and administration as would fairly qualify them to be Officers of Health in any distinctive sense of the term were comparatively but very few; that therefore the new appointments had generally to be made without reference to proofs of distinctive qualification; and that in a large proportion of cases, the local Officer of Health, appointed as such with the approval of the Board, is in fact (as the Royal Commission recommended he should be) the Poor Law Medical Officer serving *quasi ex officio* in the second capacity. When regard is had to these facts, it will be evident that the advance of the new officers to a state of efficiency in which their reports may uniformly be regarded as adequate to the circumstances of the respective districts, must of necessity be a gradual process extending over years, and requiring the best assistance of suitable organization. And the fact (of which the Medical Profession has great reason to be proud) that the new offices are already in so many cases filled with credit, and in a notable number of cases with really eminent ability and success, must not obscure the fact, that, before such standards can be general in the country, very much work will have to be done, and very many difficulties surmounted.

I am, Sir,

&c., &c.

Supplementary Report of 1875*.

SIR,

IN supplement to my recent Annual Report, I have now the honour of submitting to you (Appendix) the paper which I mentioned in that Report as at the time under preparation by Mr. Netten Radcliffe: setting forth the results of his laborious and instructive study of the international relations of Asiatic Cholera during the past ten years.

* Report of the Medical Officer of the Privy Council and Local Government Board, New Series, No. V.

The international relations of Asiatic cholera.

During that space of time, Asiatic Cholera made great ravages in other quarters of the globe than Asia; and especially as regarded our own quarter, the epidemic inroads of the disease were such that twice in the decennium the several European Governments consulted together in congress as to the possibility of better defending their States against a danger which seemed of growing importance. Of the two International Conferences to which I refer, one, lasting for more than seven months, was held at Constantinople in 1866; and the other, lasting for a month, was held last year at Vienna. The former was convened at the instance of the French Government with reference to the great pestilential invasion which in 1865 had radiated from Alexandria to all parts of Europe; the latter was convened at the instance of the Austro-Hungarian Government, with reference to the state of cholera in Europe during the years 1870–4. For an account of the more elaborate proceedings of the conference of 1866 I can only refer to the two valuable volumes in which the *Procès Verbaux* (including the reports of the Committees) of that Conference were published. For a full account of the proceedings of the second Conference, it is of course also necessary to refer to the published volume of *Procès Verbaux;* but, for more convenient reference on the present occasion, Dr. Seaton, who, with Dr. Dickson of Constantinople, attended the Conference on behalf of Her Majesty's Government, has, at my request, favoured me with the annexed brief abstract of the proceedings [A].

Recent facts as to cholera in Europe have undoubtedly been of very evil omen. Europe, within the ten years' time, has twice been over-run with cholera. From the middle of 1865, when one great diffusion of the disease began, till after the middle of 1874, when a second great diffusion had apparently run its course, there possibly was no moment at which the disease was extinct in Europe, and there certainly was but little time when it could even be supposed to be extinct. It is true that, just at the end of 1868 and beginning of 1869, if traces were still remaining of the great diffusion which began in 1865, they were no longer publicly identified as such; but then, in the summer of 1869, began the second great diffusion,

which was destined to have a five years' course. Whether or not there was latent continuity of process between those two great diffusions of cholera—whether the second of them began (as the phrase goes) in "re-crudescence" of the first, or arose independently of it in a second invasive influence from Asia, has been matter of doubt among epidemiologists, and must perhaps remain undecided. Be that, however, as it may, the broad fact, concerning the nations of Europe, was that during the decennium 1865–74 Asiatic Cholera hardly ever ceased to more or less afflict or alarm them; and this fact, which, when duly understood, could not but suggest grave considerations as to the future, is receiving at the present moment a confirmation of its serious import in the circumstance that already, though only in the middle of 1875, cholera is reported to be again diffusing itself on the Syrian side of the Mediterranean.

Mr. Radcliffe's annexed paper is essentially narrative: telling facts which need no argument to emphasise their meaning; and, in submitting it to you, I would only beg leave to preface it with such few remarks as may help to define its practical bearings.

The special aim of the paper is to exhibit, with as precise detail as possible in regard of times and places, the various relations of cholera for the past ten years in this Western division of the Eastern Hemisphere: to show, as far as can be learnt, what local epidemics composed the total of each great diffusion; and in what order of time, and in what (if any) mutual connexion, they occurred; and in what (if any) way the local events were related to the circumstances of inter-local traffic. As regards the critical events of 1865, my annual report made to the Lords of the Council in 1866 had appended to it an excellent account then furnished by Mr. Radcliffe of such facts as were yet known; and the facts were likewise to some extent recorded by the Constantinople Conference of 1866; but, even as regards the events of 1865 Mr. Radcliffe is now able to add very materially to the knowledge which was possessed in 1866; and as regards all events subsequent to 1865, the evidence is now put together for the first time in Mr. Radcliffe's annexed paper.

The labour and difficulty of compiling such a record as Mr. Radcliffe has made are infinitely greater than persons who have never tried the same sort of work can well imagine. His raw material (consisting of all information received by different Departments of Her Majesty's Government with regard to the movements of cholera in foreign parts) has been of really immense quantity, but, though of such extent, has been often at first far too vague for scientific use, and has often failed to give essential facts; so that, before exact history could in any way be founded on the first material, much collateral inquiry has had to be undertaken; and occasionally long periods of time, even in some cases years, have elapsed before Mr. Radcliffe could succeed in getting certain links of evidence which were necessary to complete his record. Partly for this reason, and therefore unavoidably, Mr. Radcliffe's account of the second of the two great diffusions of cholera is far less elaborate than of the first; but, as a further reason for this difference, I may add that, when the one diffusion had been so exhaustively studied—studied with a completeness perhaps never before attempted in regard of so large a passage of epidemiology, an equally detailed study of the other diffusion might, comparatively speaking, be dispensed with.

The practical results of Mr. Radcliffe's research are to be looked for in two directions: first, in the facts which are brought to light with regard to the influence of human intercourse in determining the diffusion of cholera; and secondly, in the inferences which arise with regard to the virtual illimitability of that influence (as between Asia and Europe) by measures of the nature of quarantine.

As regards the first matter, the evidence which Mr. Radcliffe exhibits is uniformly to one effect. So far as the extension of the disease could be followed in detail, it was found to have had definite relation to personal traffic: in various important cases the arrival of persons affected with the disease was unquestionably the starting point of local and perhaps national epidemics; and no extension of the disease was to be found, where the arrival of human beings from previously infected places was not either proven or probable.

It is important to appreciate those results in their negative as well as in their positive bearing. Detailed observation of particular outbreaks of cholera, and suggestions of analogy and experiment, have long led European pathologists to believe that the disease possesses great, though peculiar, power of spreading from the sick to the healthy; and Mr. Radcliffe, so far as he shews that particular cholera-epidemics have been started by imported cases of the disease, furnishes only additional illustration of that now (as I believe) unquestionable doctrine. But Mr. Radcliffe's other and merely negative result is in my opinion not less important: the result, namely, that in his very wide epidemiological study, extending from our own shores to the torrid climates of Africa and South-western Asia, he finds no reason to impute to cholera (outside the limits of India) any other mode of origination and extension than such as that doctrine expresses.

If, then, human contagion is the one active power in the international spread of cholera, is it possible so to restrict the intercourse between infected and non-infected countries as to prevent the spread of the contagion? Mr. Radcliffe's results, so far as I have quoted them, are eminently of a sort to suggest that question; but the impossibility of its being affirmatively answered was perhaps never so well illustrated as it is in parts of his paper.

In my above-quoted 8th Annual Report to the Lords of the Council, I entered at some length on the question, whether quarantine established at the ports of this country could be available to protect us against cholera: and I expressed a confident opinion that it could not. I submitted that quarantine, of a sort to be trusted in as a national defence, is not conceivable except in proportion as a people lives apart from the great highways of commerce, or is ready and able to treat its commerce as a subordinate political interest: that though undoubtedly quarantine, planned with the precision of a scientific experiment, and conducted with extreme rigour, may keep cholera out of places (such as remote and secluded islands) where the extremely difficult conditions can be completely fulfilled, yet, under other circumstances,

quarantine cannot reasonably be expected so to succeed, and must then be regarded as a mere irrational derangement of commerce. I presumed of course that our local authorities would individually have at command against the chances of cholera-importation the same powers of interference as against any dangerous infections of our own country, and that port-authorities might learn to exercise those powers in regard of evident arrivals of cholera in a way to confer at least some local service; but it seemed to me that, in the case of the United Kingdom, more than this could not be hoped for.*

That argument, primarily meant to apply to this country, might be expected to apply to other countries in proportion as they are commercial, or in proportion as great movements of population are kept up by other causes, as for instance in religious pilgrimages; and there are plenty of facts in Mr. Radcliffe's paper, to show how utterly futile against cholera were the quarantine-establishments of Europe in 1865. Egypt, aware early in May that illness of some sort was epidemic among the multitude of pilgrims then at Mecca, had provided that no returning pilgrims should disembark at Suez till their ships had undergone medical examination, and been found free from infectious disease; but during the latter half of May, ship after ship, bearing thousands of pilgrims, arrived at Suez without betraying any such evidence of disease as the authorities were prepared to consider a reason for quarantine; and Alexandria (as well as other parts of Egypt) received abundant choleraic infection from these arrivals, before any single case of cholera had been identified by the health-sentinels at Suez. Next, before Alexandria confessed itself to be infected, it had infected Marseilles; and through Marseilles it infected the rest of France. Then, before Marseilles confessed itself infected, Valencia had received a most disastrous infection from or through it; and from Valencia all Spain was infected. Odessa, before it was recognized as itself having cases of cholera, had let infection pass through it, first to start in

* For detailed discussion of Quarantine, *see* the section on that subject re-printed from 8th Annual Report to Privy Council.—J.S.

Podolia an epidemic which diffused widely in South Russia, and secondly to start at Altenburg in the middle of Germany an epidemic which diffused widely in Central Europe. Italy received its infection through the quarantine-establishment of Ancona; which both infected the town of Ancona by sending infected things to be washed there, and also allowed an undiscovered case of cholera to pass on from its lazaret, after six days' detention, to infect the town of Pistoia.

The above cases, which were before the Constantinople Conference, could give little encouragement to a belief that, when cholera is once current in Europe, the individual States can protect themselves against it by respectively quarantining each other; and accordingly the Constantinople Conference, though it approved the continuance of such quarantines, insisted far more on the very important advantages which would be gained to Europe at large if the States, acting collectively, would establish at the mouth of the Red Sea a joint quarantine against Asia. At the Vienna Conference, where, as Dr. Seaton's annexed abstract sets forth, the resolutions of the Constantinople Conference were more or less re-considered, that recommendation for a joint quarantine at Babelmandeb was not expressly renewed, and was not, Dr. Seaton says, meant for renewal, but it was not expressly renounced; and as the Conference clearly adhered in principle to the recommendation of strict cholera-quarantine against Asia, I would observe that Mr. Radcliffe contributes material of particular interest with reference to the proposal of 1866. The proposal started from a belief that the infection of 1865 had come into the Red Sea as a direct importation from the far East; but Mr. Radcliffe gives facts which I think are conclusive against the correctness of any such opinion. He shows that before the arrival at Jeddah of the particular ships which the Conference believed to have infected the Hedjaz, and thus to have started the great outbreak of 1865, cholera had for some time been extensively prevailing both in the Yemen and Hadramaut provinces of southern Arabia and also in the Somali country on the African side of the Gulf of Aden; that the ships in question, instead of having brought cholera from farther east, had probably contracted it at Makallah; but that at any rate

quarantine at the mouth of the Red Sea would, if it had existed, have dealt only with one of the dangers of infection to which the Hedjaz was at the time exposed; and further that, apart from the infection of the Hedjaz, cholera, early in 1865, was steadily making its way from Beloochistan up the Persian Gulf and Euphrates valley, to invade Europe otherwise than through Egypt.

I have noted that the facts which Mr. Radcliffe tells with regard to the spread of cholera in Europe in 1865 say little for the value of such cholera-quarantines as any one European State can maintain against any other; and the practice of this country in respect of cholera in Europe has long recognised that little or no control can be exercised at ports of arrival except as to persons who on medical inspection are found manifestly infected with the disease. Control to this limited extent, not pretending to efficiency as a measure of national defence, but able to be of some local value where local authorities are vigilant in exercising it, and in principle scarcely exceeding that which is exercised in respect of small-pox or fever, is what this kingdom has in place of quarantine: and it is satisfactory to read in Dr. Seaton's abstract of the proceedings of 1874 at Vienna, as compared with those of 1866 at Constantinople, how strongly the balance of European opinion is now inclining to the side of our English practice.

As regards the interest which the world at large has in the preventability of Asiatic Cholera, Mr. Radcliffe's present paper does not pretend to deal with more than one section of a very great subject-matter; but he has so treated this section as to give additional importance to the sections which lie logically next to it; and the reader who would appreciate it in that connexion, should briefly pass them in review.

Cholera, as a geographical subject-matter, divides itself for our practical purposes into three sections: (1) cholera, as existing in India; (2) cholera, as diffusing to other countries; and (3) cholera, as we here, in England or generally in Europe, see it from time to time epidemic among us.

Persons regarding exclusively the second of those sections, and seeing it as now displayed by Mr. Radcliffe, might at first take an almost fatalistic view of the immense mischief which cholera inflicts on mankind. For they see the disease diffusing itself as an attribute of such vast social movements as it is evidently impossible to control or minutely scrutinize: spreading itself, namely, in all directions in those constantly-moving streams of religious pilgrimage and commercial enterprise which constitute very large proportions of national life, and they see that a first, but unattainable, condition of dealing completely with a contagion thus distributed would be that they should be able to immobilize at their discretion the great tides of human life which convey it. They would no doubt see that the marine exportation of cholera from India may be considerably impeded by an enlightened and vigorous supervision of shipping, such as Her Majesty's Indian Government have designed under the Acts (constantly in course of amendment) which relate to native passenger-ships; but they would fear that, even if only in such movements of land-population as comparatively escape control, means must continue by which cholera existing in India will have ample facilities for extending to Europe; and they would recognise how the progress of circumstances is constantly making it less and less possible that, at times when cholera is present in any territory of Europe, the other territories should succeed in really protecting themselves against it by restrictions on international movement.

Undoubtedly, therefore, it is in directions which are outside the view of Mr. Radcliffe's present paper, that we must mainly look for such hopes as can be entertained of dealing effectively with this great pestilence. We have to hope, on the one hand, that India may be made less productive of the infection: we have to hope, on the other, that other countries may be made less susceptible of it. And in each of these directions, there is room for very hopeful work.

Of the conditions which in Europe make local susceptibility to the infection of cholera, I have often had occasion to speak. That cholera, when imported into a locality, will under certain circumstances spread from the sick as from a centre, is among

the certainties of medicine; but we know with at least equal certainty that its means of thus spreading are strictly limited, and the limiting conditions which are best known to us in regard of it are those which bring it into intimate analogy with our own enteric fever, and justify us in classing it as a Filth-Disease. On the preventability of cholera in this point of view, I have said so much on other occasions that I need not now insist on it, and would only refer to the general report which I had the honour of laying before you a year ago, on the subject of Filth-Diseases and their Prevention.* It cannot I think reasonably be doubted but that, as conditions of filth, and especially as filthy conditions of water-supply, are the main facilitating conditions for the dissemination of cholera in Europe, so they must be immensely potent influences in favouring the advance of cholera from station to station in successive epidemic outbreaks in the countries which lie between India and Europe; and it would seem certain that, along the whole succession of lands which transmit the streams of westward traffic from India, common hygienic vigilance in respect of those conditions may be of very great effect in impeding the diffusion of cholera.

Regarding cholera in India, apparently two sets of conditions have to be distinguished: (a) the conditions of the disease's endemic prevalence, in larger or smaller quantity, in a limited portion of the Indian continent, and (b) the conditions of its occasional spread over areas indefinitely larger.

That under the latter head must be counted, at least in part, the same property of contagiousness, and the same relation of this property to circumstances of filth, as we know to be the essential conditions for the extension of the disease in Europe, is an opinion which European pathologists find it impossible not to entertain:† and so far as that European opinion holds

---

* Report, New Series, No. II.

† If this opinion is less generally entertained in India, or in parts of India, than it is in Europe, probably the difference of opinion is in great part only an expression of the fact that it must be more and more difficult to prove the contagiousness of the disease in proportion as studies on this point are made in places where the disease may be autochthonic.—J.S.

good, the amount of cholera-diffusion in India is likely to be controlled by the same preventive measures as are certainly effectual for the like purpose in Europe. Those parts of the world therefore, which have had the habit of receiving cholera-infection from India, and especially those which have received it from secondary centres of infection, may expect to incur less and less of this danger in proportion as common sanitary government shall more and more bring within control the common Filth-Diseases of that vast country. And in this point of view it is most hopeful to know that for many past years, and even more rapidly than Europe has been able to appreciate her own interest in the sanitary progress of India, the British Government has been organising in that part of the empire such provisions for sanitary government as promise soon to compare not unfavourably with the present institutions of Europe itself.

The distinctive Indian problem, however, is that of the endemicity of cholera in part of the Indian area. It is from within British territory that this enemy of the human race sallies forth from time to time to do world-wide execution; and the first threat of each coming foray is that the disease is produced in greater quantity in the area to which it primarily belongs. There, in lower Bengal—specially in the Sunderbunds and other alluvial lands from Juggernauth to beyond the mouth of the Bhurmpooter, cholera is said to be as normal to the district as ague to the marsh-lands of Europe, and as definitely related to the seasons as if it were a fruit of the earth. To learn the conditions of that endemicity and its variations is a problem of the highest science; and to control them in the interests of mankind will be among the noblest administrative tasks which the responsibilities of empire have ever imposed. It would be foreign to my province to dwell upon this part of the subject: but I may permit myself to advert to the fact that Her Majesty's Government, now for some years past, has been promoting the study of cholera in India with the best lights of contemporary European knowledge: and no one will doubt but that here, as in other departments of medical research, truly scientific study must eventuate in practical good.

Briefly then,—if the constantly-developing and constantly-accelerating commerce between India and the rest of the world is not to carry with it a constantly-increasing terror of pestilence, the safeguards, I apprehend, will consist, not in contrivances of the nature of quarantine to maintain from time to time more or less seclusion of nation from nation, but rather in such progressive sanitary improvements on both sides as will reduce to a minimum on the one side the conditions which originate the infection, and on the other side the conditions which extend it. That cholera, as endemic and epidemic in India, will, even in the near future, be rendered by the exertions of the British Government far less terrible to Europe than it has been for the last half-century, is a conclusion which I think cannot fail to be entertained by those European epidemiologists who are conversant with the annual volumes, printed by order of the Secretary of State for India in Council, with regard to the measures adopted for sanitary improvements in India.

I am, Sir,

&c., &c.

Annual Report of 1876*.

SIR,

I HAVE the honour of submitting to you my Report of the proceedings which in the year 1875 you directed to be taken through the Medical Department of the Local Government Board in matters concerning the Public Health.

I. A large part of the proceedings consisted as previously, and as was explained at some length in my last year's Report, in the inspection of Public Vaccination, with other superintendence of the action of the local authorities and officers who are charged with duties under the Vaccination Acts.

* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. VII.

Public vaccination.

1. Under the system which the Lords of the Council established, and which has been continued under the Local Government Board, each ordinary vaccination-district of England is visited by one of the Inspectors of this Department once in every two years*; but in the year 1874 (as I had to mention in my last year's Report) it had happened that this customary inspection was, from accidental causes, considerably interrupted; and as it was necessary in 1875 to deal with the arrears which had thus arisen, the quantity of vaccination-inspections done during 1875 was to that extent in excess of an average yearly amount. The inspections of the former year had extended only to 1,357 vaccination-districts, comprised in 275 unions and non-united parishes; but those of 1875 extended to 1,782 vaccination-districts comprised in 371 unions and parishes. I enumerate the unions and parishes which were inspected as above, and give particulars as to the awards of money which were made in each case to the public vaccinators, under § 5 of the Vaccination Act of 1867, out of the grant provided by Parliament for this purpose [A]. The awards actually made amounted to 15,676*l.*; but a portion of this amount, probably about 2,500*l.*, represented the accidental excess of the vaccination-inspections of 1875 beyond the average yearly number.

2. The success of our modern vaccination-laws in enforcing the general vaccination of infants is to be measured by the periodical returns which are made to the Board, under the Act of 1871, by the so-called vaccination-officers throughout the country. Of such returns the first collection, which related to children born in the year 1872, was completed early in 1874, and a digest of it, prepared by Dr. Seaton, was included in my last Annual Report: a second such collection, relating to children born in 1873, was completed early in 1875, and Dr. Seaton's digest of it is now given [A]. It will there be seen that of the 826,508 children registered as born in England and Wales in the year 1873, all, up to a margin of less than 5 per cent. had, at the time of closing the return, been accounted for by the vaccination-officers; that, of

* A few districts are, for special reasons, visited every year.—J.S.

the $95\frac{2}{3}$ per cent. accounted for, $85\frac{1}{5}$ were accounted for as vaccinated, and $9\frac{3}{4}$ as having died early and unvaccinated; while the small residue, not quite $\frac{2}{3}$ per cent. on the whole number of births, included infants who had contracted small-pox before they could be vaccinated, infants who had been certified as insusceptible of vaccination, and (as by far the largest item) infants whose vaccination had for the time been postponed under medical certificate.

3. The maintenance of the public supply of vaccine lymph, and the arrangements under which candidates for appointment as public vaccinators obtain the authorised certificates of proficiency in vaccination required of them by the regulations of the Board, were in 1875 as usual superintended by the Board through this Department; and the vaccination-stations which are concerned with those special objects underwent their usual special inspection. Subjoined [A], I give the statistics of these branches of service; and here I need only mention that in 1875 the Department supplied vaccine lymph in answer to more than 10,000 applications.

Inquiries into Local Sanitary Administration and respecting outbreaks of Disease.

II. In 1875, 27 local inquiries were made by inspectors of this Department with regard to particular facts of disease in particular places, or to conditions which were deemed likely to cause disease; and I subjoin [A] a list of these inquiries, with an abstract of the chief results of each as reported by the medical inspector. In 4 of the 27 cases the matter of inquiry lay chiefly or wholly outside the province of the local sanitary authority; but in the other 23 cases, the inspectors' reports, so far as they go, exhibit the working of the Sanitary Acts under the 41 local authorities (25 urban and 16 rural) whose districts were visited. In England and Wales, however, the areas of separate jurisdiction for general sanitary purposes are 1,557; that is to say, in addition to the 39 which are metropolitan, there are 928 urban and 590 rural jurisdictions: and the above inspections, extending to only 41 of this number, though they represent, as applied to the new Local Sanitary Administration, the inquiring function which was formerly

exercised by the Privy Council under the Act of 1858 in matters concerning the Public Health, evidently do not constitute an amount of observation on which it would be possible for me to base any such general report under that Act with regard to the sanitary progress and requirements of the country as I can present with regard to vaccination.

Concerning two of the cases in which local inquiry was made, the reports, which in both cases are by Dr. Buchanan, are subjoined in full. The one relates to a considerable and very disappointing prevalence of enteric fever in the town of Croydon, where for many years great exertions have been made for sanitary improvement, and in regard of which it is therefore particularly important that the explanation of so unexpected a result should, if possible, be arrived at. The other relates to a curious outbreak of scarlatina among certain persons—a private family and its guests, who had met on a festive occasion, and who, it seemed probable, might have got their infection in common from partaking of an infected article of food.

Places were also visited by medical inspectors on six occasions with reference to questions of hospital-accomodation for cases of infectious disease: chiefly in order to assist the Board in determining whether (under a provision of law which has since been repealed) it should declare particular hospitals to be for the purposes of the law within a "convenient distance" of particular sanitary districts, or whether its approval, required in other respects for the particular hospital-arrangements, should be given. On one of these occasions the question concerned the five small neighbouring urban districts of Drighlington, Birstal, Birkenshaw, Churwell, and Atherton; on another, the two neighbouring rural districts of Chester and Tarvin; on the others, singly, the respective rural districts of Darlington and Hexham, and the respective urban districts of Todmorden and Over.

III. In addition to the above proceedings, two general inquiries, of the sort by which the Board from time to time seeks to increase its own knowledge and efficiency with regard to particular sections of the large sphere of medical

subject-matter in which it has to advise or direct, were, in 1875, begun in the Medical Department:—one, a more exact and systematic study of the conditions which determine the spread and intensity of scarlatina; the other, a study concerning the effluvium-nuisances which arise in connexion with various manufacturing and other branches of industry, and specially with regard to the effect upon health of each such industry, and to the degree in which the nuisance can be prevented.

Inquiries respecting the causes of scarlet fever;

1. The inquiry concerning scarlatina is in the hands of Dr. Buchanan, who, by way of introduction to it, has had to make careful examination of the mortuary statistics of the disease as presented in the Registrar-General's returns of the last 22 years. This examination has not hitherto suggested any clue which could advantageously be followed up by detailed local inquiries; and it seems probable that the progress of the investigation must mainly depend on opportunities which the Department may accidentally find, or which the friendly co-operation of local officers of health and of private medical practitioners may afford us, for studying in detail, and at the earliest possible moment, such outbreaks of scarlatina as shall appear exceptional in any of their circumstances, and particularly those where the outbreak may seem imputable to any other cause than contagion.

and respecting effluvium nuisances.

2. The inquiry concerning the branches of industry which tend to produce nuisance by their effluvia is in the hands of Dr. Ballard, who possesses very eminent qualifications for dealing with it successfully. Inspections in contribution to it have already been made by him on a large scale in and about the Metropolis and down the Thames, as also at several centres of industry in the Midland Black Country and in Lancashire, and at Plymouth and Devonport, Bristol, Southampton, and some other places: and the offensive industries, large and small, which he has investigated, are already not fewer than fifty. Extension of the inquiry is still necessary, especially in order that the practical conclusions arrived at, with regard to the degree in which any given effluvium-nuisance is preventable, may rest on a sufficiently large basis

of facts; and I therefore, instead of now bringing before you any fragmentary statement from Dr. Ballard, propose that his whole treatment of the subject should come before you later in a supplement to the present Report.

Foreign epidemics.

IV. In respect of the cognizance which the Medical Department has to take of the progress of Foreign Epidemics I subjoin [A] a Memorandum by Mr. Netten Radcliffe on the modern history and more recent movements of Levantine Plague. I regret to observe that at the present time the infection of the disease is in Baghdad; for, being there, it may find considerable facilities for diffusing itself to other places; and though, in view of the experience of the last two centuries, we need not, I think, anticipate as probable, that, if plague should extend considerably in the Levant, it must therefore necessarily extend to any part of Western Europe, still, any wide Eastern diffusion of the disease, especially if to the seaports of Turkey or Egypt, could hardly fail to excite alarm in Western Europe, and at least to cause much derangement of traffic.

In my last Annual Report I mentioned that Mr. Radcliffe was at the time engaged in compiling an account of the movements of Asiatic Cholera, in relation to Europe for the last preceding ten years; and subsequently, in supplement to the Annual Report, I had the honour of submitting to you the elaborate compilation which Mr. Radcliffe with some months further work had then completed. Since the date of that supplementary report of last year, nothing in respect of cholera has occurred which seems to require present mention.

I am, Sir,
&c., &c.

PRIVY COUNCIL REPORTS, 1874–1877.

Scientific Investigations in 1871-3.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

My Lords,

In continuation of former reports, referring to Scientific Investigations made under your Lordships in this Department, I have now the honor of laying before your Lordships the subjoined five papers [A], and would beg leave to prefix to them a few introductory words, first, with regard to the branch of work to which the papers belong, and then with regard to the papers respectively.

Scientific Investigations.

The purpose of the Scientific Investigations which are made in this Department is to contribute in a particular way to the progress of the Art of Medicine.

The sorts of study by which the Medical Profession hopes to extend its means of usefulness to mankind, whether as regards the cure of individual cases of disease, or as regards those large acts of preventive medicine which are of interest to masses of population, may broadly be distinguished as two. On the one hand, there are studies which every member of the Medical Profession (more or less according to his circumstances) has both opportunity and inducement to cultivate at least for his own use, and generally for that of others, by intelligent observation and record of the facts which come before him in his daily practical work, and by scientific generalisations from such experience; and I need hardly observe that, from studies of that sort, which are a life-long

* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. III.

Scientific Investigations.

happiness to innumerable medical practitioners, the aggregate efficiency of the Profession is always in course of increase. On the other hand there are extremely important studies, for which the ordinary professional practice supplies neither opportunity nor immediate stimulus; studies, namely, of elaborate and purely scientific research in aid of the development of medical knowledge; studies never immediately convertible to pecuniary profit, but perhaps, on the contrary, involving heavy cost; studies, too, which from their nature cannot promise rapid results, nor be conducted in fragments of leisure, but require systematic and continuous labor extending over long periods of time.

It cannot be expected that studies of this latter sort, even where of the highest eventual importance, should generally be cultivated to any adequate extent by private medical investigators; and the distinctive intention of the Scientific Investigations which are conducted under your Lordships' auspices has been to supplement in that direction the ordinary resources of private medical observation. It is of the essence of the case that the work does not pretend to immediate popular application, but addresses itself primarily to the deeper scientific requirements of the Medical Profession, and is therefore in an extreme degree technical. It is also of the essence of the case that, in common with everything which is tentative the work may sometimes have its turn of temporary unsuccess and disappointment; and that therefore its results (as indeed the results of every scrupulous scientific investigation) are less suited to be measured from year to year than in terms of several years taken together.

The work which is at present in progress is an exceedingly large and various study, having many divisions and subdivisions of its own, and sometimes (as will be seen) involving collateral inquiry, but nevertheless, in its intention, quite definite and single. It aims to be a systematic study of the intimate pathology of the *Morbid Infections*, acute and chronic.

Such study in regard of any one infection has of course several lines of investigation: for, on the one hand, the infective agent has to be identified; and, on the other hand, the successive changes which it effects in the living body have

Scientific Investigations.

from beginning to end, to be made intelligible. Then, scientifically speaking, no morbid change in the body can be stated in intelligible terms except with exact comparative reference to health as a standard; and in the present case the things and processes as to which the questions of comparison arise, and which belong to the subtlest subject-matters of physiological research, are hitherto, in a large part of the field, but very imperfectly known as to their normal standards: so that, to this large extent, an indispensable preliminary to progress in the pathological study is at least to verify and complete the required physiological standards of comprocedure and in not a few cases to invent new methods by which observations so subtle may be conducted.

Without pretending to prejudge exactly what may be the eventual application of each addition made to scientific knowledge, I may observe in general terms that some physiological and pathological work seems rather to connect itself with the hopes of Preventive, other rather with the hopes of Curative, Medicine. Every process of disease admits of being contemplated and investigated from either of two opposite points of view: either, namely, from the side of the morbific cause, and with particular reference to the initiatory acts of disease; or from the side of the final morbid effect, and with particular reference to the modes of operation by which disease tends to destroy life. Researches in the former sense may peculiarly be expected to increase our powers of preventing disease, and researches in the latter sense to suggest improvements in therapeutical practice.

It is chiefly from the former of those points of view that Professor Sanderson has for some years been working under your Lordships in one large part of the Scientific Investigations; in which division of the field he has of late been very ably seconded by Assistant-Professor Dr. Klein, and on the present occasion also presents a contribution of much interest by Dr. Creighton.

Ætiology of acute infective diseases.

Of the annexed papers the first two, respectively by Dr. Sanderson and Dr. Klein, relate to the intimate ætiology of the acute infective diseases. Ten years ago we had not even

a beginning of any true insight into the respective *Contagia* which excite those diseases; and considering the large and lasting interest which exact studies in this field of scientific research must have for the human race, I think the fact noteworthy that the first of such studies were instituted, and the first steps of discovery made, with reference to a contagious fever of horned cattle. I refer, namely, to the researches which were made under Her Majesty's Government in 1865 in aid of the then Cattle Plague Commission: when Dr. Beale, working at the microscopy of the disease, drew attention to the swarms of extremely minute particles which he found universally present in the textures and juices of the animals, and which he believed to be the contagium of the disease; and when Dr. Sanderson, working at the matter from a different point of view, succeeded in showing experimentally that the true contagium admits of being physically distinguished in the animal juices which contain it, and of being so separated from them as to leave them without infective power. In the next succeeding years, the writings (to which I have on former occasions adverted) of Dr. Hallier, Professor of Botany in Jena, brought under animated discussion, as a branch of micro-phytology, the nature and mode of origin of contagium-particles in a great variety of diseases, human and brute: new experimental knowledge of several contagia was set forth in the writings (to which also I have before referred) of Professor Chauveau, of the Veterinary School of Lyons; and in 1870 I had the honor of presenting Dr. Sanderson's first report of researches made in the matter under your Lordships' direction. At that time, general conclusions already seemed justified; first, that the characteristic shaped elements, which the microscope had shown abounding in various infective products, are self-multiplying organic forms, not congeneric with the animal body in which they are found, but apparently of the lowest vegetable kind; and, secondly, that such living organisms are probably the essence, or an inseparable part of the essence, of all the contagia of disease. The study of morbid contagion was thus brought into seeming affinity with that which had for some years before been made by Professor Schröder and M. Pasteur in the ordinary processes of fermentation and putrefaction; and there began to become faintly visible to us a vast destructive laboratory of Nature, wherein the diseases which are most fatal to animal life, and the changes to which dead organic matter is passively liable, appear bound together by what must at least be called a very close analogy of causation. This view of the matter has since then become greatly more distinct in consequence of investigations made under your Lordships by Dr. Sanderson, particularly in 1871 and 1872, with reference to the common septic contagium or ferment;* for in that ferment, particulate as above described, there seems now to be identified a force which, acting disintegratively upon organic matter alike whether dead or living, can on the one hand initiate putrefaction of what is dead, and on the other hand initiate febrile and inflammatory processes in what is living.

Continuation of this line of study in regard of acute infections of the living body is represented in the first two of the appended papers.

Microphytes of contagion.

In the first paper Dr. Sanderson brings down to the present time an account of the *Microphytes of Contagion;* setting forth more particularly such positive knowledge as has yet been obtained with regard to the respective contagia and respective morbid processes of diphtheria, erysipelas, relapsing fever, and (though but rarely a human disease) the splenic fever or "milz-brand" of veterinary practice.

Variola Ovina or sheep pox.

The second paper represents a contribution to the growing modern doctrine of contagion, in an exposition by Dr. Klein of the intimate nature of the local changes which characterise the acute zymotic disease known as *Variola Ovina* or *Sheep-Pox.* Dr. Klein has been able to identify the contagium-particles of that infectious fever as definite microphytes growing and fructifying with vast rapidity in the canals and tissues of the infected skin: the woodcuts of his annexed paper show the process to have been observed by him with a completeness not yet, I believe, attained in regard of any

* For convenience, in speaking of this morbific influence, I use the singular number, but have no intention of implying that ordinary putrefactive changes have only one ferment which can be considered habitual to them.—J.S.

other such case: and these results of his, while they complete as regards the special disease in question the broad pathological outline which previous inductions had rendered probable, must also, I think, be regarded as tending very importantly to confirm, while they illustrate, the general doctrine of the vitality of contagia.

Tubercular diseases.

The third of the annexed papers, also by Dr. Klein, and founded on work of his which has been in progress for more than two years, continues a line of research already much worked by Dr. Sanderson, with regard to the most important of all chronic infective processes: that, namely, which is at the root of the so-called *Tubercular Diseases* of the animal body, and which has its highest practical interest in relation to the pulmonary phthisis of the human subject. In my Report of 1868, I had to mention to your Lordships an infinitely interesting light of new knowledge with regard to tubercular disease, in the discovery which M. Villemin had recently made, and which other observers had immediately confirmed, of its being inoculable from subject to subject. During the years which have since passed, further and very striking illustration of the communicability of tubercle has been given by the results of experimental feeding with the milk of living tubercular animals, or with bits of diseased texture from such animals when dead; it having been found that in the subjects of such experiments the contagium penetrates by the absorbent organs of the alimentary canal, and so diffuses from them its influence to other organs of the body as to produce general tubercular disease.* With my Reports of 1868 and 1869 I submitted to your Lordships important papers by Dr. Sanderson on the studies which had then been made of tubercle in its infective relations; and the paper by Dr. Klein which I now submit gives a second series of results in the same subject-matter. It has from the first

* In this connexion it deserves notice that within the last few weeks Dr. Hermann Weber has brought before the Clinical Society some facts of a strikingly suggestive kind as to the possibility of tubercular infection being freely communicated to women through their conjugal relations with men who have pulmonary phthisis in a quiescent or very chronic state.—J.S.

been a necessary part of the researches into the processes of tubercular infection in the animal body, that very exact study should be made of the intimate anatomical conditions which determine the sequence of its phenomena and make different organs differently susceptible of it. In the earlier researches Dr. Sanderson found himself obliged for this reason to make much anatomical study of the lymphatic glands; and in the later researches it was an indispensable first need that the knowledge of the lymphatic system should be completed by an exhaustive investigation of the radicles and gland-rudiments of that system in at least the serous membranes and the lungs. Dr. Klein's fulfilment of that large preliminary task has added very valuably to previous knowledge of the normal anatomy; but in the accompanying paper, which essentially relates to the course of tubercular infection in the organs referred to, these results of his two years' work are only given with such amount of detail as may make the morbid anatomy quite intelligible.*

The broad results of modern discovery in regard of ordinary tubercular disease tend to represent it as a chronic locally-originated zymotic process, which, starting under certain conditions in one first spot of the (predisposed) animal body, advances by successive steps in definite anatomical lines to infect the entire system: a process, which by means of its characteristic products is inoculable from part to part, and from subject to subject; but of which in certain other cases the locally originating cause or contagium appears to be the common septic ferment, or a ferment not yet separable from the septic.† This being the tendency of recent knowledge in

* I may note that these studies of Dr. Klein's, and also that relating to Sheep-Pox, were completed at a time when my former series of reports had come to an end and the plan of the present series was not yet settled; and that, as it was desirable not to delay scientific publication of the results, the papers were, with their Lordships' sanction, communicated at once to the Royal Society.—J.S.

† That the acute tuberculisation of organs is preceded by an infection of the blood is made in the highest degree probable by a consideration of the circumstances of cases: but, as to the source from which this infection would first have come, evidence enough for judgment is not yet given.—J.S.

regard of tubercle, evidently there must arise from it very important suggestions (on which I need not here dwell) both as to further like studies of the same disease, and as to tentative applications of the knowledge in the province of preventive medicine; and suggestion also arises with regard to a collateral interest scarcely less important than that of tubercle.

Cancer.

In view, namely, of these results of the modern investigation of tubercle, question naturally arises whether analogous investigation of *Cancer* might not be equally successful. The analogy between the two sorts of disease must of course not be overstrained, nor be construed into any prejudgment of facts; but subject to this condition it will, I think, be generally admitted that cancer and tubercle are morbid processes so nearly parallel as probably to throw light on one another, and that methods of investigation which have led to an immensely improved knowledge of the one disease can hardly not lead to instructive results concerning the other. Careful consideration has therefore been given to the possibility of investigating more exactly than hitherto the chronic self-propagative process which is at the root of the diseases called cancerous; and a first preparatory step under your Lordships for the purpose of such an investigation is represented in the fourth of the annexed papers [A]. In it, namely, is the state ment of an interesting study which Dr. Creighton has made, and of which the results are there given, with regard to the earlier signs of cancerous infection in the ultimate anatomical elements of the secondarily infected organs.

Chemical Pathology of the nervous system.

The fifth of the annexed papers [A] belongs to another sphere of study than the four preceding. It contains, so far as yet ripe for publication, the results of a very important and very laborious research, on which Dr. Thudichum has been engaged for more than two years, in introduction to the *Chemical Pathology of the Nervous System*. During the years 1870–2, Dr. Thudichum, in accordance with the general scheme of work which I explained in my 12th Report, had been investigating the chemistry of typhus; but after following as far as

then seemed possible the chemical phenomena of that disease, had found that the results of his work could not properly be deemed more than provisional, and that, under the circumstances as they then stood, direct attainment of final results could not be expected. The difficulty was of a sort to which I have already adverted: it consisted in the want of normal chemical standards by which to measure the morbid declensions in typhus. Especially a leading fact in typhus, one which may be in intimate relation to the killing-power of the disease, and which it is on all accounts necessary to have as completely as possible understood, is the fact of the action on the nervous system; and clearly no true chemical knowledge of that morbid action would be possible, till greatly improved knowledge of the normal brain-chemistry should be supplied. Accordingly this task was taken in hand; and of course not with exclusive reference to the one disease which gave immediate occasion to it, but in the hope of eventually obtaining results which should be applicable to all cerebral pathology. I need hardly observe that a research of such interest — an endeavour so to unfold the very complex chemistry of the normal brain as to make the abnormal processes chemically intelligible, must, as regards the interest and importance of its object, rank highly among the exact studies by which physiology hopes to give light to Medicine; but I would particularly note that while certainly it is among the most interesting and important of such endeavours, so it certainly must be counted among the most difficult; and I therefore refer with particular satisfaction to the very remarkable evidences of success which Dr. Thudichum is already able to show.

In addition to bringing before your Lordships the accompanying complete papers, I am able to state that much other and equally important work is at present in progress. Especially I may mention that Dr. Sanderson, who for the last three years has been continuously engaged in studies of the infective processes of common fever and common inflammation, will, I believe, early next year have an instalment of valuable results ready for publication with regard to these investiga-

tions*; and that Dr. Klein, who has recently been investigating the minute anatomy of enteric fever, and seems already to have succeeded in identifying for the first time the contagium-particles of that extremely important disease, will also, I believe, early next year have his results in this matter sufficiently elaborated for publication.

In closing my present Report, and with the interest which I must of course feel in whatever tends to strengthen the scientific resources of the Medical Profession, I would beg leave respectfully to congratulate your Lordships on the progress of this work which is advancing under your authority, and to express the gratification with which from time to time I find myself privileged to bring its results before you. Equally to your Lordships who have instituted the work, and to the men of science who under your Lordships are instrumental in conducting it, the reflection must, I think, be satisfactory, that, so far as the Investigations fulfil their primary aim of giving aid and stimulus to the growth of Medical Science in this one country, their success is contributory to knowledges which are of universal human concern, and which ithas therefore ever been the aspiration and the pride of each civilized people to augment for the common good of mankind.

I have the honor to be,

&c., &c.

* Here I may note that two years ago, in the interval between my two series of reports, Dr. Sanderson reported to me some first results which he had then obtained in regard of the infective products of inflammation; and that with their Lordships' sanction (in order not to delay scientific publication of those results) his paper was communicated to the Royal Medical and Chirurgical Society, who published it in the 56th volume of their Transactions. At Dr. Sanderson's suggestion I do not now annex that paper in its original form, but leave its matter to be incorporated by him in a future more comprehensive report.—J.S.

Scientific Investigations in 1874.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

My Lords,

In further report on the Scientific Investigations which I have the honour of superintending under your Lordships, I now beg leave to submit the annexed six papers [A], referring to the various sections of work which were in hand during last financial year.

Scientific investigations.

The *first* of them relates to the pathology of that complex bodily disturbance which is known as the *Process of Fever*.

Process of fever.

This process, as regards the width and depth of its practical interest to persons concerned in the treatment of disease, is certainly second to none which the body suffers; for at every turn of medical practice it is apt to present itself for treatment as a more or less prominent part of the patient's total illness, and in a large proportion of such cases is an influence which involves the issues of life or death. In order that the medical treatment of the febrile process should be perfect, the process ought to be thoroughly understood in respect of all the dynamics of its constitution: so thoroughly, indeed, that the bedside practitioner shall be able to apply his counter-agents with the precision of one who conducts a merely physical experiment. Till within very recent times, however, not even the necessity for that degree of insight into the febrile process has been distinctly felt; and though in these latest times the process has been studied in such spirit of exact science as must surely sooner or later eventuate in improvements of practical efficiency, the modern studies, so far as their results have been made known, can hitherto hardly claim to have done more than contribute some preparatory elements towards the complete doctrine of the future.

* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. VI.

Professor Sanderson, under your Lordships' commission, has during the past three years been spending much time in the investigation of this great section of pathology, and has been gradually making his knowledge of it fuller and more exact. It is scarcely needful to observe that no present treatment of the subject can be regarded as exhaustive and final; but in the annexed paper Dr. Sanderson gives, as instalment, a very elaborate critical exposition of those parts of the subject which he thinks may now be taken as settled.

Inflammation.

The *second* paper, which is also by Dr. Sanderson, relates to the study of *Inflammation* in that extremely important point of view which regards it as an infective process.

Facts which more or less pointedly tend to establish the infectivity of the process of inflammation are familiar in the practice of surgery, and have for many years past been grouped together in that ætiological connexion:* but, with clinical observation alone, the case could not be fully understood; and it was indispensable for the growth of surgery in this direction that the inflammatory process, in its zymotic relations, should be carefully investigated by experiment. The studies which in the years 1867–8 and 1871–2 were made under your Lordships, with regard to the processes of tubercular infection, necessarily had regard to the infective influence of various acute inflammations; and much new knowledge which accrued from them in this respect was embodied by Dr. Sanderson in a special report, completed in the summer of 1872.† Dr. Sanderson has recently

* Thus, in 1860, in the article "Inflammation," in Holmes's "System of Surgery," it was argued that the evidences then known were enough to prove the essential contagiousness of the process, and the general conclusion was stated as follows: "Inflammatory excitement tends to diffuse itself. Within limits "hitherto not defined, inflammations, both common and specific, are communi- "cable from part to part, and from person to person. *Sympathetic inflamma- "tions* are facts of inflammatory contagion. *Inflammatory fever* is a total "bodily infection, wrought by materials from the inflamed part."—Op. cit., first edition, Vol I., p. 92.—J.S.

† At that time (in consequence of departmental changes) the continuity of my annual reports to my Lords of the Council had been interrupted; and therefore, in order not to delay scientific publication of Dr. Sanderson's results, a copy of this paper was, by permission, communicated to the Royal Medical and Chirurgical Society, who printed it in the next (56th) Volume of their Transactions.—J.S.

made further investigation in the same study, and now reports again on an important section of it; and the annexed paper, which contains his report of the present year, contains also, as requiring to be read with it, and as not before officially published, the earlier report which he presented.

The prolonged research which is represented in the two parts of the annexed paper has been of extreme pathological and practical interest: partly as an essential contribution to the general study of processes of contagion, but even more as tending to throw new light on those terrible misadventures which arise in surgical and obstetrical practice when infective inflammations develop the malignant forms of traumatic and puerperal fever.

With regard to these disastrous infections, the earlier report gives results which I have already had occasion elsewhere to quote:* broadly to the effect, that apparently those "pyæmic" and "septicæmic" diseases have their common essential cause in one morbid poison or contagium, which, so far as can yet be discerned, is a particulate ferment of ordinary putrefaction, and which, while able to produce those diseases by its intenser action, is also able (as had previously been shown) to produce by less intense action the chronic tubercular infection of the body; and that, in animals, suffering under the acute infection, microzymes, in active process of multiplication, had uniformly been found in the exudation-liquids of the inflamed parts. Dr. Sanderson, however, had also found that inflammations, in order to be most formidably infective, need not have been started by contagion from any pre-existing case of like sort, nor by any immediate inoculation with foreign putrid matter, but might, it seemed, be highly infective merely in accompaniment of being highly intense. And it is at about this part of the subject that the special interest of Dr. Sanderson's later report begins. For, in regard of that compound quality of infectiveness and intensity in inflammation, Dr. Sanderson has now succeeded in clearly showing that it is a quality which may

* In Nos. II. and III. of the present series of Reports.

be artificially cultivated; and that, starting from some purely chemical lesion, it can be developed in higher and higher degrees by successive inoculations from subject to subject, till there presently results one of the most tremendous morbid poisons which the mind of the pathologist can conceive.

Enteric fever.

The *third* paper, which is by Dr. Klein, gives (as foreshadowed in my last report) the extremely interesting results of his investigation of the intimate anatomy of *Enteric Fever;* and Dr. Klein, who fortunately is artist enough to reproduce admirably with his pencil the anatomical appearances which he displays under the microscope, has here, as on former occasions, illustrated his written report with drawings which make the results peculiarly clear.

The paper has its distinctive and very great interest in the fact that it purports to describe for the first time the contagium of enteric fever as something cognizable to the eye: in respect of certain multiplying microscopical forms, apparently of the lowest vegetable life, which are found in innumerable swarms in the bowel-textures and bowel-discharges of the sick; penetrating from the former to diffuse throughout the patient's general system, and teeming in the latter to represent, as this view supposes, the possible germs of epidemic infection.

The most cursory glance cast by the anatomist at the illustrations of Dr. Klein's paper will convince him of the reality of the facts which Dr. Klein interprets to the above effect: and, that the interpretation thus assigned to the facts is the one which they must generally receive is, I think, an inevitable consequence of considerations which were stated in my last report with general regard to agencies of contagion. The enteric fever of man is not yet known to be communicable to any other animal; and it has therefore not been possible to perform in relation to its supposed contagium such experiments as have been made on the lower animals with respect to the contagia of some other diseases. In absence of such experiments, the same degree of certainty cannot at present be expressed with regard to the contagium of enteric fever as with regard to that (for instance) of sheep-pox: but, subject

to any correction which experiment may hereafter supply, we may at least accept as approximately proven, that the contagium of enteric fever has its essence, or part of its essence, in the microphyte which Dr. Klein has discovered; and that here accordingly is a further illustration of the general doctrine which I have noticed on many previous occasions, with regard to the significance of specific organic forms in the constitution of specific contagia.

In an immediately practical point of view, much interest attaches to Dr. Klein's remark that the microphyte which he describes in the present paper closely corresponds with that which Professor Cohn, the eminent micro-botanist, described, under the name of Crenothrix polyspora, as found by him "in the well-water of a certain district in Breslau, famous "for the frequent occurrence of enteric fever among its "inhabitants."

Cancer.

The *fourth* paper, which is by Dr. Creighton, reports the continuation of the research in which he has been engaged, in introduction to the ætiology of *Cancer.*

In agreement with general principles which modern pathology illustrates more and more strongly in proportion as its own progress advances, and the importance of which is asserting itself to the utmost in the present matter, it had appeared that, before there could be any reasonable hope of understanding for preventive purposes the dynamics of the production of cancer, there was need, in the first place, that the process of the disease should admit of being identified in the earliest movement of its divergence from health; and therefore that, in regard of any organ in which the disease had to be investigated, the observer should know with absolute accuracy the normal texture-changes of the organ.

Dr. Creighton has for the past two years been working in that sense at the genesiology of cancer: working, namely, from the point of view which regards, as first matter for interpretation, the finer anatomy of the disease. His report of last year gave the results of a very careful study of the beginnings of cancer in organs secondarily affected by it, as specially in the liver; and in that report he not only

expressed very definite conclusions as to the mode of origin of the secondary tumours—both as to the anatomical elements in which they begin and as to the physiological analogies of their beginning, but intimated also that the observations which he had made in that respect were in his opinion highly suggestive with regard to the probable mode of origin of the primary disease. In the report of the present year, account is given of a very thorough following of that line of suggestion so far as relates to one organ of the body; namely, *the Breast;* an organ, the interest of which in the present context may be ranked as of the highest order. In the first part of the paper, Dr. Creighton reports the results of his investigation (far more exact than had ever previously been made) with regard to the development of the mammary gland, and to the processes of change which the adult female breast normally undergoes in its alternations of activity and rest, and to the relations of the lymphatic system to these changes; and in the second part of the paper he exhibits the development and infectiveness of primary cancerous tumours of the breast as standing in the clearest connexion with the morphological history which he has premised.

Chemical Pathology of the nervous system.

The *fifth* paper relates to that branch of the Investigations which is in the hands of Dr. Thudichum, and which consists distinctively in the chemical division of our subject-matter.

Dr. Thudichum during the past year has been very actively continuing the great research on which he reported a year ago in introduction to the *Chemical Pathology of the Nervous System;* but, as regards this further work, he is not yet prepared to do more than report provisionally some of the more interesting separate results which have been obtained. Of these the chief refers to the existence of Alkaloids in the Brain, and specially of one alkaloid which has properties of a new type. Incidentally to the investigation of the brain-alkaloids, Dr. Thudichum had to acquire more exact knowledge as to the distribution of alkaloids elsewhere in the animal body; and in his annexed paper he briefly records the results which he thus got in relation to muscular tissue, and to milk and albumen and urine.

Disinfectants.

The *sixth and last* paper of the annexed series is by Dr. Baxter, who reports in it the results of an experimental study which he has made of the amenability of certain contagia to control by certain officinal *Disinfectants.*

Last year, when I was reporting to the Local Government Board, on some of the chief infections which prevail in this country,* practical considerations obliged me to point out in regard of them (and the same observation applies generally to infectious disease) that much procedure which popularly passes among us under the name of "disinfection," is but the most futile of ceremonies; and in contrast with such, I referred to the very real services which might fairly be expected from Chemistry, if skilfully used within its appropriate sphere of operation. It is in relation to individual cases of infectious disease, and in endeavours to secure in detail (so far as possible) the immediate neutralisation of the infectious matters which come from the sick, that Chemistry has its chief opportunities of subserving preventive medicine; but in any such endeavours for disinfection, everything must turn on the accuracy and completeness with which each prescribed performance is done; and it is evident that prescriptions for disinfection ought to have the same sort of exactness as prescriptions which are for therapeutical purposes. Exactness such as this is only possible in proportion as the disinfection-value of each disinfectant has been ascertained by process of strict experiment, duly varied according to varying circumstances; but hitherto, even with regard to the agents which are most largely in use, experimental knowledge has been almost altogether wanting; and even the best of our so-called "disinfections" with regard to products of disease have rested rather on theories of chemical analogy than on true knowledge in the actual subject-matter.

Dr. Baxter's investigation has been intended to illustrate, with a view to more general application, the method of study which this branch of medicine requires; and with that intention, it was carefully planned by him with Dr. Sanderson. Moreover, so far as the investigation could go (but this on

* New series No. II.; on Filth-Diseases and their Prevention.

a first occasion could not be very far) it has been intended to supply, in regard of certain cases, the precise experimental knowledge which is wanted as a basis for practical rules.

The agents with which Dr. Baxter has experimented are four: viz., permanganate of potash, sulphurous acid, chlorine, and carbolic acid. The morbid contagia on which the disinfection-value of these agents has been tried are three: those, namely, of vaccinia, of glanders, and of intensified (infective) inflammation; and, for reasons which are well explained in the paper, Dr. Baxter has made similar proof of each of the four agents in relation to the microzymes of common putrefaction. Within this area of experiment, some very exact results have been obtained by Dr. Baxter; and though, in our present infancy of knowledge as to contagia, we clearly are not entitled to assume that the four agents with which Dr. Baxter experimented would have in relation to all other contagia the same disinfection-values as they shewed in relation to those on which he tried them, his results may, I think, at least be regarded as highly suggestive in that wider sense, and as offering to medical practitioners far more exact clues than they have yet had towards a judicious selection and proportioning of the means with which they shall aim at disinfection.

In concluding this brief introduction to the papers which I have the honor to submit, I would beg leave, my Lords, to express my conviction that they are contributions of substantial value towards the important objects for which your Lordships are empowered by Parliament to incur the cost of the Investigations, and that both here and in other countries they will be highly appreciated in that sense by persons who themselves are engaged in giving growth to the Medical Sciences.

I am, my Lords,

&c., &c.

Scientific Investigations in 1875-6.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

My Lords,

In accordance with the desire which your Lordships, on my retirement from office, did me the honour of expressing to me, that, when the various reports which were yet to accrue from the Medico-Scientific Investigations of last financial year should be complete, I (though no longer in office) should fulfil the agreeable duty of seeing to their passage through the press, I submit the present volume to your Lordships; and as the date of my doing this is by some months later than I had hoped it would be, I beg leave to state that the completion of the printing has been delayed by circumstances not in my control.

Scientific Investigations.

1. The first report which the volume contains is a further contribution by Dr. Sanderson to the study of the Morbific Ferments.

Morbific Ferments.

It relates particularly to the common ferment of putrid infusions,—a ferment which, besides having power to excite putrefaction in dead animal matter, has (as former of these reports have shown) very definite toxical relations to the living animal body. Dr. Sanderson now shows that, if infusions which have the septic ferment in them be passed under pressure through porous porcelain, the filtrate (which after such filtration has no microphytic organisms in it) will now not undergo any further zymotic process in itself, and, if introduced into the living body, will not exercise any morbific influence on it. These results have at least an important negative bearing: for, had contrary results been obtained, and had the septic liquid been shown to contain its characteristic ferment in the mechanically-inseparable state of true solution, this fact would have conflicted with our

* Report of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. VIII.

opinion, previously expressed, that the morbific ferments are essentially particulate, and probably have their essence, or part of their essence, in the multiplying organic forms (microzymes) which they contain.* But while the verdict is to that extent distinctly in favour of the previous opinion, the test cannot, I apprehend, be considered unambiguous for purposes of positive argument, till we know for certain that the filtration-process, which obviously does arrest all visible particles, does not at the same time effect any other change which can be deemed essential in the liquid which goes through the filter.

This report from Dr. Sanderson represents all that his other engagements would allow him to do in the way of scientific investigations under your Lordships during the year 1875-6; and I much regret to have to state that, at the time when my own official connexion with the Department was ending, Dr. Sanderson had found himself unable to accept any commission under your Lordships for the year which is now drawing to its close.

Sheep-Pox.

2. The next three papers in the volume are by Dr. Klein. The first of them [A] is a short memorandum in which he refers to his previous report on Sheep-Pox, and rectifies a very important error of interpretation in that report. It had chanced that Dr. Creighton, while studying preparations which he had made of glandular textures for the purpose of his own researches in Cancer, came on appearances so similar to some of those branching forms which had been found by Dr. Klein in the skin-eruption and skin-lymphatics of variolus sheep, but at the same time so certainly due to his own method of anatomical preparation, that he was led to believe that Dr. Klein's interpretation of the sheep-pox appearances had been in part erroneous; and upon his doing

* As regards the component parts of the previous opinion, it will be observed that Dr. Sanderson in the present paper, though apparently still supposing that the septic ferment is particulate, seems to regard as proven by Professor Panum's experiments, as well as approximately by his own, that it "does not "consist of living organisms." I think it better not to attempt on the present occasion to follow any of the lines of consideration which suggest themselves with regard to that distinction.—J.S.

me the favour of drawing my attention to the supposed fallacy, which I at once brought to Dr. Klein's notice, Dr. Klein returned to his examination of the variolous specimens, and eventually came fully to recognise that Dr. Creighton's contention was just. The effect of the above correction is to set aside as mistaken those parts of Dr. Klein's paper which represent the higher fungic structures, mycelium and gonidia, as existing in variolous skin; and on consideration of all the circumstances, I am disposed to think that provisionally we ought to regard this correction as applying also to certain parts of Dr. Klein's paper on enteric fever, and as invalidating, till further examination shall have been made, the descriptions which he there gives of higher fungic forms in the follicles of the diseased intestines. Dr. Klein is confidently of opinion that the correction does not in either case affect those parts of his description which represent the diseased textures as pervaded by swarms of micrococci; and this is also the opinion of Dr. Sanderson, under whose superintendence the former researches were made; but as it will, I think, clearly be convenient that Dr. Klein should at the earliest opportunity re-write, under the present correction, his account of the morbid anatomy of the two diseases, I would suggest that, in preparing to do this, he should re-examine, so far as any doubt could be raised, the whole ground of the former investigations.

As regards the curiously fallacious microscopical forms by which Dr. Klein was misled, I think it due to him to state that not only did those forms lead other skilled animal-histologists who saw them to concur with him in believing them to be extrinsic organisms, but that also botanists of the highest European authority accepted them without demur as truly fungic.

Scarlatina.

3. Dr. Klein's next paper [A] gives the results of an elaborate investigation he has made of the intimate anatomical changes which arise in various organs of the body during the progress of severe Scarlatina.

His results, so far as the investigations have gone, do not seem to me to justify any final opinion with respect to the

nature of the scarlatinal contagium; but the detailed illustrations which he gives of the peculiar working of the infection in a great variety of organs seem to me a very interesting addition to previous knowledge, both as regards the scarlatinal infection in particular, and as regards febrile infections in general. In these points of view I would especially draw attention to the evidence which Dr. Klein seems to find that scarlatina tends to produce widely-diffused textural changes in the walls of bloodvessels,—a hyaline swelling of the texture of capillary vessels and of the inner layer of minute arteries, and also an abundant growth of new elements in the contractile layer of the arterioles: changes which (as affecting the perviousness and contractility of the vessels) may of course, in their turn, be productive or partly productive of other lesions.

I would connect Dr. Klein's observation of these changes, as incidental to scarlatina, with his previous but less elaborated observation of like changes in cases of enteric fever. Diffused bloodvessel-changes, started in that inner surface of the vessels which has immediate contact with the circulating blood, can hardly not be ascribed to the blood as their cause; and moreover, in both the diseases here referred to, grosser blood-change is occasionally attested by clots which form in the course of the circulation, and become impacted as plugs (so-called *emboli*) in the smaller vessels. The tendency to form "emboli" is known to be likewise an attribute of the septic infections; and at least in them it seems certain that the clotting-process is determined by minute masses of shaped zymotic material which act as nuclei for such concretion.

Dr. Klein has not hitherto found in scarlatina anything which he can confidently regard as a microphytic contagium; for, though he no doubt did see, in some cases, in special combination, an abundant presence of well-marked micrococci, this was only where the circumstances rather favoured a supposition that the micrococci were of secondary occurrence; and he for the present reserves his opinion with regard to the doubtful appearance of micrococci which he found in the scarlatinal skin at an early stage of the disease.

Swine Fever.

4. Dr. Klein's final paper [A] is a summary account of some studies which he has made of a certain infective Fever of Swine. The special reason for this research was that the disease in question had been supposed to be identical with the enteric fever of the human subject; and hope was entertained that therefore our studies of the human disease might be usefully supplemented by studies of the brute. In the event this hope was not realised: for Dr. Klein's research soon showed that the two diseases differ in respects which appear to be essential, and the human disease therefore cannot for the present be studied in other than its human relations. But the research, though in that respect fruitless, has given results which in other ways are of much interest, both as contributing to veterinary practice the more exact knowledge of an important disease of live stock, and also as adding a very interesting new illustration to zymotic pathology in general. In the latter point of view I would draw particular attention to Dr. Klein's description of the state of the lungs and pleura in this pig-disease, as regards the plugging of pulmonary blood-vessels and lymph-vessels, as well as small air-tubes, with micrococci, and as regards the extraordinary diffusion of micrococci on the surface of the serous membrane.

Cancer.

5. In the fifth paper of the present volume [A] Dr. Creighton reports on such further studies of Cancer as he had made down to the end of the financial year. The report is a chapter in the natural history of those ineradicable and indefinitely-advancing infective growths which in surgical practice are emphatically called "malignant;" and it particularly relates to the intimate anatomical changes which arise in lymph-glands, when cancer, operating from some spot in which it has been of primary occurrence, secondarily spreads its infection to them.

In explanation of the fact, familiar in pathology, that, in the consecutive extensions of cancer in a given affected body, the secondary and tertiary tumours tend to repeat with an exact mimicry the special pattern of the primary tumour, pathologists have had two different surmises as to the nature

of the secondary and subsequent processes: one, that such acts of infection are merely of the nature of a transplantation or botanical grafting-process,—that effluent living elements of the primarily-diseased parts, passing into streams of lymph or blood, and carrying with them a strong germ-power of their own, grow indefinitely on their original plan, and as parasites, in the parts to which they are floated, and in which they chance to take root; the other, that not a mere transplantation, but a zymotic process, is signified by the extensions of cancer,—that the elements of the primarily-diseased part have in them a specific ferment-power, by which, if lymph-stream or blood-stream carries them to another part, they enforce on that part, as with a kind of impregnation, that it, deserting its own former textural type, shall grow in a new way with new endowments, so as to become in form and ferment-power a repetition of the parent tumour. The former of these two opinions was that which, before the beginning of Dr. Creighton's researches, was, I believe, the more generally entertained in this country,* and, while nothing was shown to the contrary, might easily have been judged the more probable (because apparently the simpler) explanation of facts: but Dr. Creighton's report of 1874, on the development of secondary cancer-nodules in the liver, pointed decidedly to the other conclusion; and his present report, on the cancerisation of lymph-glands, speaks again in the same sense. He had, it is true, one class of cases in which he could identify in the diseased lymph-glands characteristic forms, derived in considerable quantity from the primarily-diseased part; and in this class of cases, taken alone, it no doubt was difficult or impossible to determine whether given tumour-forms existing in the lymph-gland were mere colonists derived (with or without multiplication) from the primary disease, or were an essentially new generation to which the gland itself, by reason of its being infected, had given rise. But the ambiguity which in such cases attached to the phenomena because of

* See, for instance, the very interesting discussion which was held on the subject of Cancer two years ago at the Pathological Society of London, and particularly the admirable paper with which the late Mr. Campbell de Morgan then introduced the subject for debate.—*Path. Trans.*, Vol. 26.—J.S.

the large quantity of the foreign material was, in cases of a different class, comparatively absent. In some cases, namely, material which could be identified as coming from the primary disease was present in given lymph-glands in but so small quantity that the behaviour of the individual migrants, or of separate little groups of them, could be advantageously studied; and in the very valuable set of observations where this was done by Dr. Creighton, he saw no signs as of migrants preparing to pass by mere self-augmentation (after the manner of vegetable grafts) into the new growth which was to follow their arrival. On the contrary, in observations which appear to have been the most instructive of the series, migrants, when they had attained their fullest type of character, seemed merely to undergo dissolution in contact with the gland-soil onto which they had been cast; perhaps diffusing into it at the point of contact as the spermatozoon into the ovum which it impregnates; while, contemporaneously with this their dissolution, the contiguous portion of gland-substance straightway began to show in its individual elements that it had become subject to an alien power, under which it must pervert its own growth to those new and destructive issues which are common to cancerised organs. And Dr. Creighton's observations to that sort of effect acquire an additional importance when they are considered in conjunction with a third set of observations which he describes: cases, namely, in which the infected lymph-gland not only gave, so far as he could see, no evidence of having received shaped migration from the primary disease, but in which moreover the signs of its incipient secondary infection were diffused in it so generally and so equably as almost to exclude the thought of mere transplantation.

It seems to me of great interest to pathology, in some of its most promising relations to the future improvement of practice, that researches like these which Dr. Creighton has begun should be followed to their very utmost yield; and in view of the high qualifications with which Dr. Creighton had been prosecuting these researches, I found cause for particular regret in learning from him towards

the close of the year's work here reported on that I might not propose to your Lordships his further continuance in the work.

Chemical Constitution of the Brain.

6. The last paper [A] in the present volume is by Dr. Thudichum, continuing his former reports by a provisional account of certain further studies which he has made of the Chemical Constitution of the Brain. Though Dr. Thudichum's work in this investigation has been and is continuous, yet, having regard to its very great extent and its extraordinary difficulty, he does not anticipate that for the next two or three years he will be in a position to give his concluding report on it—a report as comprehensive as that which he submitted two years ago, and containing also his pathological applications of the study; but pending this completion of the entire scheme, there are results of each year which admit of being separately stated; and, just as last year so again now, Dr. Thudichum has presented an interim report with much highly interesting detail in it.

The report chiefly occupies itself with the intimate chemistry of certain of the complex bodies which were described in the former report as immediate principles of the brain, particularly of those of the so-called *cerebrine* (nitrogenous) series; studying, in regard of each such principle, what is its exact eventual yield of elements, and what its exact process of break-up, under artificial chemical treatment. The general importance of this kind of study, as conducing to the interpretation of the chemical changes which are effected by disease in the living body, and as indeed often an indispensable clue for such interpretation, is, I believe, now generally recognised among pathologists; and there are points in the present paper which seem to me strikingly to illustrate it. Thus, the fact, now clearly established by Dr. Thudichum, that sugar is apt to arise as one of the decomposition-products of cerebrine, is highly suggestive in relation to the familiar occurrence of so-called "amyloid bodies" in the diseased nerve-centres of persons who have suffered certain sorts of paralysis, and perhaps also (in a different way) in relation to one interesting

section in the obscure ætiology of diabetes; and, in another direction, it is equally suggestive to find that the new crystalline alkaloid which Dr. Thudichum exhibits as a product of brain-destruction, appears to be of intimate affinity with certain chemical compounds which are known as contents or derivates of bile.

Finally, my Lords, adverting to the fact that my tenure of office under your Lordships did not terminate till nearly two months after the end of the period to which the foregoing report relates, I believe it may be right for me here to state that, during these two months, no work, except such as was of the nature of continuation-work, was undertaken in this branch of your service: for your Lordships had, for parliamentary reasons, determined that you would not till late in the session move Parliament for the usual annual grant for the Scientific Investigations; and under these circumstances the programme which I had in readiness for your Lordships' consideration, with regard to work to be done in the new financial year, necessarily remained in great part in abeyance. I may perhaps be permitted to mention that, among the diseases which I was hoping this year to submit to systematic investigation (in addition to those in regard of which our previous work had to be continued or extended) the first was Rheumatic Fever; and I would also mention that our studies of the obscure problems of zymotic pathology had at so many points (as various sections of the present volume may illustrate) made us aware of the insufficiency of present knowledge of the Natural Ferments of the living animal body, that I was further hoping with your Lordships' sanction to initiate a systematic study of this very difficult physiological subject-matter.

Though now myself removed from further active participation in the medical service of the State, I must continue to feel warm interest in whatever shall promote the progress of that service; and your Lordships, graciously crediting me with this, were so good as to inform me, on my leaving office, that Government intends to continue these investigations.

The connexion of them with your Lordships' Medical Department was always felt by me, while in office, as an invaluable aid, co-operative and consultative, in directions where my own working-power (under prior claim of other engagements) necessarily fell short of my wishes; and I daresay that, by my successors under the Local Government Board, the privilege of the official association with scientific research will be appreciated as highly as it was by me. As for the general value and promise of that kind of work in its bearing on the progress of Medicine, I entertain the strongest conviction that, in regard of all antagonism to disease, whether with preventive or with curative measures, and whether by official or by private hands, Medicine's best prospects of increased success are inseparable from such studies of exact science, and that, in proportion as the pathological insight becomes more clear, the growth of practical power will certainly follow. The investigations which have been made under your Lordships' authority have, I need hardly say, only pretended to deal with selected portions of the vast subject-matter of Pathology. Their distinctive aim (as explained in a former report) has but been to supplement, in particular matters and methods of research, other and ordinary agencies of medico-scientific progress: in directions, namely, where research, if it is to succeed, requires systematic and continuous labour extending over long periods of time—labour, not only inconducive to immediate pecuniary profit, but perhaps involving much cost; and where, such being the conditions, it can hardly be expected that the study, however great its eventual importance, will be adequately cultivated by private investigators. That the investigations, instituted by your Lordships on that limited basis, have even in these few years been of very real instructiveness to the Medical Profession in this country, and that, besides such direct gain of knowledge as they have given, they have very greatly stimulated the general spirit of pathological investigation among us, will not, I believe, be questioned by anyone who knows the medico-scientific records of the time; and in view of their intended continuance, I would

express to your Lordships, though now but as an individual practitioner, my thankfulness for the aid which Government will thus be giving to the culture of the Profession to which I belong.

I have the honour to be, my Lords,
Your Lordships' obedient humble servant,
JOHN SIMON.