A Sketch OF

THE ORIGIN AND DEVELOPMENT OF THE SCIENCE OF HYGIENE.

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By F. S. B. F. DE CHAUMONT, M.D., F.R.S.,
PROFESSOR OF HYGIENE IN THE ARMY MEDICAL
SCHOOL, NETLEY.

To trace the history of the search of the human race after health would be almost tantamount to writing the history of the race itself. Fortunately, both for myself and my hearers, such an undertaking is neither expected nor intended. An inquiry into early wanderings and gropings after health would be doubtfully useful, even if it were likely to be interesting, for it would bear to the hygiene of the present day something of the same relation that the visions of the astrologer bear to the astronomy of Newton. Perhaps some might object that this is claiming too much for our subject, and that even its title to be treated as a science may be questioned. But much the same objection might be made to medicine, and perhaps even to other branches of knowledge which are conventionally included in the list of exact sciences. A careful examination, however, of the position which hygiene now holds will, I think, justify us in claiming that it has made such advances as may fairly entitle it to take its place among the progressive if not absolutely exact sciences. Its literature has been said with truth to be amongst the oldest in the world, the earliest records being religious ceremonial formulas which ever involved rules directed to maintain the health and efficiency of the people.

It has been proposed to place upon these walls the names of the illustrious dead who were the pioneers and founders of our science, and the difficulty will probably lie more in the wealth than in the paucity of material, rendering selection less easy where so many are worthy. We cannot doubt that in order of chronology the first name to be honoured is that of Moses, as the author of the most complete and detailed system of hygiene in ancient times. His rules, given as part of the Divine Law, are of course mixed up with religious ceremonial, both as being appropriate to the age and to the nation for whom they were intended, and also as being more likely to be followed when made in that way a part of the religion of the people. We may be pretty well sure that the code of Moses was the outcome of the wisdom and experience of long past ages. "Nemo fuit repente turpissimus"; so also "Nemo fuit repente hygienicus." Be that as it may, however, one cannot but admire the excellent precepts laid down for the cleansing and purifying of house and camp, for the security of pure water, for choice of good and wholesome food, for the isolation of the sick and the unclean, for the destruction of refuse &c. Some of the rules we may smile at now-a-days, as being a superfluity of precaution, and it is true that with advance of knowledge we can see that certain of them were unnecessarily sweeping in character; but still it would not be too much to say that a fairly strict adherence to the Mosaic law would have preserved mankind from many of the disastrous plagues which have afflicted it. The history of the Jews themselves illustrates this point. Of old, when a pestilence visited them, it was always represented, and probably with perfect truth, as a punishment consequent upon the breaking of the law, a statement which may be frankly accepted either by those who maintain the special intervention of a Divine Providence, or by those who regard it as a strict consequence following on antecedent cause. In later times, and especially during the Middle Ages, the Jews enjoyed a remarkable immunity from outbreaks of epidemic disease, an immunity which still distinguishes them in our own time. Several causes have combined to bring this about. 1st. They are generally temperate and frugal. 2nd. They still in the main follow out the Mosaic law with regard to

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their food, their meat being carefully examined and selected for its freedom from signs of sickness or parasites, nothing but pure (or kosher) meat being used. And 3rd. By reason of the periodical purifications which take place in their dwellings, as a part of their religious rites, which purifications extend to most minute particulars, so minute as to render it hardly possible that disease germs should lurk in any part of the dwelling. So little, however, was the real cause of their healthiness appreciated by our predecessors in the bad mediæval times, that it was held an irrefragable proof of their demoniac machinations, which led them to poison the wells which supplied the Christian community with water, their bigoted enemies not stopping to consider that it would be much against the interest of the Jews to kill or harm those from whom, by commerce, they gained their livelihood. But, indeed, our own time furnishes the exact counterpart of this cruel and unreasoning tyranny, not merely in the savage outrages perpetrated by the rude and ignorant populace of Russia, but in the disgraceful *Judenhitze* which has stained the name of civilised Prussia, and was led by—save the mark—the chaplain of the Court itself!

Let us turn now to the classic records, as they are called—that is, the writings that remain to us from the Greeks and Romans. Considering how many men must have written in those times, how general knowledge and the art of writing was, we have to lament the paucity of the literary remains that have survived. How we curse the fanatical zeal of Omar, who burned the library of Alexandria, and still more the senseless stupidity of the monks of later days who scraped out the writing from priceless manuscripts to write missals and the like in their place! As might be expected, it is to the Father of Medicine, the great Hippocrates, that we owe the most of what we have left of Greek hygienic literature, although we must admit that even in Homer there are traces of hygienic knowledge, and that there the disinfecting powers of cleansing fires of sulphur are fully recognised. It is a remarkable fact that one of the chief books of Hippocrates relating to hygiene—viz., that on "Air, Waters, and Places"—is one of the few about the authorship of which no doubt has ever been raised. Like the code of Moses, it was probably a summary of the already existing knowledge of the subject, supplemented and extended by the experience of the great physician himself. Another name that deserves remembrance is that of Xenophon, whose triumphant retreat was no less a hygienic than a military triumph; and there is no doubt also that Alexander the Great was a master of the art of hygiene, to have taken his force so far with so little loss. Nor ought we to omit the name of Herodicus, one of the preceptors of Hippocrates, and the first to introduce gymnastics on scientific principles, not only as a curative, but also as a preventive measure. The works of Asclepiades, who boasted that he would never be sick, and did, indeed, die of a fall, and those of Aretæus, doubtless contained reference to preventive medicine; whilst those of Galen, which extended to 300 volumes, the majority of them now lost, furnished many of the precepts on which later hygiene was based. On the other hand, the myth which makes Health, or Hygieia, the daughter of Asklepios (whom we call Æsculapius) no doubt arose from an instinctive perception of the value of medical science in preserving health as well as in the cure of disease. We may also be permitted to believe that the honours paid to his sons Machaon and Podalirius were due, at least in part, to their hygienic foresight as well as to their medical and surgical skill. The famous line of Homer shows the estimation in which the military surgeon of those days was held, and the consternation that fell on the Grecian camp when Machaon was wounded:—

Ἰητρός γὰρ ἀνὴρ πολλῶν ἀνταξίος ἄλλων,

which is thus rendered by Pope:

"A wise physician skilled our wounds to heal,
Is more than armies to the common weal."

Would that modern commanders had an equally just and appreciative estimation of the services of the best abused but most beneficent of professions. I may mention that the above line of Homer has been selected as the motto for the medal in military surgery, founded by the liberality of the late Mr. Nathaniel Montefiore, and awarded every session at the Army Medical School, Netley. Besides the writers already quoted it would be unjust to omit the name of Aristotle, whose writings include important hygienic precepts. The praise of health was also sung in an ode of

Ariphron, who calls her *πρεσβιστη μακαρων*, eldest born of the blessed, and also by Isocrates, one of the purest of Greek writers, whose line *ἡ περὶ το σῶμα καὶ τὴν ψυχὴν ἴγνεια*, has been adopted as the motto of the gold medal founded at Netley in memory of Edmund Alexander Parkes. The general life of the Greeks was eminently hygienic, being mostly out-door and under favourable conditions, persons even of high position taking part not only in active occupations but in labours that might be even considered menial by the unthinking. The honourable place that athletic games held is a point of resemblance between the Greeks and our own countrymen that ought not to be lost sight of. Nothing is more conducive to health of body and mind than active exercise in the open air, and the splendour of Greek literature, art, and knowledge is a sufficient answer to those who are afraid lest athletics should develop the muscles of our youth to the detriment of their brains.

Among the Romans the care bestowed upon the provision of pure water—with which is connected the celebrated name of Frontinus, as *Curator Aquarum*—and their elaborate system of drainage, prove that they had correct ideas on some of the fundamental questions of hygiene. Their fondness for bathing and extensive establishments for that purpose remain monuments of the next to godliness which even at this distance of time we, with all our boasted civilisation, have been unable to emulate. The more recent discoveries in the Campagna have still further shown that they were fully aware of the conditions which alone could make that now pestilential region habitable, as a system of subsoil drainage has been revealed that is a reproach to the ignorance and supineness of modern times. Nor was Rome the only city of antiquity that was efficiently drained, for we have evidence of it at Agrigentum at least; but Rome was certainly among the oldest of which we have actual remains, the beginnings of its great cloaca going back at least five and twenty centuries. Another direction in which the Romans showed great knowledge of the principles of hygiene was in the management of their troops on the march and during war. The rules for encampments given by Vegetius are excellent, and to the great care shown for every detail of sanitation must be attributed the comparatively small loss which the armies of the Romans appear to have sustained. We may say, indeed, of classical times generally that there was a remarkable absence of devastating epidemics, none of those on record approaching in fatality and intensity the great plagues which swept over Europe down to quite modern times.

In taking a cursory retrospect of the Old World in its medical aspects, I should be inclined to say that on the whole its medicine was as much preventive as curative. It is probable that such a proposition would be combated; but, in spite of the treatises that have survived in curative medicine and surgery, and the long list of medicaments that we find, for instance, in the works of Galen, there was probably as much, if not more, done in the preventive line as in the simply curative. The motto of the time might have been, "*Venienti occurrere morbo*." Two things seem to indicate this:—1. There was a dread and impatience of disease, so much so that men were known to commit suicide to escape it; like the aged Indian who slew himself at the tomb of Achilles, for fear he should die of disease, from which he had through life been free. 2. The sentiment of pity for the weak and the oppressed appears to have been absent; there was the same tendency as we find among animals and among savages to hold a sick man of little account, as useless to the State, and the sooner got rid of the better. Hence, perhaps, the curious fact that we have no record whatsoever of public hospitals or infirmaries for the sick poor during the classical period—the earliest being as late as the reign of Justinian.

From the time of the decline and fall of the Western Empire the progress of hygiene appears to have been arrested. Some few of the treatises of the Greek and Latin physicians survived, others were known only as translated from the Arabic, &c., whilst the wholesome traditions of the hygienic life of Greece and Rome appear to have decayed, and we pass into a dark and dirty period when fanaticism usurped the place of religion, and dirt became the odour of sanctity. The Hermits of the Thebaid became the types of all that was holy, and so framed their lives and manners as to be as much as possible the antithesis of the heathen. The heathen led an active and healthy life, the Christian fanatic led a life of mooning and inaction; the heathen washed himself and

his clothing, the Christian forswore cold water and wore his clothing till it fell off his body from sheer rottenness. The picture of the thousand years which elapsed between the downfall of Rome and the final capture of Constantinople, as drawn by Michelet in his "*Sorcière*," is one of the most striking as well as disgusting that can be conceived. "*Pas de bain*," he says, "*pendant mille ans*!" Can we wonder at the plagues which devastated Europe? Is it astonishing that the "*black death*" cut off two-thirds of its inhabitants? Although the revival of learning was partly instrumental in arousing the nations to a sense of their degraded condition, yet the change was by no means great, even down to much later days, and it is humiliating to think, from the accounts of Erasmus and other visitors to our shores, that our own country remained long pre-eminent in Europe for dirt and disease. Hardly a decade passed without visitations of some foul malady until the cleansing fires of the great conflagration of London in 1666 appear to have extinguished the last vestiges of those old and dreaded enemies. It is true that even then we were far from being free from epidemic disease, and that we are still open to its ravages; but the forms of disease which have shown themselves since the Great Plague are of a type, if not entirely different, still of a kind and under circumstances which have been more understood, and the causes traced more certainly to particular conditions. But one can easily imagine how different the case of Europe might have been could the hygienic knowledge collected during and before the classic period have been carefully put together, formulated, and acted upon by the succeeding generations. As it is, whatever may have been written in the Middle Ages, was either a mere re-echo of the classic writings, a copying of the Arabian physicians, or a farrago of nonsense into which spells and magic largely entered. When a fresh interest began to be excited, and men began slowly to perceive that the elixir of life was a vain imagining, their minds turned more to actual observation, and among other things the science of dietetics attracted much notice. The older writers had already written much on diet, and even Hippocrates had pointed out the close relation between food and work, a relation which has been fully recognised only in our own generation. Various treatises on food and regimen were written later, of which the two that might claim notice are the one entitled "*Tacuinus Domus*," or "*Tables of Health*," published under the name of "*Elluchasem Elimitar*," and written, it is said, by two Jewish physicians at the request of Charlemagne. This is a curious old book, and very "*rarely met with*," as remarked by Mackenzie in his "*History of Health*," "*except in public libraries, which is no great loss, being but a mean, perplexed, and whimsical performance, and scarce worth taking notice of, but only because it happens to be sometimes quoted by the learned*." We possess a very fine copy of this book, which is a beautiful specimen of the printing of the early part of the sixteenth century, in our library at Netley. It is quaintly illustrated throughout with woodcuts of much spirit, representing every article and operation mentioned in the book which it is possible to illustrate. But the most celebrated mediæval work on the subject is undoubtedly the renowned "*Regimen Sanitatis Salerni*," the code of the famous university of Salerno, which is believed to have been compiled by John of Milan in 1099. So much was it esteemed that it was called the "*Flower of Physic*:" "*Hoc opus optatur, quod flos medicinæ vocatur*." Haller enumerates twenty editions, and it was translated into various languages—among others into English by Paynell (1579 and 1609) and by Dr. P. Holland, whose version is the best known. It was also the subject of numerous and voluminous commentaries, such as that by Arnoldus de Villa Nova, none of which, however, added much that was valuable to the original. We may well believe that this Code of Salerno is a summing up of the hygienic knowledge and experience of the time, most of it probably borrowed from the ancient writers, and suited to the habits of the age. Some of it is no doubt fantastic, but much of it is sound sense. Some of the precepts might well fit many towns of the present day, the metropolis among others:

"*Lucidus ac mundus sit vitæ habitabilis aër,
Infectus neque sit, nec oleus fœtore cloacæ.*"

Dr. Holland's translation is not very faithful; some may render it this way:

"*Dwell in air both clear and pure,
Free from taint or smell of sewer!*"

I do not know, however, if our friends of the Blue

Ribbon persuasion would quite approve of the next precept:

"Si nocturne tibi noceat potatio vini,
Hoc tu manè bibas iterum, et fuerit medicina."

Which I take the liberty of rendering thus:

"If overnight your drink has hit you,
Take a hair of the dog that bit you!"

Talking of dogs, I am sure all would rejoice if the receipt for the cure of a mad dog's bite were only efficacious, as it is certainly simple, and Dr. Holland translates it thus:

"A mad dog's byting may recured be,
With onyans, hony, vinegar, these three."

But we must not dwell any longer on this quaint book, although it was long the basis on which works on hygiene were founded. A list of writers who followed, more or less obscure, is given by Mackenzie, in his "History of Health," and by Sir John Sinclair, in his "Health and Longevity." Indeed, it may be said that no writings on science during this dark period were worth notice, except those attributed to our own Roger Bacon.

One of the first really practical writers on the subject of hygiene was the well-known Ludovico Cornaro, a noble Venetian, who, after a youth of intemperance and excess, reformed his ways and kept so strict a watch over his diet and habits that he prolonged his life to the age of 100 years, dying in April, 1566. Twelve ounces of solid food and fourteen ounces of liquid, in this case wine, were all he allowed himself, but then he led a life that was less life than mere vegetation, for he was careful to avoid heat, cold, fatigue, grief, watchings, and every other excess that could hurt his health. "How," says Sir John Sinclair, "could the business of the world be carried on if every man, like Cornaro, were to begin to follow such a system at the fortieth year of his age." Yet the value of Cornaro's treatise was very great, for it was an indisputable proof that life might be maintained, and even health, upon much smaller amounts of food than were often taken, and further, that temperance and moderation are the best resources against both disease and accident. He recounts how he had been upset in a carriage, and been in consequence severely bruised and had an arm and leg dislocated. The doctors wished to bleed and purge him, but he, confident in his temperate habits, desired merely that his limbs should be set and he himself be let alone, after which he made a rapid and complete recovery. The advanced age to which he lived, and also the great ages of Pope Paul Farnese, Cardinal Bembo, and the Doges Lando and Donato, whom he cites, all of whom were men of regular and temperate lives, contrast remarkably with the short lives of the average of men of the time, old men being very rare, and even those who had passed the half century uncommon.

Various writers followed Cornaro, few of them of much note, save the famous Jerome Cardan, one of the most learned of the physicians of the Renaissance, but somewhat whimsical in his hygienic views. He opposed the views of Galen, and in particular objected to exercise that caused the smallest amount of fatigue or perspiration, or accelerated the respiration. He considers it to be a proof that Galen was wrong, seeing that he died at the age of seventy-seven, which, Cardan says, cannot properly be considered old age. Cardan, however, died himself a youth of seventy-five! He adhered to the principles of Cornaro in diet, and showed that he understood to some extent hereditary influence, as he considered that one of the chances of living to a great age was to be descended from a long-lived family.

Of the other writers of the period I will only refer to Thomas Philologus of Ravenna, on account of his strong protest against intramural interment, thus anticipating by some three centuries the happily fruitful labours of our distinguished countryman Edwin Chadwick.

The next writer of eminence was the celebrated Sanctorius, a native of Istria and a professor of Padua. He wrote a work on health, entitled "Medicina Statica," and he also began the era of exact observation by his well-known experiments with the weighing-chair, by which he endeavoured to show the weight of the insensible perspiration. His experiments were very crude and inaccurate; but they were in the right direction, and his work may be considered as marking an epoch in the advance of scientific observation. The aphorisms in his book are couched in quaint, and even fantastic, language, but many of them are sound when stripped of the vagueness and mannerism of the time. He is particularly severe upon a certain "Staticomastix," who had criticised him, and had asserted that a plentiful per-

spiration did not take away from the body one ounce of weight.

The writers from the time of Sanctorius down to the end of the seventeenth century call for little attention, as they seem to have added but little to the knowledge of the time. The remarkable physical discoveries of the close of that century and throughout the whole of the next certainly paved the way for more exact observation in medicine, both in its purely medical and its etiological aspects. Accordingly, we have the observations of Boerhaave and Haller, and a host of other names of distinction, all representatives of progressive medicine, either directly or indirectly connected with the advance of hygiene. Sketches of the various writings of this and preceding periods are given by Mackenzie in his "History of Health," by Sir John Sinclair, and by Hallé in his long article on Hygiène in the "Encyclopédie Méthodique." And I may here pause for a little to consider the name of the science which we have adopted. It has been objected to that we have taken a foreign word when an English one would do, and that there is no reason why the plain word "health" should not answer our purpose. To this we may reply that the foreign word better defines the science or art, and is less likely to lead to confusion; that the word is now adopted and used in every country of the world, and is therefore common property; and that by its use we accomplish the same end as when we apply a scientific name to a disease, or to a plant, an animal, or a chemical compound. Each of these, under its scientific name, is easily recognised and accurately described. The word "hygiene" itself is derived from the Greek ἡγίαινα, "I am in good health," and was apparently first definitely used by Ambrose Paré, according to Littré. Its use in this country was not general until quite recent years, the expression "medical police" being more usually employed. In Germany the kindred expression "Sanitäts-Polizei" was adopted, as well as the more truly Teutonic word "Gesundheitspflege"; but now the word "hygiene" (formerly written "hygiène") is coming into regular use. There is therefore some advantage in having a common title for our science, even although it be of foreign origin. But, after all, a good half of our tongue is of foreign origin, and as it is one of the most assimilative of all the languages of the earth, we need not reject a word that has much to recommend it on mere grounds of sentimental nationalism.

It is a little difficult in a necessarily restricted lecture to convey any exact idea of the way in which modern hygiene became formulated into so much of a science as it can at present lay claim to; but I will attempt to make a brief sketch of its more salient points. In the eighteenth century there were several important questions inquired into, and to a large extent solved, of which the chief were: (1) The influence of air as a factor in the spread of disease; (2) the true cause and prevention of scurvy; and (3) the prophylaxis of small-pox. Taking the last first, we may say that the introduction of inoculation was a most important step, even although we must admit that it introduced a greater danger to the community at large than could be compensated for by the protection to individuals. But it was the first step on the road which led at the close of the century to vaccination, one of the most signal triumphs of preventive medicine, and in our own time to the magnificent results obtained by the renowned Pasteur, results which seem pregnant with so much hope for the future of our race.

The inquiry into the causes of scurvy was another step in advance, of the most signal importance. No one in the present day can form any idea of the ravages that terrible disease produced. All long voyages were imperilled by it, whilst the very existence of England depended upon her fleet, which had frequently to return to port absolutely crippled with scurvy, in some cases as many as ten thousand men being landed from the Channel fleet helpless. Although so far back as the seventeenth century the efficacy of fruits and fresh vegetables as preventives had been surmised if not actually noted, it is really to the renowned Captain Cook that the credit is mainly due of having established this important fact. That eminent navigator never lost an opportunity of taking on board fruits and fresh vegetables whenever he could, and the result was that he was able to bring home from a lengthened voyage crews in almost perfect health and condition, a thing never before known. It took many years, however, to impress this fact sufficiently upon the authorities, and it was not until 1796 that the medical officers of the navy (among whom was the renowned Sir Gilbert Blane) obtained the regulation ordering lime-juice to

be supplied to our seamen. The effect was magical; scurvy lost its terrors, and it may be that the supremacy of England at sea during the Napoleonic wars was in part owing to the improved condition of her seamen during that gigantic struggle. We have still a monument of the extent of the disease in the immense naval hospital of Haslar, the largest in this country, which was built of such dimensions mainly to admit the extraordinary number of scurvy patients which were being continually landed from our fleets. We have not yet got entirely rid of this enemy, but I think we know now how to combat it, in spite of heretical opinions which find expression from time to time.

The recognition of foul air as a factor in disease was certainly begun in the last century, when the brilliant discoveries in pneumatic chemistry made by Lavoisier, Cavendish, Priestley, Black, and Rutherford threw such a flood of light upon a previously obscure subject, and opened the whole immense vista of the boundless science of modern chemistry. It was only then that the physiology of respiration could be even partially understood, and the changes recognised which take place in the respired air from the lungs of man. The great disaster of the "black hole" of Calcutta, and the terrible effects of the gaol fever, investigated by Howard and others, pointed to foul air as a main factor in the propagation of disease and death; and this was further corroborated by the observations made by military surgeons that outbreaks of typhus (or putrid fever) were most rapidly arrested when troops were encamped and scattered widely over the surface of the ground. It was reserved for the later researches of Neil Arnott and other hygienic observers of the present century to prove the still more important fact that foul air is the main cause of the still more general and fatal class of destructive lung diseases, which in this and in other lands cut off so many of the brightest and the best.

Another important discovery of the last century was the determination of the cause of the well-known lead colic by Sir George Baker. This opened up the large field of metallic poisoning which has received so much elucidation and proved of such importance in reference to the water-supply of large communities.

In the present century we have to point to the establishment of the fact of the water carriage of disease, with which the name of Snow is so honourably associated, the differentiation of continued fevers by Stewart and Jenner, and their connexion with the poison of infected excreta by the labours of Budd and other eminent men. To those we must add the elaborate investigations into the modes of propagation of cholera, dysentery, and other tropical diseases, and the means by which scarlet fever, diphtheria, &c., are carried from place to place by various channels of communication. It would be unadvisable, even if it were possible, to enter into details on these points, but there is one branch of the subject on which we must dwell for a little. No inquiry can assume a scientific form unless it has a numerical basis to work upon, and therefore it behoves us to note the starting-point of such a basis in hygiene, if we can find it. This we do find in the collection of statistics, a beginning of which was made a long time ago in the bills of mortality kept in this country. We know how imperfect those were, and how even the population of this country was not correctly known until within the lifetime of men still living. But still beginnings were made, and the question taken up more and more enthusiastically by enlightened men, until at last the Government Statistical Department was formed, and that remarkable series of reports begun which will immortalise the name of William Farr. From that time the future of hygiene was assured; for there was sound ground to work on, and if we add to that the valuable reports on the health of towns published by the Commission of which the present Duke of Buccleuch was president, we shall have stated some of the most important foundations of modern sanitary science. Those reports disclosed a state of things little dreamt of, and the statistical returns compiled by Dr. Farr showed how much the life and health of the nation were dependent upon the conditions in which its individual members were placed. The establishment of the General Board of Health, under Mr. Chadwick, was one of the valuable outcomes of this remarkable movement. Although the original Board of Health was brought to an end in 1854, yet its work has been continued and expanded under Mr. Simon, his colleagues and successors, in spite of many difficulties and obstacles.

The part which the public services, such as the Army and Navy, played in the progress of hygiene was very important, as might indeed be expected; for under no other circumstances could bodies of men be so well observed, and the effects of surroundings and conditions upon health noted. Accordingly we have a long roll of names connected with those services which must ever be remembered with honour; in the Navy we have such men as Lind, Blane, Trotter, Burnett, &c.; and in the Army, Pringle, one of the most philosophical physicians who ever lived, Brocklesby, Ferguson, McGrigor, and a host of others. The labours of the late Sir Alexander Tulloch, Deputy Inspector-General Marshall, and Assistant-Surgeon (now Surgeon-General) Balfour, in collecting and arranging the army statistics, were of the highest value, and it is not too much to say that the publication of the first army medical statistical report marked an epoch in hygiene, especially in that part that deals with climatology. It exposed the fallacy of the common notions of acclimatisation, of the advantages of a seasoning fever, and similar ideas. It showed also that it was possible for men of temperate habits and in hygienic conditions to live and thrive in the tropics, whilst the death and sickness that were unfortunately so common were due much more to the ignorance and folly of man than the influence of climate in any form. The truth of that is to be seen now when life in the West Indies is actually healthier, especially for young soldiers, than service at home, whereas sixty years ago a tour of service there was looked upon as almost a sentence of death. It is true we have still yellow fever to combat, but we know now much better how to deal with it when it does come, and how to obviate its invasion when it is threatened. The army medical statistics are continued now yearly, but it is a matter of regret that they have been allowed to be published in so abstract and undetailed a shape as to deprive them of much of their utility. It is to be hoped that this mistake may be remedied, and that the saving of a trifling sum, which is said to be the reason, may be recognised as a truly false economy. But perhaps the most remarkable contribution the Army has made to sanitation has been by the evidence given to the Royal Commission of 1857, which met after the Crimean war to investigate the causes of the sickness and mortality of our troops. The results of that Commission are well known, and from its publication may be dated the reforms which have been productive of much advantage both to our own and foreign armies, and to the civil population as well. The paramount influence of foul air in the production of lung disease was proved to demonstration, and the art of ventilation was placed upon a secure foundation. The Barrack Hospital Committee, of which Dr. Sutherland and Captain Douglas Galton were the active members, laid down a series of regulations for the construction of barracks and hospitals, which have been followed with the utmost benefit both at home and abroad. Following this came the Indian Commission, which did for that vast dependency what the Home Commission had done for the rest of the empire. The mortality in India was found to be inordinate, and it was equally clearly traced to insanitary habits and surroundings. To recognise an evil and its cause is half way to curing it, and after a lapse of a quarter of a century we can point, not certainly to perfection, but to such an improvement as might fairly at one time have been looked upon as chimerical. The death-rate of the army at home is only two-fifths of what it was before the Crimean war; the death-rate in India is only one-third, and the death-rate in the West Indies one-tenth.

In civil life it has recently been shown that the improvements of later times have resulted in a diminution of 2 per 1000 in the general death-rate, and with the knowledge we now have of the causes of disease we may be sure that a general death-rate of not more than 15 per 1000 may be confidently looked for. We have not yet got rid of the fatal endemics in our midst, but they are in some directions diminishing, and we have good hope for the future; whilst it seems probable that neither cholera nor any other introduced pestilence could establish a foothold in our land. The remarkable immunity of soldiers and prisoners in the last epidemic shows what can be done when people can be compelled to lead fairly hygienic lives.

I might extend this lecture by reference to the various theories of disease propagation, but time will not permit of it, even if it were otherwise desirable. I may, however, say that no one theory yet promulgated completely satisfies the requirements of the case, and that there may be some

basis of truth even in the most conflicting views. So much has been done hitherto, and so much activity is being shown in investigation, that we cannot fail ere long to find the key to many of the mysteries that now baffle and perplex us. It is quite clear that it is only by a knowledge of the causes of disease that hygiene can be advanced, and that it can never be in any way perfected without a complete system of etiology; and we are at present in this position, that practical hygiene has to some extent outstripped the knowledge of disease causes. We look, therefore, anxiously towards the pathological investigations of the time, and we deeply deplore the well-meaning but misguided zeal which is at present placing such grave obstacles in the way of the only means by which true science can advance—namely, direct experiment.

Although there are many names I might refer to as great writers in hygiene, abroad as well as at home, there is one which we cannot omit in a lecture like this, more especially as it is the first delivered in this museum which has been founded to his memory. Edmund Alexander Parkes did more than any other one man in this or any age to make hygiene a positive fact, a practical science, based upon not only philosophical conceptions but actual experiment. Starting in life as an army medical officer he was able to produce during his short service in India and Burmah works upon dysentery and cholera, which will always be of the greatest value. Retiring into civil life he became eminent as a physician and teacher, and in 1855 he undertook the organisation of the hospital at Renkioi, in the Dardanelles, which was a perfect model of successful hygienic administration. Struggling with distressing and dangerous disease he continued to lead a life of intellectual activity not often accomplished by the most robust; and when, in 1860, the Army Medical School was established by Lord Herbert of Lea, Sir James Clark had no hesitation in advising that Dr. Parkes should be secured if possible as the Professor of Hygiene. How excellent the foresight of that eminent physician was we all know, for Dr. Parkes was not only the first professor of the science in this country in point of time, but also the first in every sense of the word. The publication of his well-known "Manual of Practical Hygiene" gave us for the first time a work on the subject, which was not merely a string of opinions and surmises, but at every point brought opinion to the test of figure and experiment, where it was possible, and thus laid the foundation for a real science in the future. Similarly with his teaching he pressed upon the Government to establish practical laboratories for his pupils, where they could do for themselves as much of the experimental work as time and opportunity allowed; and he impressed upon those who studied under him the necessity of testing everything by actual investigation and bringing all statements to the proof of figures before accepting them as true. There was never probably a man of calmer and more judicial mind, a man more rigidly critical of his own work, or more kindly disposed to allow every credit to the work of others. Having known him personally for many years, during thirteen of which I was his assistant and colleague, I can bear confident testimony to the exceeding beauty of his character, in which "sweetness and light" were never more truly displayed, and the scrupulous accuracy and care with which every investigation of his was carried out. The science of hygiene could have no purer and better founder and its votaries no brighter and more spotless example.

NOTE OF AN INSTANCE OF THE VALUE OF PHYSIOLOGY IN THE PRACTICE OF SURGERY.

By WILLIAM S. SAVORY, F.R.S.,
SURGEON TO ST. BARTHOLOMEW'S HOSPITAL.

A GOOD instance of the value of physiology in its direct application to the practice of surgery occurred some time ago in St. Bartholomew's Hospital. A man was admitted with aneurism of the second and third portions of the right subclavian artery. In discussing the various plans of treatment still open to the surgeon, the question of placing a ligature on either the axillary or common carotid, or on both of these vessels, was considered. In favour of selecting the carotid, the fact was insisted on that pressure on that vessel

produced a very manifest diminution in the pulsation of the tumour, an effect very far transcending that produced by compression of the axillary. On this ground ligature of the carotid was for awhile generally approved; but in demonstrating the effect of pressure on the carotid it became obvious that the sudden and striking reduction, not so much in the force as in the frequency of pulsation in the aneurism, was due directly to the effect upon the action of the heart of irritation of the pneumogastric—the inhibitory nerve. This explanation was not, however, at once accepted by all, not until the reduction not only of the force, but also of the frequency of pulsation, was clearly made out, and the confirmation of the truth by a like effect being produced by pressure on the opposite side.

The fact has been long recognised. Waller more than twenty years ago called attention to this effect of "mechanical irritation by simple pressure on the trunk of the nerve."¹ He says: "I generally apply pressure of the fingers at the highest point of the neck behind the ramus of the lower jaw. A moderate amount of pressure applied in this manner is usually sufficient in the course of about a minute to produce symptoms which are at once easily recognised as originating from the irritation of the vagus and the sympathetic nerve. We observe a considerable disturbance of the heart's action. At first there is increase in the number of its pulsations with decreased power, as may be easily ascertained by the pulse. To this supervenes a retardation of the heart's action of about four to five beats a minute of its initial number, at the same time there being decrease of the force of the pulse. At the next stage the heart's action may become so enfeebled as to produce syncope." He adds: "It is easily ascertained that the symptoms above described are not owing to compression of the carotid artery, as they may be produced without obliterating the calibre of the artery, or, *vice versa*, the course of the blood may be completely interrupted in the artery without producing any of the symptoms enumerated."

It is well known that Czermak, by pressing his vagus nerve against a small osseous tumour in his neck, was able to stop the beating of his heart.

I am indebted to Mr. Henry Morris for the following reference.

In the *London and Edinburgh Monthly Journal* for 1841 is a paper by Sir William Fergusson, entitled "Case of Aneurism of the Innominata treated by Ligature of the Right Carotid Artery, with Observations," in which this fact is clearly recorded. He says: "Pressure on the carotid opposite the larynx caused sudden diminution in the size of the swelling and singular slowness in the pulsations, with a feeling of giddiness, sickness, and faintishness. Pressure on the subclavian outside of the scaleni muscles caused less perceptible change, and produced no other marked effect. Simultaneous pressure on both vessels caused a rapid decrease in the size of the tumour; the skin over it wrinkled, and the pulsations seemed almost to cease" (p. 787). Further on he says, in describing the operation itself: "Having ascertained that the patient had actually fainted on one occasion in consequence of pressure with the fingers in the course of the carotid, I resolved before tightening the ligature to mark the effects of obstructing the course of the blood in that vessel by itself, and accordingly when the needle was under the artery I ascertained by pressure with the forefinger that sudden obstruction produced no immediate remarkable symptom such as had been previously experienced." Again: "Before the patient was removed from the table, the tumour seemed slightly diminished in size, and the pulse in the right wrist was fuller and more bounding than it had been previous to the operation, and much more distinct than in the left" (p. 788). In commenting on these facts Sir Wm. Fergusson says: "I was the more prepossessed in favour of this operation [that is, ligature of the right carotid] by the more marked effects produced on the tumour, whilst pressure was applied in the course of the carotid, as well as by the pulse in the right wrist being less distinct than on the opposite side. Though on the first of these points (as similar symptoms were observed by pressing on the course of the left carotid) I had strong reason to suppose that the pressure caused its peculiar effects by its influence on the brain and on the action of the heart, or *vice versa*, I deemed it most reasonable, considering that in all probability some favourable change was already going forward on the subclavian, to select the other branch of the innominata. It is worthy of

¹ Proceedings of the Royal Society, vol. ii., pp. 302-3.