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VITAL STATISTICS.

WILLIAM FARR.

1885.

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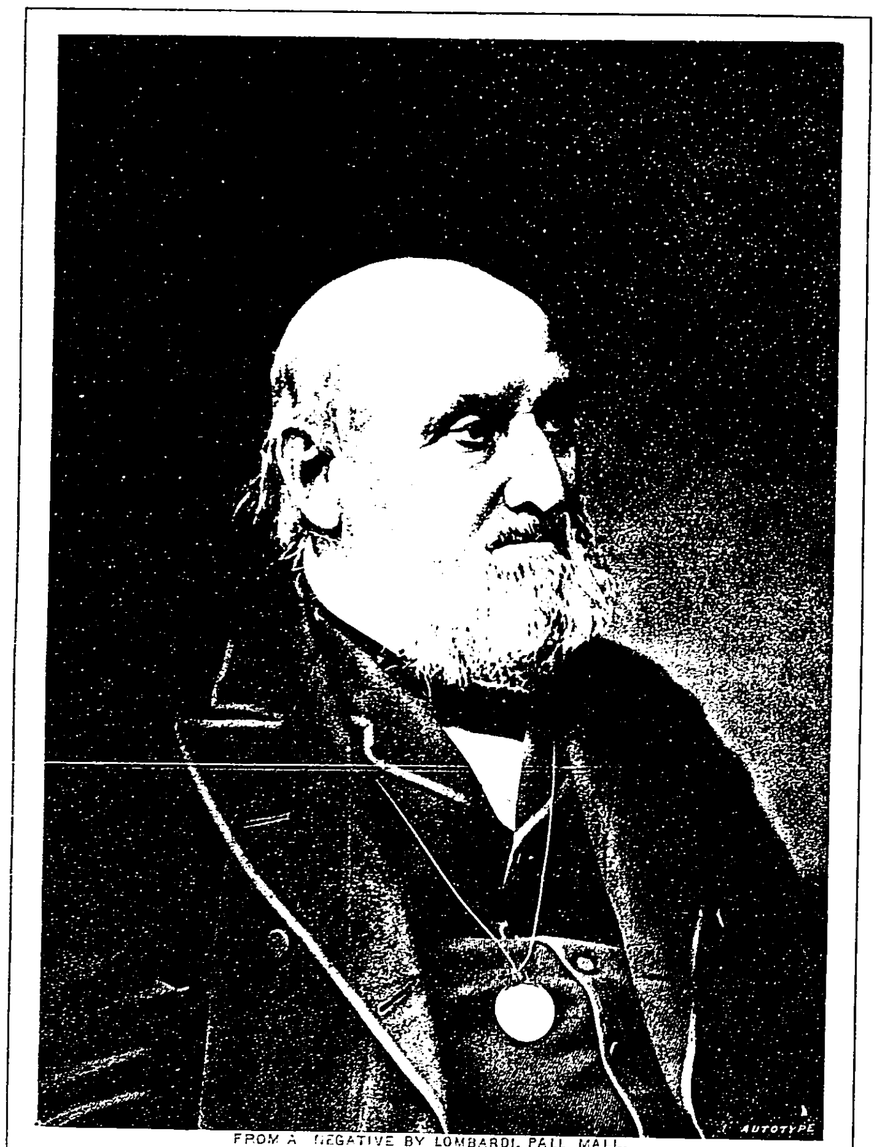

FROM A NEGATIVE BY LOMBARDI, PALL MALL.

AUTOTYPE

Ever yours faithfully
W. Farr

VITAL STATISTICS:

A

MEMORIAL VOLUME OF SELECTIONS FROM
THE REPORTS AND WRITINGS

OF

WILLIAM FARR, M.D., D.C.L., C.B., F.R.S.,

LATE SUPERINTENDENT OF THE STATISTICAL DEPARTMENT OF THE REGISTRAR GENERAL'S OFFICE, ENGLAND.

EDITED FOR

THE SANITARY INSTITUTE OF GREAT BRITAIN

BY

NOEL A. HUMPHREYS,

OF THE REGISTRAR GENERAL'S OFFICE, MEMBER OF THE COUNCIL OF THE STATISTICAL SOCIETY OF LONDON.

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1885.

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PREFACE.

The suggestions which led to the inception of this work had their origin at the Meeting of the Sanitary Institute of Great Britain in Glasgow, in July 1883.

Professor W. T. Gairdner, in his Address as President of the section on "Sanitary Science and Preventive Medicine," dwelt forcibly upon the work of William Farr in the field of Sanitary Science. He suggested that the Institute should take steps to publish a selection from his statistical works, which might serve as an enduring monument of his fame. "The best of all possible monuments before the lessons " of his life and character have ceased to be vividly present to us."

Immediately after the Address, as Chairman of the Council, I promised that the subject should have the careful consideration of the Council, and, that if possible, the proposition should be carried into effect. In the following December the suggestion was considered by the Council; and a Committee, consisting of myself, as Chairman of the Council, Professor Corfield, Dr. Collingridge, and Professor Robinson, was appointed to consider and report upon the possibility of carrying out Dr. Gairdner's proposition. At a later meeting of the Council, the Committee was empowered to carry out the proposal, and the appointment of Mr. Noel A. Humphreys as Editor was sanctioned.

The publication of a deceased Author's works not being absolutely provided for by the regulations under which the Sanitary Institute of Great Britain was established, it was thought best to publish the work by subscription. The Committee, with the sanction of the Council, issued a circular, in June 1884, to those interested in sanitary science and health progress, which contained the following paragraphs.—

"It has long been the source of much regret amongst students of " Vital Statistics, as well as among those practically interested in this " branch of Sanitary Science, that the valuable statistical work of the " late Dr. William Farr, C.B., F.R.S., is, from the form and manner " of its publication, not generally available.

"The Sanitary Institute of Great Britain, having had the desire for " the publication of these statistics pressed upon its notice by those " capable of forming an opinion of the advantages to be derived there-

" from, and being fully impressed with the value of Dr. Farr's work, " proposes to publish a selection from the official reports, papers, and " addresses, which were contributed by that eminent statistician.

"Mr. Noel A. Humphreys, of the Registrar-General's Office, has " consented to undertake the selection and editing of this memorial of " Dr. Farr's statistical labours, which exercised so marked and so " beneficial an effect on the sanitary progress of England during the " forty years of his official career."

The result of this circular was a list of upwards of 500 subscribers, thus assuring the successful realisation of Dr. Gairdner's suggestion, which can scarcely fail to confer a benefit upon all interested in the science of Vital Statistics and Public Health.

As an earnest disciple of Dr. Farr, it gave me the greatest pleasure to assist in pressing the claims which his works have upon our grateful remembrance before the Council of the British Medical Association, when I was its President, and also before the Sanitary Institute of Great Britain.

ALFRED CARPENTER, M.D.,

CHAIRMAN of the COUNCIL
of the
SANITARY INSTITUTE.

BIOGRAPHICAL SKETCH

OF

WILLIAM FARR, M.D., D.C.L., C.B., F.R.S., &c., &c.

This memorial volume of selections from Dr. William Farr's literary work in connexion with vital statistics would be incomplete without a biographical sketch of the author. The story of his uneventful life, however, mainly consists of a chronological list of the productions of his pen.

William Farr was born at Kenley, a small, ancient, and remote village of Shropshire, on 30th November 1807. His grandfather was a small farmer in that parish, while his parents, who were in humble circumstances, migrated early in their married life to Dorrington, a small township six or seven miles from Shrewsbury. Here, while he was still an infant, he was adopted by Mr. Joseph Pryce, almost the only well-to-do resident of the neighbourhood. Dr. Farr, in a sketch of his early recollections, to be called "The Life of a Medical Student," which he began in 1833, but unfortunately never completed, thus alludes to his parents and his earliest years:—" My mother was young, and I was her " first child. At the age of two years I left my parents; I do not " remember living with them. My mother was 'extreme in all'; she " was a woman of violent attachment and temper, retiring and solitary " in her habits, of a strong mind, able and inclined to subsist on itself. " She was religious from duty and for consistency, rather than from " impulse or feeling, and had a good deal of superstition in her turn of " mind. The character of my father was very different; he was good- " natured, sensible, straightforward, a Christian in faith, feeling, and " simplicity of heart." Although he did not live with his parents after he was two years old, he must have seen them frequently, as they lived at Dorrington after their migration from Kenley, at any rate until the death of his mother in 1845. His father spent the last years of his life with his son, and died in 1864 at Dr. Farr's house at Bickley, Kent.

Of his benefactor and of his childhood, Dr. Farr thus speaks in his recollections:—"To him I owe my education, the most constant and " tender care, and an example of benevolence and integrity. Would " that I could add a moment's duration to his memory! When I first " recollect Mr. Pryce he must have been between 70 and 80 years of " age; his health was delicate, his senses, with the exception of hearing,

" were acute, his mind was vigorous and active. Dorrington is a village " situated 6½ miles from Shrewsbury. It lies on the Hereford Road; a " brook flows through its meadows; the Lawley and Caradoc rise in " the distance. No parson, no doctor, no great landed proprietor, lived " in it. Joseph Pryce was the squire, as he was not only the richest, " but the most influential man in the place. His house was constantly " open to the poor; he gave them coals and food in winter, paid the " apothecary when they were sick, established a day school, supported " a Sunday school, and was the principal founder and stay of a place of " religious worship. His acute intellect, his affection, his love of young " children, his benevolence, remained unclouded to the last. At home " I was a spoiled child. I always took refuge between Mr. Pryce's " knees when the wind blew high. I do not recollect the time when " I could not read, and after the dame's school went to Longnor school, " then the best in the neighbourhood, about a mile and a half from our " residence. * * * The schoolmaster was idle and empty-headed. I " learned writing and accounts, but did not at all distinguish myself. " The rookery and mill-ponds I remember distinctly, but the rest is " confusion. Mr. Pryce enabled B. Jones to open a day school; I " finished my school education here. I read English history, and was " taught English grammar, geography, and Latin, by Mr. Beynon, the " local dissenting minister. Mr. Beynon takes some credit to himself " for my early instruction; but, though very much indebted to " Mr. Beynon in several respects, I am sorry to say that I learned very " little grammar or Latin from him."

From these facts it is evident that Dr. Farr's educational opportunities in childhood were few, and of a most elementary character. His real education, and his classical and mathematical acquirements were mainly due to reading and private study. Even his opportunities for reading in his early years were very restricted, as may be judged by the following extract from his recollections:—" Our own library was " limited; its most conspicuous ornaments were 'Brook's Gazetteer,' " 'The Whole Duty of Man,' 'Sturm's Reflections,' Timothy Priestley's " folio Bible, and various old theological works. The pictures in the " old Bible were a favourite study. With what ghastly fear, and yet " curiosity, did I look on the grim, grinning, bat-winged devils tor- " menting poor Job, and his wife muttering through them, 'Curse God " 'and die.' After leaving school I read as many works as came in my " way. To Mr. J. Palmer I am much indebted; he lent me 'Smith's " 'Natural History,' and 'Rollin's Ancient History.' To Latin a good " deal of attention was paid, and about 1823 (at 16 years of age) I " commenced learning Hebrew, which, with the help of 'Parkhurst's " 'Dictionary,' I was at last able to read decently. About this time " the books I read were almost exclusively theological, and some " religious friends thought I might make a preacher of the Word."

He was so constant a devourer of books that his benefactor would say, " Go, look in the glass; when thou wast a little lad thy face was

" red and round, now, what a thin yellow cheek thou hast in its place; " all is brought on by this reading, morning, noon, and night!" He expresses his obligations to his friendly intercourse with the Williams family of Ryton; "their society refined and enlarged my views, and " drew me into the portal of infinite thought." He thus retrospectively summarises the advantages and disadvantages of his bringing up:— " The advantages I enjoyed, the privations and the errors under which " I laboured, are obvious. In point of birth I was favoured; my parents " were healthy, vigorous, and moral. My intellectual and inquisitive " faculties were not developed in a public school, nor by the example " and excitement of cultivated minds around me. Left to myself my " progress was wayward."

In his nineteenth year, inclination, or chance, or a combination of both, appear to have turned his attention towards medical study. He writes:—"Some apothecaries in the neighbourhood several times " expressed a wish to have me for a pupil, the objection to which was " that Mr. Pryce could not spare me, as he depended upon me for the " management of his business affairs. Besides, the old gentleman had " such a fond attachment to me, that he could scarcely rest when I was " out of his sight for an entire day. In May 1826, Dr. Webster called " accidentally one evening. The 'Encyclopædia Metropolitana,' and " the 'Quarterly Review' containing an article on 'Contagion' by " Dr. Gooch, were on the table. This and other matters were discussed. " The Doctor's was a striking and original mind, and left an impression " not to pass away. I called on him when I next went to Shrewsbury. " Physic seemed a field opened all at once before me. The plan " suggested was feasible, plausible, and excellent. I was to study with " G. Webster, under the doctor, become a dresser of Mr. Sutton's at " the Infirmary, and be nominally apprenticed to Mr. Wyke. On " Whit-Monday, in May 1826, I walked to Shrewsbury and called on " Dr. Webster. Through this summer I every day walked to Shrews- " bury, dressed patients at the Infirmary, read with Dr. Webster, and " returned home at evening, nearly 14 miles there and back. As " winter came on a good bay mare was purchased, and I rode to Shrews- " bury every day for two years, Sundays excepted. I thus became " tolerably acquainted with the manual and practical art of chirurgurie. " Sutton was very kind and gentlemanly in his manners, and always " took me to his private operations. With Dr. Webster I studied " anatomy in Fife. We read Celsus and Gregory's Conspectus. " The judicious and enlightened direction, and the elevated tone, " Dr. Webster gave to my studies, laid the foundation of all I shall " ever do that is useful or good. Many pass the first years of their " scientific career under well-informed industrious men, few, indeed, " under the eye of a man of genius. My medical reading was miscel- " laneous, and was gradually prolonged in the evenings till midnight. " With a Carbonarist from Turin, a Roman patriot, Dr. Webster and " I read Italian—Boccaccio, Dante, Ariosto, Tasso, Alfieri. My health

" continued good till the autumn of 1828, when I had acute bronchitis. " During my illness Mr. Pryce was indefatigable in his care for my " recovery."

Dr. Farr's benefactor, Mr. Pryce, who was a bachelor, and 90 years of age, was seized with pneumonia in November of the same year (1828), and died after a few days' illness, leaving a legacy of 500*l.* to promote the education and advancement of William Farr, then 21 years of age. He remained at Dorrington till the following April, and in May 1829 left Shrewsbury for London; after staying there for a few weeks he proceeded to the Paris University to prosecute his medical studies.

Dr. W. P. Bain, who enjoyed an intimate and unbroken friendship with Dr. Farr of more than fifty years duration, writes:—"I first met " Dr. Farr in Paris in the beginning of 1830, when I went to study " there after having passed my surgical examination in Edinburgh, and " took lodgings in the Hotel des Grès, where he had been residing " some time. We became intimate and attended lectures together. " There was then a good deal of bad feeling amongst the lecturers. I " remember at one of Lisfranc's lectures at La Pitié, in speaking of " Dupuytreu of the Hotel Dieu, on the banks of the Seine, he called " him 'Ce brigand au bord de l'eau.' The revolution of July gave us " a good opportunity of seeing gunshot wounds and their treatment. " The Hotel Dieu, La Charité, and La Pitié, were full of such cases."

During his two years' residence in Paris, Dr. Farr attended the lectures of Orfila, Louis, Dupuytreu, and Lisfranc on various branches of medical science; of Andral on hygiene; of Gay Lussac and Thenard on chemistry; of Pouillet on natural philosophy; of Geoffery St. Hilaire, Dumeril, and Blainville, on comparative anatomy and physiology; of Cuvier on the history of natural sciences; and of Guizot and Villemain on history and literature. It was during the course of his studies in Paris that the subject of hygiene, and of medical statistics bearing thereon, began to attract his special attention, and to engross his interest.

On leaving Paris, Dr. Farr and Dr. Bain travelled in Switzerland, and the latter writes:—"I had many opportunities of studying and " admiring my friend's character. In a diary which I kept of our tour, " I find recorded that 'Mr. Farr, while of a simple disposition, is " 'endowed with a vastness of ideas and a philosophic mind.' He gave " evidence then of observation and research. I well remember the " scene at our inn at Martigny, when, after a walk to see the celebrated " waterfall about four miles away, I returned weary and hungry to " dinner. To my surprise, I found the entrance blocked up by at least " a hundred of those miserable beings, the Crétins, who inhabited the " Valais in great numbers. On inquiry of the landlord he told me that " the gentleman inside had commissioned him to get together as many " Crétins as he could, so that he might examine them. After some " difficulty, I wedged my way into a room, where Mr. Farr was standing

" with a table and numerous large sheets of paper before him, on which " he was marking the shapes of the different heads of which he had " previously taken the contours vertically and horizontally by means of " a leaden tape. That day we dined late."

On his return to England, after spending a short time in London, during which he appears to have commenced a course of study at University College, William Farr went back to Shrewsbury, and, probably through the influence of his friend Dr. Webster, was appointed *locum tenens* for the House Surgeon of the City Infirmary, who had been granted six months leave for the purpose of obtaining a second qualification. At the close of this six months the House Surgeon returned, but without his additional qualification, and the Governors of the Infirmary, obliged to appoint a surgeon with the double qualification, selected Mr. Yardley, whose brother is still (1885) Vicar of St. Chads, Shrewsbury. That William Farr fulfilled his hospital duties to the entire satisfaction of the pupils, may be inferred from the fact that they presented him, on his leaving, with a silver snuff-box. At this time Dr. Farr was without any medical qualification, or it is more than probable that he would have been appointed to the vacant post. It is impossible to regret what was to him, we believe, the cause of temporary disappointment, for had Dr. Farr been appointed House Surgeon of the Shrewsbury Infirmary in 1831, the chances of his subsequent devotion to medical and vital statistics would have been exceedingly small.

His Shrewsbury experience would appear to have led Dr. Farr to lose no more time in qualifying himself for practice. During the following two years he attached himself to University College, where he continued his course of medical studies, attending the lectures of Grant, Carswill, Jenner, Elliotson, and others. In March, 1832, he passed his examination for the L.S.A. at Apothecaries' Hall, which was the only medical qualification he obtained except the honorary degrees afterwards conferred upon him on the ground of "high scientific acquirements."

In 1833, Dr. Farr married a Miss Langford, of Pool Quay on the Severn, between Welshpool and Shrewsbury, and afterwards resided in Grafton Street, Fitzroy Square, where he commenced the practice and teaching of medicine. To supplement a probably precarious income he about this time wrote for various medical journals, mainly on subjects connected with vital statistics. He attempted to establish a course of lectures on what he called Hygiology, but in this respect he was ahead of his time, for no public licensing body in the United Kingdom at this time recognised even the desirability of public health lectures. The subject matter of these proposed lectures formed about the first* of a long series of papers contributed to the "Lancet," Dr. Wakley, the founder, proprietor, and editor of that journal, being

* See *Lancet*, vol. II., 1835–6.

one of the first to recognise the original talent of this young student of vital statistics.

In 1837, in conjunction with his friend Dr. R. Dundas Thomson, he edited the "British Annals of Medicine." He also in the same year wrote his valuable article on "Vital Statistics" in McCulloch's Account of the British Empire. This article, from which many extracts will be found in this volume, established his claim to a foremost place among authorities upon this hitherto neglected subject. Although it is now nearly half a century since this article was written, there is no other treatise on this subject (thoroughly and soundly treated in all its branches) that could be more profitably studied by students of vital statistics. This article may be said to be the foundation of a new science, to the development of which, with special reference to the improvement of public health, Dr. Farr devoted the greater part of the forty-five most active years of his industrious life. He also contributed in this year to the British Annals of Medicine "A method of determining the danger of "the duration of diseases at every period of their progress." During this year he lost his good friend Dr. Webster, of Shrewsbury, who left him a legacy of 500*l.* together with his library.

Among other work undertaken at this period, Dr. Farr is said to have been engaged by Sir James Clarke to assist him in revising and preparing for press his work on "Consumption," about the same time that Dr. Farr's young wife fell a victim to this disease.

In 1837 the civil registration of births, deaths, and marriages came into operation, and Mr. T. H. Lister was appointed the first Registrar-General. The necessity for skilled and scientific assistance in the compilation of statistical tables from the marriage, birth, and death registers soon became apparent, and William Farr was fortunately selected for the post of Compiler of Abstracts in the newly created General Register Office. He undoubtedly owed the appointment to the reputation he had earned in the field of medical and vital statistics by his article in McCulloch's work, and by his contributions to the "Lancet," and other medical publications. Sir James Clarke is believed to have strongly urged the claims of William Farr not only on the ground of his writings but from personal knowledge of his abilities and qualifications for literary work. The result of Dr. Farr's appointment upon English vital statistics, and indirectly upon health progress in England, most fully justified the selection, and it is now interesting to read in the Registrar-General's First Annual Report the announcement of the appointment, and the reference to "Mr. Farr, a gentleman of the "medical profession, whose scientific knowledge and intimate acquain-"tance with statistical inquiries are ample pledges of his peculiar "fitness for the post."

Dr. Farr was appointed to the General Register Office on 10th July 1839, at the modest salary of 350*l.* per annum, and thus ended his career as a medical practitioner, which he had scarcely seriously commenced. The next 40 years of his life were almost exclusively

devoted to the, to him, congenial task of creating and developing a national system of vital statistics, which has not only popularised sanitary questions in England in such a manner as to render rapid health progress an accomplished fact, but which has, practically, been adopted in all the civilized countries of the world.

In 1838, the year preceding his appointment to the General Register Office, he contributed a notable paper to the "Lancet" on "Benevolent "Funds, and Life Assurance in Health and Disease"; a "History of the "Medical Profession, and its influence on the Public Health" to the "British Medical Almanac"; and a paper on "The Law of "Recovery and Mortality in Cholera Spasmodica" to the "Lancet."

The First Annual Report of the Registrar-General contains the first of that long series of letters, addressed to the Registrar-General, on the Causes of Death in England. With reference to this remarkable series of letters an eminently competent and thoroughly appreciative pen wrote of them as "from first to last marked by the same lucid "marshalling of the facts, the same masterly command of all the "resources of method and numerical investigation, the same unaffected "and vigorous English, breaking out every now and again, when "stimulated by a clear view of some wide generalisation, into passages "of great eloquence and pure philosophy."

In the first Report were sketched out various fields of investigation which it was hoped that the resources of the death register might be used for enlightening; fields of investigation which afterwards, under Dr. Farr's system of cultivation, yielded an abundant harvest of scientific knowledge. One of the first requirements which Dr. Farr set himself to fulfil was a system of statistical nosology. In this first report, based upon the deaths in the first half-year of civil registration, it was pointed out that "Each disease has, in many instances, been "denoted by three or four terms, and each term has been applied to "as many different diseases; vague inconvenient names have been "employed, or complications have been registered instead of primary "diseases. The nomenclature is of as much importance in this depart-"ment of inquiry as weights and measures in the physical sciences, "and should be settled without delay."

The subjects both of nomenclature and classification of diseases received constant study and consideration in these annual reports, and out of chaos order and system were evolved.

In connexion with his official contributions to the Registrar-General's Reports, special reference should be made to the Supplementary Reports, dealing with English mortality statistics during the two decennia 1851–60, and 1861–70. These two Reports, in the form of letters addressed to the Registrar-General, especially the last, published in 1874, take a very high place among what have been aptly styled the "statistical classics of William Farr."

The Supplementary Report, dealing with the 10 years 1861–70, may be described as the crowning effort of Dr. Farr's labour at the General

Register Office, as there is scarcely a subject in the wide field of vital statistics which is not more or less exhaustively discussed in that Report both from a theoretical and a practical standpoint.

It is needless, however, here to dilate upon the contents of these Reports, a large proportion of which forms the bulk of the present volume, classified and arranged under subject-headings for convenience of reference, and accompanied by an alphabetical index.

The health aspect of mortality statistics was from the first the main lesson which Dr. Farr sought, and was eminently successful in his endeavours, to treat with the help of his well-devised and soundly-constructed system of vital statistics. He struck the keynote of his 40 years' work in the General Register Office in the following words to be found in his first letter in the First Annual Report :—"Diseases "are more easily prevented than cured, and the first step to their "prevention is the discovery of their exciting causes." Few will be inclined to dispute the beneficient influence of Dr. Farr's work upon health progress, especially in towns, but the authority to which we have above referred asserted that its "indirect influence (an influence "the source of which may not have been generally recognised) upon "practical medicine must have been very great. The constant endeavour "after exactness of diagnosis and precision of nomenclature is itself a "wholesome discipline which re-acts inevitably upon treatment."

In or about 1841 William Farr migrated from Grafton Street to Stoke Newington, and early in the following year married his second wife, Miss M. E. Whittall, daughter of Joseph Whittall, of Deal, but previously of Shropshire. The issue of this second marriage (his first wife died childless) were eight children, of whom one son and four daughters survived him.

The pages of the "Lancet" contained many contributions from his pen during the first few years of his service in the General Register Office, and it may be noted that in 1839 he delivered an oration on medical reform at the anniversary meeting of the British Medical Association.

Dr. Farr's name is especially identified with the history of the Statistical Society, the foundation of which was in some measure due to the institution of the Statistical Section of the British Association (of which Dr. Farr was also an active member), and to an attempt on the part of some of its members to limit its specific objects of inquiry. The Statistical Society was founded on 15th March 1834, and Dr. Farr was elected a Fellow in 1839. His first contribution to the Journal of the Society was a paper on "The Mortality of Lunatics" in 1841, many extracts from which will be found in this volume. In 1846 he read a paper on "Influence of Scarcities and of the Prices of Wheat on the "Mortality of the People of England." In 1849 he read a paper on the "Civil Service of England, with observations on the constitution "of Funds for Fatherless Children and Widows." In 1852 a paper on "Influence of Elevation on the Fatality of Cholera." In 1853 a

paper on "Income and Property Tax," from which some valuable extracts find place in the following selections. In 1857 a paper "On "the Pay of Ministers of the Crown." In 1865 a paper on "Infant "Mortality, and on alleged inaccuracies of the Census." In 1866 a paper on "Mortality of Children in the principal States of Europe." Having filled the office of Treasurer of the Society from 1855 to 1868, he was elected President in 1871, and delivered inaugural addresses at the opening of the two sessions of the Society in 1871–2 and 1872–3, during both of which he was President. His last contributions to the Journal of the Society were two papers on the "Valuation of Railways, Tele-"graphs, Water Companies, Canals, and other Commercial Concerns, "with Prospective, Deferred, Increasing, Decreasing, or Terminating "Profits." These papers were read in 1873 and 1876. The selections in this volume have of necessity been almost exclusively confined to purely vital statistics, and therefore include no extracts from many of these papers, which, although deservedly held in high repute, deal with subjects which could not be so classed.

Dr. Farr had no official connexion with the Census of 1841, although his earnest representations on the subject probably conduced to the inquiry of that year including a complete enumeration of the ages of the people which had been omitted at the previous Census. At each of the three following Censuses he was appointed an Assistant Commissioner, and not only had the statistical control of the published tables, but wrote, with but inconsiderable exceptions, the whole of the Census Reports for 1851, 1861, and 1871. These three elaborate reports contain some of Dr. Farr's best work, and have contributed liberally to the selections in this volume.

In the Registrar General's Fifth Annual Report (dated August 1843), was published Dr. Farr's English Life Table, No. 1, based on the deaths in England and Wales in 1841, and on the Census enumeration in the same year. The objections to such use of the mortality returns for a single year, even when the population basis is as large as that of England and Wales, are obvious; but the rates of mortality in that year were fairly average rates, and the results of the Life Table, No. 1, were in remarkable agreement with those yielded by his subsequent tables, which had a far more extended basis. The Life Table, No. 2, was published in the Twefth Annual Report, dated 10th January 1853, and was based upon the deaths in the seven years 1838–44, and the enumerated population in 1841, the middle of that period. The Life Table, No. 3, was published as a separate volume, on the authority of the Registrar General, by Messrs. Longman and Co., in 1864. This Life Table was based upon the 6,470,720 deaths registered in England and Wales during the 17 years 1838–54, and the two Census enumerations in 1841 and 1851. The title of the work was "Tables of Lifetimes, Annuities, and Pre-"miums, with an introduction by William Farr." In the Life Table Part of this volume will be found extracts from this introduction, dealing with the general construction of the tables. Those

interested in the more technical aspect of the subject, and especially in the infinite variety of formulæ dealing with different branches of life insurance, must, however, be referred to the work itself, the introduction to which has been, not inappropriately, described as "a very elegant treatise." Only those officially connected with Dr. Farr in the General Register Office, and who worked on this laborious volume (of more than 700 pages) under his superintendence, had the means of fully realising the unremitting attention he gave to every detail of the work, or the intense and unvarying interest he maintained in every successive process. It is not easy to forget the expression of his countenance, beaming with pleasure and triumph, almost childlike in its unaffected simplicity, when (during the progress of the Life Table, No. 3,) he reached the office one morning with a small page or two of MS., containing *one* of those formulæ which had taken him *all the night* to work out.

Before quitting the subject of Dr. Farr's Life Tables, reference should be made to his Healthy District Life Table, which was contributed in 1859 to the Royal Society, in a paper "On the Construction of Life "Tables, illustrated by a new Life Table of the Healthy Districts of "England." This is not the place to speak of the value of this Life Table as a standard of actually attained healthiness in England. Extracts from this paper find place in the Life Table Part of this volume, where will also be found reference to other life-table work of Dr. Farr's, published from time to time in the Registrar General's Reports.

In or about the year 1846, Dr. Farr moved from Stoke Newington to Melina Place, St. John's Wood, where a large circle of friends enjoyed his society and hospitality. Here he resided until 1860, when he went to live at Bickley, in Kent. During these years his official salary rose slowly, until in 1855, on the urgent representations of Major Graham, who had been appointed Registrar General in 1842, in succession to Mr. Lister, the Treasury granted him, in consideration of his eminent services in connexion with mortality and census statistics, a special allowance of 200*l.* per annum, which raised his salary as Superintendent of the Statistical Department of the General Register Office to 800*l.* We may here state, that at subsequent periods his salary was finally raised, in 1874 ,to 1,100*l.*, of which 300*l.* was in the form of special allowance for exceptional services. It may be remarked that his salary would probably, at this last-mentioned change, have been further increased except for the fact that the salary of the Registrar General, as Chief of the Office, did not exceed 1,200*l.*

In 1852 was published his celebrated Report upon "The Mortality of "Cholera in England, 1848–49." This undoubtedly added much, not only to our knowledge of the causation and methods for prevention of cholera, but also to the reputation of the author. Considerable extracts from this Report are given in the following pages, as also from his special Reports upon the subsequent cholera epidemics in 1853–4 and 1865–6, in

which his theories as to the causation of this disease and to its dissemination by means of a polluted water supply, were to every impartial mind most conclusively corroborated. His history of the outbreak of cholera in East London, and of his investigations as to its causation, and his conclusions drawn from the results of those investigations, form a lasting monument of his acumen, his power of induction, and his patient determination to elucidate the truth in face of every difficulty, to say nothing of the fearlessness which led him to expose himself not only to the risk of infection in the midst of this remarkable outbreak, but to the unforgiving animosity of those intimately connected with the vested interests of the London Water Companies. Dr. Farr's disinterested services to London, and to science in connexion with the cholera epidemics, and the lasting benefits resulting therefrom, through improvements in the quality of the metropolitan water supply, have never been sufficiently appreciated, much less duly acknowledged.

Dr. Farr gave evidence before the Select Committee on Assurance Associations which sat during 1852–53, and in 1853 he published a paper on "A System of Life Assurance which may be carried out, and "would (1) be equitable in its operations; (2) afford the best security; "(3) be well adapted to the wants of the people, as it would afford all "the advantages of an insurance office and some of those of a bank; "and (4) operate at less risk, less expense, and lower premium than "small offices; and (5) also make a considerable source of national "revenue." It was, however, more than 10 years before a scheme of Government insurance was seriously entertained by the Government; but in 1865 Dr. Farr was commissioned to draw up a "Memorandum "for the use and guidance of the Chancellor of the Exchequer (W. "E. Gladstone), in the development of the Government system of "insurance." The system of Post Office insurance, which came into operation in 1864, was undoubtedly due in a great measure to the initiation of Dr. Farr, whose English Life Table, No. 3, was adopted as the basis for the tables of premiums, and who acted as consulting actuary during the early years of its operation, with scant recognition in the way of remuneration. While it must freely be admitted that Government insurance has not hitherto attained the success which was anticipated, its comparative failure must be attributed to want of judgment in its management, and in the regulations by which it is controlled, rather than to any unsoundness in the conception of the scheme, or in the tables upon which the premiums are based.

Dr. Farr took an active part and interest in the International Statistical Congresses held successively in Brussels, Paris, Vienna, London, Berlin, Florence, The Hague, St. Petersburg, and Buda-Pesth, between 1853 and 1876. At most of these Congresses he attended as the official delegate of the English Government, and by his personal influence as the founder of the English national system of vital statistics contributed materially to the remarkable development of the closely allied sciences of vital statistics and of practical hygiene which has taken place throughout

the civilized world during the past thirty years, and especially in England and on the continent of Europe. The full bearing of Dr. Farr's work on health progress in England and abroad has indeed been more fully appreciated on the continent and in America than has been the case in England.

Dr. Farr contributed many papers to the British and Social Science Associations. From a paper read before the Social Science Association in 1858, on the "Influence of Marriage on the Mortality of the French People," extracts find a place in this volume. He contributed a paper to the British Association in 1861 on "Recent Improvements in the Health of the British Army." In 1864 he delivered an address as President of Section F. (Economic Science and Statistics) of the British Association; and in 1866 an address as President of the Public Health Section of the Social Science Association. It was mainly owing to the influence of Dr. Farr that this section of the Association was not disestablished in 1877, when he wrote a paper setting forth his considerations in favour of its maintenance. He was an active member of a Committee appointed by the British Association for the Promotion of Uniformity of Weights and Measures, which sat between 1866 and 1874; and contributed a paper to Section F. of the British Association in 1869 on International Coinage. He was also a member of the Anthropometric Committee of the British Association between 1876 and 1881; and in 1876, 1877, and 1878, contributed his last three papers to Section F. of this Association, "On the practicability of "adopting a common measure of value in the assessment of Direct "Taxation," on "Some doctrines of Population," and on "Babbage's "Analytical Machine." In 1878 he also contributed a paper to the Social Science Association on "Density or Proximity of Population; its "advantages and disadvantages."

It is impossible within the limits of this sketch to do more than enumerate some of the more important subjects in connexion with which the advice and assistance of Dr. Farr was from time to time sought and obtained by the Government. He was a member of the Committee appointed in 1858 to report on the preparation of Army Medical Statistics, and of the Royal Commission for Inquiry into the Sanitary Condition of the Army in India appointed in 1859. He gave evidence before the Royal Commission on the Condition of Miners in Great Britain in 1864, and contributed some valuable statistical information on the subject, which was fully adopted and endorsed in the report of the Commissioners. Selections from the contributions of Dr. Farr, printed at length in the Appendix to that Report, are reproduced in the section of this volume dealing with Class Mortality. He, moreover, gave important and valuable evidence, full of statistical information, before the Royal Commission on Water Supply, and before the Royal Sanitary Commission, both of which sat in the years 1868 and 1869. Among other subjects on which he was actuarially consulted by the Government may be mentioned the Superannuation of

the Metropolitan Police, on which he prepared an exhaustive report, with a complete set of tables in 1860.

Dr. Farr, notwithstanding a slight constitutional tendency to bronchitis, enjoyed exceptionally good health up to the year 1876, when he was in his 69th year. While attending the Statistical Congress, at Buda-Pesth, in the autumn of that year, however, he suffered from an attack of dysentery, which left him much weakened; and in December of the same year he lost his second wife. Although he afterwards enjoyed fairly good health, those who were in the way of seeing him continually could not fail to observe that he never fully recovered from the two severe shocks he suffered in the autumn of 1876.

When the retirement of Major Graham, after an eminently successful administration of civil registration as Registrar-General for nearly 40 years, became imminent, Dr. Farr not unreasonably entertained hopes that he might be appointed to the vacant post, and in 1879, with a view to sparing himself the fatigue of railway travelling, which had begun to be irksome to him, left Bickley, and again took up his residence in London, in Portsdown Road, Maida Vale. This step was taken in the prospect of prolonged official service.

The marked success which attended the administration of civil registration in England during the 40 years 1840–80, may be mainly attributed to the combined influence of Major Graham and Dr. Farr. Major Graham possessed in an exceptional degree the power of organization, with strong business capacity, and gave close and laborious attention to detail; these combined qualifications made him eminently fitted to be the administrative chief of nearly 3,000 registration officers, and of a central office with a staff of nearly 100 clerks of different grades. He felt the deepest interest in the success of civil registration over which he so ably presided, and scarcely less interest in the welfare of those who served under him. The services of Major Graham, in the eyes of the public, who are singularly ignorant about the inner working of Government departments, were to some extent overshadowed by the well-deserved esteem in which Dr. Farr's talents and services, in utilising the results of civil registration, were held by the public and the press. Not only abroad, but by a large section of the English press, was Dr. Farr regarded and spoken of again and again as the Registrar-General. This tendency to ignore the more silent and hidden work of Major Graham, which was, however, none the less indispensable to the success of civil registration, on the part of an ill-informed public and press, cannot be admitted as any palliation of the unaccountable omission of the Government to confer on him at his retirement some mark of their appreciation of so long, so devoted, so successful a public service. Under all the circumstances of the case it is pleasant to refer to the *entente cordiale* which marked the long continued official relations between these two eminent public servants. Major Graham felt, we believe, genuine pride in the success and extended usefulness, as well as in the public

appreciation of the Chief of his Statistical Department, and in the valedictory conclusion of his last Annual Report thus alludes to Dr. Farr's services: "Lastly, I must express to Dr. Farr, whom in " 1842 I had the good fortune to find here presiding over the Statistical " Branch, my gratified acknowledgment of the important services he " has ever since rendered. He is acknowledged throughout Europe, " the United States, East Indies, and the Colonies, as one of the first " statists of the day. To his scientific researches I attribute any " reputation that may have accrued to the General Register Office " of England and Wales from the time I accepted office in the " Department."

On the retirement of Major Graham in 1879, Dr. Farr applied to the Government to be appointed as his successor, asking to be allowed to hold, even for a short time, the post of Registrar-General, with which his name had been so frequently, but erroneously, identified. The refusal of this appointment to Dr. Farr, and the appointment of Sir Brydges Henniker as Registrar-General, are matters of such recent history that they need not be dwelt upon here. The partial failure of health under which Dr. Farr was suffering at the time, probably weighed with the Government in deciding not to do what would have been a graceful and magnanimous act, in recognition of the distinguished and valuable services of Dr. Farr. The public and the medical profession strongly sympathised with Dr. Farr in the disappointment he felt at the refusal of his request for promotion. Immediately the decision of the Government in the matter was announced, Dr. Farr sent in his resignation, and applied for superannuation. In a letter he addressed to the "Times," in explanation of the circumstances of his resignation, the following passage occurs: "Although warned by the recent state of my health " that I was in want of rest rather than of increased duties and " responsibilities, I was induced, by the hope of enlarged opportunities " of rendering assistance in the approaching Census, and in the promo- " tion of public health and sanitary statistics, to become a candidate for " the post of Registrar-General. Failing to obtain that promotion, I " no longer hesitated to seek that retirement which my friends had " previously urged upon me."

The official career of Dr. Farr closed on the 1st of February 1880, when he was superannuated upon an allowance of 800*l.* per annum, and soon after his retirement unmistakeable symptoms of softening of the brain set in, which gradually obscured the intelligence of his highly organised intellect. He died on 14th April 1883, rather more than three years after his retirement from the public service. He was buried at Bromley Common Church, by the side of his wife, whose loss, coming as it did at a time when his health had been shaken by illness, inflicted upon him a shock from which he seemed never thoroughly to recover.

The British Medical Association took an early opportunity to mark the full appreciation entertained by the general body of the medical profession of the conspicuous talents and public services of Dr. Farr

The Committee of Council of the Association in the spring of 1880, soon after Dr. Farr's superannuation, passed the following resolution:— "That the Gold Medal of the Association be awarded by the Committee " of Council of the British Medical Association to William Farr, M.D., " F.R.S., D.C.L., C.B., as an expression of their high appreciation of " his long, unwearied, and successful labours, in behalf of statistical " and sanitary science; as a recognition of the light he has thrown " upon many physiological and pathological problems, and on account " of the extraordinary services his work has rendered to the advance- " ment of the health of the nation." The presentation of the Gold Medal took place at the 48th Annual Meeting of the British Medical Association in the Senate House at Cambridge, on 12th August 1880. The President of the Council (Dr. Alfred Carpenter) addressed Dr. Acland, who had been deputed by Dr. Farr, in consequence of his illness, to receive the medal, in the following words:—"Professor " Acland, you have been requested by Dr. Farr to receive, on his " behalf, this Gold Medal, which is the highest honour that the " Association has the power to give, or our profession to confer. In " conveying it to him, to whom it has been voted, you will kindly tell " him that this medal is voted only for the very highest services in the " profession. He has given, in the knowledge of all men, these highest " services, and they have been long continued; for he has given a " life-long labour to sanitary work and to vital statistics—labours which " in themselves have had little that was attractive; labours which " have brought to him but barren rewards; but they have been labours " which lie at the foundation of all researches in medical science. It " is a great grief to the Association that Dr. Farr has been unable to " be present in person, and that this, like many other rewards in life, " has come when life's labour is nearly done; but it will be a great " solace to him, Dr. Acland, that this will be conveyed to him through " yourself, through one who is held in high estimation, who stands so " high in public and professional regard, who has spent the greater " part of his life in an endeavour to raise the study of natural science " in Oxford, and thus place professional education upon a broad basis." Dr. Acland, in reply, stated that he would "to the best of his ability " convey to Dr. Farr, the valued friend of them all, the Gold Medal " which he had just received, and would inform him that it was the " highest testimony which the profession could give of esteem and " regard for the great services he had rendered to the profession and " to the country; indeed, it must be said for services rendered to the " world." The presentation was made amid the loud cheers of those present in the Senate House, which was well filled. The medal was accompanied by an engrossed scroll on vellum, bearing a copy of the resolution.

The following are a few of the honorary degrees and distinctions which were conferred upon him from time to time in recognition of his high scientific attainments, and especially for his services to the science

of vital statistics, and to public health. In 1847 the honorary degree of M.D. of New York was conferred upon him. In 1852 he was elected an Honorary Member of the Institute of Actuaries. The distinction of Fellow of the Royal Society was conferred upon him in 1855; and in 1857 the Royal Medical and Chirurgical Society elected him an Honorary Fellow in the distinguished company of Dr. Virchow. In the same year the honorary degree of D.C.L. was conferred upon him at Oxford. About this time he also received the honour of election as Corresponding Member of the Institute of France. Ten years later, in October 1867, he was elected an Honorary Fellow of the King and Queen's College of Physicians in Dublin. Lastly, at the time of his retirement, he was, on the recommendation of Lord Beaconsfield, gazetted a Companion of the Civil Division of the Order of the Bath.

As soon as Dr. Farr's retirement from the Registrar-General's Office became known, a very general feeling was expressed that the occasion called for some public recognition of the exceptional value of his services. With a view to carrying out this project a Committee was formed, of which the Earl of Derby accepted the Chairmanship, and a subscription list was opened. The amount subscribed was 1,132*l.*, which, at Dr. Farr's request was invested in Bank of England Stock for the benefit of his three unmarried daughters, in order to supplement the very slender provision which he had been able to make for their support after his death. On Dr. Farr's death in 1883, the Government contributed 400*l.* to this Testimonial Fund, which was then closed, and the net proceeds invested in accordance with the expressed desire of Dr. Farr. In an Appendix to this volume will be found a list of the subscribers to this fund, and the balance sheet of the treasurer, as audited on the closure of the fund.

That Dr. Farr was a man of undoubted genius few who are really acquainted with his work could fail to recognise. This opinion is only enhanced by the knowledge of the comparatively slight educational advantages he enjoyed in his youth, and of the fact that in turning these slight advantages to the fullest account he was in the truest sense a self-taught man. He was, however, not only a thorough mathematician (although no record exists of his ever having had any instruction in mathematics), but was an accomplished linguist. He spoke French fluently, and read equally well the German, Italian, and the classic languages. An appreciative friend of Dr. Farr's, who accompanied him to Florence in 1867, when the International Statistical Congress was held there, remembers with pleasure the respectful and almost affectionate regard in which he was held by the eminent statistical delegates who met there, including M. Quetelet and M. Engel. His address, delivered in French, upon the mortality from cholera in East London in 1866, describing its sudden outbreak, and its as sudden cessation when the supply of polluted water which was its cause ceased, was listened to with breathless attention.

Dr. Farr, moreover, in addition to his special acquirements, was endowed with a large and open mind. He had been from his youth a great and general reader, had a constant and insatiable desire for information in all branches of knowledge, and had a genuine love of the true and beautiful in art and literature. He took a liberal, in the best sense of that word, and broad view of all social and political problems, for his heart was large as well as his mind.

Those who had the privilege and pleasure of his friendship, or even of his acquaintance, enjoy and treasure the memory of the man, quite apart from the inevitable respect and admiration they feel for his talents and his services. With scarcely an exception, Dr. Farr has been invariably spoken of with respectful appreciation. It would be hard indeed to believe that he could have had a private enemy, for he was not only essentially modest and unassuming in his manner, but he was always ready to see and appreciate merit, being especially free from jealousy of the success or suspicion of the motives of others. These qualities made him a somewhat bad judge of character, and exposed him to imposition from scheming speculators, who were desirous of and too frequently obtained his name and support in the furtherance of disastrous financial ventures. For this want of worldly wisdom, and of due caution in putting his actuarial reputation and his money at the mercy of others, he paid dearly. If he had possessed more self-assertion, not to say selfishness, and less trust in others, his worldly success would undoubtedly have been greater, but his character would have been the less loveable. By all those who were brought into immediate official contact with him, the memory of the "dear old Dr." will long be cherished, and many a kind word and act affectionately remembered.

He was devoted to his home ties, and lovingly indulgent to all around him. He was a delightful and delighted host, and although, in consequence of his extensive and varied information and acquirements, his conversation was always welcome, he was not what is called a great talker, whereas he was a thoroughly good listener. His keen enjoyment of and his evident participation in the pleasures of others, especially in the pleasures of children, the simplicity of his tastes, and his ready power of self-forgetfulness when surrounded by young people, were among his most marked and pleasing characteristics. None who knew him really well will ever forget the almost magnetic effect of his ever ready, spontaneous, thoroughly hearty, and most musical laugh.

Through life his capacity for work, and his complete absorption therein, combined with the rare but invaluable capacity for putting it aside when he left his study, was alike the source of astonishment and admiration among his friends. This, however, did not entirely save him from absent-mindedness, which at times was the cause of amusement to himself as well as to others, and which is held to be excusable and not altogether unnatural in those much given to deep mental study. His old friend Dr. Bain, with reference to this absence of mind, communicates the

following recollection: "Not many years ago, after having spent the "previous day and night under his hospitable roof at Bickley, I accom- "panied him in a walk to Bromley Common church, where he had to "attend a vestry meeting, with the understanding that I should after- "wards accompany him to town. I sat a long time in church, in fact, "I read through the whole of St. Mark, without seeing him come out "of the vestry. I had heard one or two doors shut, but did not take "much notice, until I thought the meeting was a very long one. "Wishing to make my observations, I went to one or two doors, but "heard no response to my first gentle, and then loud knocking. I soon "realised that I was imprisoned, and made furious attempts to break "open the doors, and to reach the high windows, but with no result. "The prospect was anything but a pleasant one, for the church was "some distance from the road, and no house was near. After a con- "siderable time, however, I was delighted to hear a key inserted in one "of the outlets, and a church attendant appeared, who explained that "the gentleman had left the church by another door, adding that it "was entirely by accident that he himself had returned, having left "something behind. I walked quietly into Bromley station, nearly two "miles off, and found my worthy friend, who had lost his train, was "reading Lucretius, and evinced no surprise at my appearance, nor "apparent recollection of previous events."

This slight and imperfect sketch of the life, works, and character of Dr. Farr is written by one in whose earliest recollections the memory of his genial face, bright voice, and happy laugh is still vivid, and who was fortunate and privileged to spend five-and-twenty years in almost daily official intercourse with him. To those who did not know him personally the sketch may appear somewhat partially drawn. It has been written, however, in full confidence that all those who knew him will see no exaggeration, but only an honest attempt to do justice to his talents, his work, and his many inestimable qualities as a man.

The portrait of Dr. Farr, which forms the frontispiece to this volume, is reproduced from a photograph taken, in 1878, by Messrs. Lombardi and Co., of Pall Mall, London.

The Editor.

VITAL STATISTICS.

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OF

PART I.—POPULATION.

PART I.—POPULATION.

Introduction.

Population, as the natural basis of all vital statistics, necessarily demands preliminary consideration in any work dealing with that subject. Our knowledge of the statistics of the English population is almost exclusively derived from the facts collected at the decennial Census enumerations, and dealt with in the published official reports. Dr. Farr may be said to have statistically presided over the three Censuses in 1851, 1861, and 1871, and he wrote the greater part of each of those three reports. Those who have had cause for studying these and preceding Census reports cannot fail to recognise the greatly increased value with which Dr. Farr's influence invested the later reports. It is inevitable that the interest of each Census report should be, in a great measure, superseded by the appearance of the succeeding report. It has, therefore, been the object in the following selection to choose only those portions appearing to possess practical and permanent value in their relation to one or other of the branches of vital statistics forming the several divisions of this work. Some of the most valuable extracts deal with the laws and principles which govern the increase of population, and with the influence of marriage-rates and of birth-rates upon such increase. The variations in the proportions of sex, age, and civil or conjugal condition, are essentially important elements of Census investigations, and are indispensable to the useful study of marriage, birth, and death statistics. Scarcely less important, as a branch of the Census inquiry, are the occupations of a population, whether viewed from an industrial standpoint or in their bearing upon the health and mortality of the people. The next series of selections deals with infirmities, especially with statistics of blindness and deaf-mutism. Lastly comes an article upon the economic value of population.

It is necessary to bear in mind, with regard to all Census statistics, that they are, in England at any rate, simply the tabulated results of facts furnished by householders in their schedules on the enumeration day. The imperfect education of a large proportion of householders in this country (householders, so called, include the head of each separate family) necessarily impairs the accuracy of much of the information collected, especially of that relating to occupations. Other causes lead to inaccuracies in the return of the ages and infirmities of the population. There is every reason to believe that the facts collected at each successive enumeration are more accurate than those collected at the previous Census, but, while absolute accuracy can scarcely be expected, there is no good ground for doubting that, with ordinary caution in the deductions to be drawn from them, Census figures form trustworthy bases for vital statistics of infinite value, political as well as social. The inherent defects of Census figures should not, however, be lost sight of, especially by those who clamour for more detail, and seem to forget or

to ignore the nature of the machinery by which a Census enumeration is effected. Occupation statistics furnished in the Census schedules can, for instance, never be made to answer the purpose of a thorough industrial Census. The difficulties arising from double and indefinite occupations, from the confusion between masters and journeymen, and between those actually engaged in and those retired from the various occupations, must tend to depreciate the value of this branch of Census statistics, so long as these statistics are solely dependent upon information supplied in householders' schedules. The obstacles in the way of successfully dealing with the information thus supplied are boldly stated in the last Census Report (1881), and should be carefully and fully considered before the time arrives for making preparation for the next Census in 1891. For the benefit of those who may be desirous to use the Census figures for 1881 as a basis for scientific investigation of the vital statistics of urban or rural sanitary districts during the current intercensal period, ending with the next Census in 1891, it may here be stated that the Census report for 1881 gives the sex and age distribution of the population of each urban and rural sanitary district as constituted in that year. The civil or conjugal condition of the population of each of the 47 urban sanitary districts having in 1881 a population exceeding 50,000 persons is also given in that report. The proportions of sex, age, and conjugal condition change so slowly that it may be assumed, without affecting the trustworthiness of the calculations based upon such assumption, that the *proportions* found to exist at the last Census will be maintained until 1891. This assumption will render it possible to estimate the numbers of males and of females living (at each quinquennial or larger age-period) in each year, in every urban and rural sanitary district, as well as in registration counties, districts, and sub-districts; and also to estimate the numbers married, single, and widowed in each town having a population of 50,000 and upwards in 1881.—(EDITOR.)

1.—SCOPE OF ENQUIRY AT FIRST SIX CENSUSES.

The inquiries undertaken at the Census of Great Britain in 1851 were of a much more extensive character than those which had been pursued in the course of any previous Enumeration, as will be apparent from the following brief summary of the results of each :—

The first Census, taken in 1801, under the superintendence of Mr. Rickman, showed the number of persons, distinguishing the sexes, in the various Counties, Hundreds, and Parishes of Great Britain,—the number of Houses and of the *Families* by which they were occupied,—and a rough statement of the occupations of the people, under the three classes of (1) "Persons chiefly employed in Agriculture," (2) "Persons chiefly employed in Trade, Manufactures, or Handicraft," and (3) "All other persons not comprised in the two preceding classes." It also included an abstract of the Parish Registers from returns made by the Clergy, giving in each Hundred, or Wapentake, &c., of England and Wales, the number of Baptisms and Burials at every tenth year from 1700 to 1780, and in each year afterwards, and the number of Marriages in every year since 1753.

The Census of 1811 was taken upon the same plan as that adopted in 1801, and the same particulars of information were given; the only difference being that in 1811 the number of *Families* occupied in the three above-mentioned classes was shown instead of, as in 1801, the number of *Persons;* and in 1811, the number of houses *building* was shown separately from the number of other uninhabited Houses. The

Abstract of the Parish Registers was also repeated, showing the number of Baptisms, Burials, and Marriages which had occurred in every Hundred in each of the ten preceding years.

In 1821 information was for the first time attempted to be supplied respecting the *Ages* of the population; but as it was left optional, both to the Census Officers and to the parties themselves, how far the investigation should be pursued, the Return upon this point (which gave the numbers in quinquennial periods up to 20, and thence at decennial intervals) proved, to a considerable extent, deficient and unsatisfactory. In other respects the particulars inquired into at this Census were precisely the same as in 1811.

The inquiry of 1831 embraced several additional particulars, principally in elucidation of the various classes into which the people are divided by their different occupations. While the classification of 1811 and 1821,—viz., that of *Families* into the three classes of (1) Those employed chiefly in Agriculture; (2) Those employed chiefly in Trade, Manufactures, and Handicraft; and (3) Others not comprised in the two preceding classes,—was still retained, a further subdivision was made *as to the Male Population of* 20 *years of age and upwards.* This was shown, in each parish, under the following heads:—

1. Agriculture { Occupiers employing labourers. / Occupiers not employing labourers. / Labourers employed in Agriculture.
2. Employed in Manufacture, or in making Manufacturing Machinery.
3. Employed in Retail Trade, or in Handicraft as Masters or Workmen.
4. Capitalists, Bankers, Professional, and other Educated men.
5. Labourers employed in labour not Agricultural.
6. Male Servants.
7. Other males, 20 years of Age.

The number of Male Servants *under* 20 was also given; and the number of Female Servants, without any distinction as to age.

In the printed Abstract of the Returns was given, at the end of each County, a detailed list of the particular Trades or Handicrafts included in the 3rd of the above classes, and the number of persons employed in each.

The inquiry as to the *ages* of the population was not repeated in 1831 beyond the distinction, above mentioned, of males above and under 20.

At this Census the *area* of each parish and township was given for the first time, being the result of a computation made by Mr. Rickman from maps.

At the Census of 1841 several alterations and additions were introduced. The number of *Families* was not given, and the statement as to occupations was not made, as before, for each *Parish*, nor was the previous classification adopted. The inquiry, however, embraced several particulars not before noticed, and the investigation as to those hitherto given was pursued with greater minuteness and accuracy. Thus, in each Parish was shown the number of persons who were born within the County, and of those born elsewhere; while, of the population of each Hundred, was shown how many were born in Scotland, Ireland, the British Colonies, and in foreign parts.

The Ages of the parish population were shown in the two divisions of "under 20" and "20 and upwards"; and the Ages of the entire population of the Country were shown, under Counties, Hundreds, and

large Towns, in quinquennial periods. So, the occupations of the people were exhibited, under Counties and large Towns, in a very extensive and detailed classification, in which the precise employment (if any) of every individual *person* was stated, and the whole population was distributed according to their various pursuits. The population of *Parliamentary Boroughs* was supplied for the first time; the boundaries being those assigned in pursuance of the Reform Act. In other respects the information previously obtained was again given, and the Parish Register Abstract, though of minor utility since the introduction of the system of General Registration by Civil Officers, was again repeated.

At the Census in 1851 it was resolved to exhibit not merely the statistics, as before, of Parishes, and, more completely, of Parliamentary and Municipal Boroughs, but also of such other large towns in England and Scotland as appeared sufficiently important for separate mention, and of all the Ecclesiastical Districts and new Ecclesiastical Parishes which, under the provisions of various Acts of Parliament, have during the last 40 years been created in England and Wales. In addition also to the inquiry concerning the Occupation, Age, and Birthplace of the population, it was determined to ascertain the various Relationships (such as Husband, Wife, Son, Daughter)—the Civil Condition (as Married, Unmarried, Widower, or Widow)—and the number of persons Blind, or Deaf and Dumb. Further, under the impression that the 5th section of the Act would authorise such an inquiry, the design was formed of collecting statistics as to the accommodation afforded by the various Churches and other places of public religious worship throughout the country, and the number of persons generally frequenting them; and also as to the existing Educational Establishments, and the actual number of scholars under instruction. It was, however, subsequently considered doubtful whether, upon a rigid construction, the Census Act rendered it compulsory upon parties to afford information upon these particulars; and the inquiry was therefore pursued as a purely voluntary investigation. It was not deemed necessary to procure, as at former Censuses, any abstract of the Parish Registers for the ten preceding years; the general system of Registration of Births, Deaths, and Marriages, which had been for that period in full operation, affording more complete and trustworthy information as to changes in the aspect of the population referable to the operation of these events. —(Census Report, 1851. Enumeration, Vol. I., pp. ix–xi.)

2.—Union or Registration Counties.

The Legislature in 1834 * entrusted to the Poor Law Commission the power of forming new districts, called *unions*, without any such reference to county limits as was observed in the constitution of the analogous hundreds, sessional divisions, and lieutenancy subdivisions. These unions, having staffs of officers, and rating powers, were in 1836 made the basis of the 626 registration districts in which the births, deaths, and marriages have been since registered, and the population enumerated. Each of 603 districts comprises one union; and 18 comprise two to four, and in the aggregate 40 unions. And as the districts consist of sub-districts, the sub-districts of parishes and townships, so the districts were grouped together to form the counties, with which they were made to coincide as nearly as was practicable without breaking up the fundamental unit—the district or union which was presided over by an

* 4 & 5 Will. 4. cap. 74, s. 26.

elected and *ex-officio* board of guardians wielding great administrative and rating power. The union counties thus constituted differed little in many instances from the old counties, and in the aggregate only transferred 1,053,423 out of a population of 22,712,266 from county to county. For the sake of maintaining the union counties properly constituted intact, the requisite changes would involve no great sacrifice; but should it be held to be desirable, the disparity might in many instances be greatly and advantageously reduced by well-considered alterations of the existing unions. The subject was discussed in the Census Report of 1851; and it will be evident from the following extract that the new divisions of the country are better suited to administrative purposes than the old divisions descending to us from a time when the population was uncivilized, and in number inconsiderable.

"The cause of the discrepancy between the 'registration counties' and the other counties arises from the circumstance that, in many cases, the boundaries of the old counties were rivers; on which, subsequently, at fords and bridges, important towns arose, the markets and centres of meeting for the people of all the surrounding parishes. These towns have been made the centres of the new districts, as at them it is most convenient for the guardians to meet, and the officers to reside. Thus Wallingford in Berkshire is the natural centre of the district, which is nearly equally divided by the Thames; and the Thames is here, as it is in a lower part of its course, the county boundary separating Oxfordshire from Berkshire. The people of the parishes of Bensington, Ewelme, Crowmarsh, North Stoke, Berrick-Prior, Warborough, and Dorchester, on the north side of the river, in *Oxfordshire*, meet at Wallingford market, and are in many ways intimately associated with the people on the south side of the river in *Berkshire;* hence it was quite justifiable to unite the parishes so related on both sides of the Thames in the Wallingford Union—the Wallingford district. The whole district is placed in the 'registration county' of Berks; though part of it is in the old shire of Oxford. [And this is reasonable, for if these people are properly associated in one union, they should on many grounds be united in one county. The same remark applies to the city of Oxford, which is now partially in Berks; the whole of it should be transferred to Oxfordshire.] In the same way the greater part of the other discrepancies is accounted for. The old shire boundaries often run near towns; and the districts, which have not been arbitrarily framed, consist of 624 of the towns, with the surrounding parishes, sub-divided into sub-districts; while the registration counties are aggregates of the districts which have their central towns within the limits of the old shires. In the counties which, like Norfolk, Suffolk, and Essex, were originally well divided, little change has been made; in others, the defect of the old subdivisions into counties has been partially modified, without any further substantial innovation than the substitution of *districts* for the obsolete *hundreds*." (Census Report, 1871, Vol. 4, p. xxxvii.)

3.—Houses.

Definition of a house.—What is a house? appears to be a question admitting of an explicit answer. And the enumerators of the United Kingdom were instructed to class under that category every habitation; each separate house comprising by definition all the space within the external and party walls of the building. Thus it became impossible to count either each room or each storey as a separate house, although

it might be separately occupied or owned, or might even have attached to it the privileges of voting.

On the continent, each hotel, however numerous may be its occupiers or tenants, is reckoned as one house; and the English practice was formally sanctioned, after discussion, by the official delegates of the various Governments of the world at the London session of the International Statistical Congress.*

Scotland is the only country of Europe in which the definition of "house" has hitherto offered insuperable difficulties. In that country the population of 3,062,294 souls has sufficient space,—19,639,377 acres,—giving six acres and more to each inhabitant; while houses in the open country enjoy the perfect security which is sought within the walled cities of the continent; yet Scottish families, instead of living on the earth in pure air, with the sky over their dwellings, in many instances prefer lying stratum over stratum in flats, opening into a common staircase,—"a continuation of the street," as it has been called,—which receives the organic emanations of the families on each floor. In several of the towns they, at the various Censuses up to 1851, conferred the names of houses on these flats or *floors* as they would be called in England, *étages* as they would be called in France.† And the Scottish Commissioners, who possessed many local advantages, do not appear to have been more successful in 1861 than we were in 1851, in getting the actual number of houses in Scotland.‡ This must be borne in mind in comparing the houses of Scotland with those of England and of other countries.

* M. Legoyt, in his report of the proceedings in Committee, observes:—"La "section est tombée d'accord sur la définition du mot 'maison,' et sur les faits "intérieurs et cataracteristiques auxquels la maison doit être reconnue. Elle a "refusé notamment d'attribuer cette désignation aux divers étages dont peut se "composer une construction affectée à l'habitation, lors mêmes que ces étages "seraient occupés par des familles distinctes, et qu'ils auraient un escalier séparé." —*Rep. on Stat. Cong.*, p. 153.

† Johnson has been quoted in support of the notion, held by some persons in Scotland. A "house" he defines as (1) a place where a man lives; a place of "human abode"; (2) "any place of abode," &c. &c. Now it does not follow that, because a house is "a place wherein a man lives," that *every place* wherein a man lives is a house; for instance, a tent, a barge, a ship, a cell, or a chamber, is not a house. In the example which Johnson quotes, "Sparrows must not build "in his house eaves," Shakespeare finely characterizes the house by its eaves: the man living under his own roof, not under another man's "flat." Again there is the other quoted passage:

"The bees with smoke, the doves with noisome stench,
"Are from their hives and houses driven away."

Here a dovecote is a "place of abode," but it is not a house in the Census sense; and there is a difference between cell and hive. Johnson defines "flat"; and he was acquainted with Scotland, yet he nowhere intimates that "a flat" is "a house"; so that his authority is explicitly against the extension of the name of the part to the name of the whole of a building.

If any doubt remains on the subject, it will be dispelled by the following quotation from Boswell, who so faithfully reflects Johnson's opinions in the Journal of the Tour in the Hebrides. After citing a certain baronet, upon the perils of walking the streets of Edinburgh at night, he adds:—"The peril is much abated by the care "which the magistrates have taken to enforce the laws against throwing foul water "from the windows; but, from the structure of the HOUSES in the old town, which "consist of many STORIES, in each of which a different FAMILY lives, and there "being no covered sewers, the odour still continues. A zealous Scotsman would "have wished Mr. Johnson to be without one of his five senses upon this occasion. "As we marched slowly along, he grumbled in my ear, 'I smell you in the dark!' "but he acknowledged that the breadth of the street, and the loftiness of the "buildings on each side, made a noble appearance.—*Boswell's Life of Johnson, Croker's edition*, p. 270.

‡ Report on Census of Scotland, p. xxvii.

We have, in conformity with the practice since 1801, for the sake of uniformity, enumerated as houses all the distinct buildings which were inhabited, as well as uninhabited houses, and houses building; and after thus avoiding the inextricable difficulties of the "flats," we have still many heterogeneous structures mixed up with houses in the ordinary sense of that word. The house is a variable unit; it includes in the Census the hut on the moor, the castle on the hill, and the palace; so that every one of these structures, and of the intermediate mansions and cottages, is reckoned as a house. The ordinary house varies in size and structure in town and country,—in its cubical contents, in its hearths, in its doors, and in its windows; so that, to give a correct view of the accommodation which houses afford the population, and of their value, and of their sanitary influences, a special inquiry is indispensable. —(Census Report, 1861, pp. 7–8.)

Houses building.—The houses building were first enumerated in 1811; and the enumeration has been since repeated at every Census. In a country under depopulation the old houses fall into decay; many houses are uninhabited; and few new houses at a Census are "building." And as the question, Is England increasing or decreasing —decaying or flourishing—was seriously discussed during the last French war, it was thought that the inquiry into the "houses building" might assist in its solution.*

Upon comparing the number of "houses building" with the total numbers standing, this result is elicited:—in 1811 to 1 house building there were 114; in 1831 the proportion was 1 to 105; in 1861 it was 1 to 144.

This seems to imply that since 1831 this "indication of prosperity" has taken an unfavourable turn.

The question requires investigation, as it is by no means so simple as it appears to be on the surface.

Houses are built to replace old houses, and to provide for the new families of the increasing population. If we assume, for the sake of illustration, that *one* house in 100 falls into decay every year, so as to require reconstruction, the 3,431,533 houses of 1851 would be reduced, by the decay of 328,116, to 3,103,417 in ten years; but the houses in 1861 amounted to 3,924,199, or to 492,666 in excess of the houses in 1851; the new houses sufficing to replace the old houses, and to leave the enormous surplus, must upon this estimate have amounted to 820,782, or to 82,078 annually on an average.

If an equal number of houses is built every year, and they last on an average the same number of years, the proportion which the number of houses building bears to the number of houses existing will depend on the mean time it takes to build a house. Thus, if the houses of a place amount to 1,000, and each lasts 100 years, the 1,000 houses will be kept up by the erection of 10 new houses every year; and if each of the 10 houses is built in a year the numbers "building," corresponding to those at the Census, will, on an average, be 10. If each house takes 2 years for its construction, 20 houses building will figure in the Census return; if the houses are built in half a year on an average, 5 only will be building, for 5 built in the first half of the year, and 5 in the second half of the year, make 10 annually.

The change in the proportion of the houses building to the subsisting houses is probably the consequence of the more rapid system of construction which is now carried on in the towns. Thus if houses,

* Preface to Census Report, 1811, p. x.

including huts and cottages, as well as castles and palaces, were built at the rate of 82,078 a year, then the 27,305 building in 1861 would imply that they were built on an average in about 4 months. If the houses were built on such a system as to require 5½ months for completion in 1831, and 4 months in 1861, the difference in the proportion of houses building in 1831 and in 1861 would be accounted for by this cause alone. (Census Report, 1861, Vol. 3, pp. 8–9.)

At each Census since 1811 the number of houses "building" has been returned. The number increased from 16,207 in 1811 to 27,444 in 1841, and remained nearly the same in 1851–61, but in 1871 the numbers ran up to 37,803. One house was "building" or being built to 114 standing inhabited and uninhabited in 1811; to 105 in 1831; to 144 in 1861; to 120 in 1871. The number of houses "building" on the Census day, as we pointed out in 1861, depends not only on the number erected annually, but on the *time* employed in the process, so that a decline in the number enumerated on one day does not imply a decline in the number of houses built yearly. The architect there cited is of opinion that houses on an average are built in six months (1861), but that is by no means certain. The houses building vary with the season; and with the facilities small builders find of obtaining advances of money. But as we know that houses are built in as short a time now as in previous Censuses, and as the season of the year has been the same, it is quite certain that the increase of "houses building" to 37,803 on the last Census day implies a rapid increase in the number of new houses. This is proved, too, by houses inhabited and uninhabited in ten years having increased by 596,263, that is at the rate of 59,626 new houses yearly. But new houses were also built in the same period to replace the houses out of 3,924,199 existing in 1861 that fell to decay or were taken down; assuming, as was done in 1861, that houses last about 100 years, and perish at the rate of one per cent. annually, then at the end of the ten years 375,223 houses must have disappeared. The new houses built in the ten years replaced these houses and added 596,263 to their number, so about 971,486 new houses have been built in the 10 years; of which about 920,194 inhabited were of the annual value of 14,907,143*l.*, and worth at 15 years' purchase 223,607,145*l.* (Census Report, 1871, Vol. 4, p. xxx.)

4. NUMBERS.

Principle of population.—The policy which England, since 1751, has pursued in respect to population was directly condemned and opposed by an acute and diligent critic, who endeavoured to establish a new doctrine, and to deduce, from what he designated "the principle of "population," the most adverse inferences. His doctrine has held such sway for some years in the works of political economists, and has such a direct reference to practice, that we shall notice two or three of its fundamental propositions.

Thomas Robert Malthus was born in 1766 at the Rookery in Surrey, amidst a poor and healthy, but not a very intelligent agricultural population. His father, an accomplished speculative man, was one of the executors of Jean Jacques Rousseau, and placed young Malthus under the tuition of Mr. Graves, the author of the Spiritual Quixote, and of Gilbert Wakefield. After proceeding to Cambridge in 1784, Malthus became a Fellow of Jesus College in 1797, under the conditions of

celibacy which still linger as traces of the monastic system in our universities. In consequence, apparently, of a friendly controversy with his father, he wrote and published the first edition of his "Essay "on Population" in 1798; chiefly with a view to combat the doctrines of Condorcet and Godwin, who held that the human race was perfectible, and was advancing towards an ideal standard of excellency. His paradox was at direct issue with theirs, as the "principle of "population" rendered vice and misery, he contended, inevitable in all ages.

Population, we know, cannot increase indefinitely; its limit is as absolute as the limits of the world, or of the matter of which the world is composed; and in Great Britain the rate of increase is retarded by the premature mortality, the vice, the postponement of marriages, and the celibacy of the inhabitants. But Malthus went further in his doctrine; he insisted that the increase of mankind is the chief source of misery, and that extensive abstinence from marriage, or the repression of population, is to be regarded as the fundamental condition of human happiness. Population, he argued, is necessarily limited by the means of subsistence; but population increases naturally in a geometrical progression, or as 1, 2, 4, 8, ..., while subsistence cannot increase at a faster ratio in the same time than is expressed by the arithmetical progression 1, 2, 3, 4 . . . . .; consequently population is checked, and the checks which repress the superior power of population, and keep it on a level with the means of subsistence, are all resolvable into moral restraint [celibacy], vice [licentiousness], and misery [famines, plagues, disease]. Such was in short his doctrine. The ranks of this army—the population of every country—are full; the supply of the commissariat is limited; therefore, the number of annual recruits remaining invariable, any decrease of the deaths in battle must be followed by an equivalent increase in the deaths by famine and fever; or, if the deaths from all causes are to decrease, the number of annual recruits must be diminished. Jenner had recently discovered an antidote to the poison of small-pox. It was declared immediately to be no benefit to mankind. "I feel not the slightest doubt," says Malthus, "that if the "introduction of the cow-pox should *extirpate the small-pox*, and yet "the NUMBER OF MARRIAGES CONTINUE THE SAME, we shall find a "very perceptible difference in the *increased mortality of some other* "*diseases*." And again: "The operation of the preventive check—"*wars—the silent though certain destruction of life in large towns* "*and manufactories—and the close habitations and insufficient food of* "*many of the poor—prevent population from outrunning the means of* "*subsistence*; and, if I may use *an expression which certainly at first* "*appears strange, supersede the* NECESSITY *of* GREAT and RAVAGING "EPIDEMICS *to* DESTROY WHAT IS REDUNDANT. If a WASTING PLAGUE "were TO SWEEP OFF TWO MILLIONS in ENGLAND, and SIX MILLIONS "in FRANCE, it cannot be doubted that, after *the inhabitants had* "*recovered from the dreadful shock*, the proportion of BIRTHS to "DEATHS would rise much above the usual average in either country "during the last century."*

"What prevents the population of hares and rabbits from over-"stocking the earth?" demands a distinguished disciple, in a chapter on the increase of mankind.†

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*Malthus on Population, B. II. chap. xiii.; see also B. I. chapters i. and ii., and the work, *passim*.

† John S. Mill, Political Economy, i. 10. 2.

One of the corollaries from the doctrine was a plan for the gradual abolition of the poor laws, by declaring that no child born from any marriage taking place after a given date "should ever be entitled to "parish assistance."

All that is peculiar in this doctrine, all that is erroneous, and all that has shocked the public opinion of the country, ever since its enunciation, flows from a flagrant oversight; which might be pardoned in a young, hasty controversialist, but should assuredly have been at once taken into account when it was discovered in the light of Sir James Steuart's original analytical work that had been first published in 1767.* Malthusianism had, however, become a sect; had been persecuted; and was modified and softened, but still upheld, by its disciples.

Sir James Steuart, who wrote before Adam Smith, lays down the fundamental principle of Malthus, but limits it by a preceding overruling proposition. (1.) We find, he says, the *productions of all countries*, generally speaking, *in proportion to the number of their inhabitants;* and (2.), on the other hand [as Malthus asserts], *the inhabitants are most commonly* in *proportion* to the *food.* Steuart then shows that the food of the world may be divided into two portions: (A.) the natural produce of the earth; and (B.) the portion which is created by human industry. (A.) corresponds to the food of animals, and is the limit to the number of savages. (B.) is the product of industry, and *increases* (all other things being equal) in proportion *to the numbers of civilized men.* The whole of the chapter on Population in Steuart's work should be consulted. Malthus, it will be observed, loses sight of this analysis, and throughout his work confounds the yield of the untilled earth with the *produce* of *human industry;* which increases at least as rapidly as the numbers of civilized men, and will increase until the resources of science are exhausted and the world is peopled.

The *population* that a country sustains does not depend exclusively on the amount of *subsistence existing* at any one time. The produce of a country is limited chiefly by the character of the inhabitants. For if, as an example, *twenty-one millions* of men from any part of Europe were put in the place of the people of Great Britain after harvest, the various produce would not be maintained in succeeding years; and in the hands of Caffres, of American Indians, or of the wretched inhabitants of Terra del Fuego, however great the stock of subsistence may be at the beginning of a ten years' occupation of these fertile islands, it is evident that, at the end, both the subsistence and the people would vary with their industry, but would decline, and be, comparatively to the actual produce, inconsiderable in amount. Future generations of Britons, if they have genius, science, skill, and industry —and if they are more numerous—will necessarily produce more than the country now yields.

It does not follow, as the theory of Malthus assumes, that a diminution of the number of the people in 1800 or in any other year would have had for its result the division of a larger share of subsistence among the survivors; for in that year a failure of the crops was followed by a severe famine, although the number of families to be fed was not by one-half so many as the number at present in these islands. And, conversely, the share of each person's produce is not diminished as the population increases; for the share of the produce of every kind that falls to a family in the most populous state of America is

* The works of Sir James Steuart of Coltness, Bart., published by his son, General Sir James Steuart, 1806. vol. i.

incomparably greater than the share of the Indian hunter's family when there was not one person to every square mile of territory.

In the rudest state, where men live on fish, or fruit, or game, the population is rarely limited by the amount of subsistence existing, but directly by the skill, industry, and courage of the savage; for any improvement in the use of the net, hook, bow, spear, or weapon is followed by an increase of the tribe; while any diminution of its courage or industry is followed by extermination or decay. In the pastoral or in the civilized state, the same causes, operating on a larger scale, produce effects still more striking.

The character of every race of men is the real limit to its numbers in the world, if allowance be made for accidents of position and time.

Population is often out of the place where it is wanted, or could be most productive; but the population of the world is not, as Malthus assumes, redundant; and not only is there a paucity of men of transcendent genius in all countries, but few persons who have occasion to undertake or who accomplish great industrial, political, warlike, or other operations ever find that the men of skill, industry, and entire trustworthiness—of whom they can dispose, either in the highest or the lowest departments—are superabundant. Every master knows that good men—and every man that good masters—*are scarce.*

The idle who will not work, the unskilful who cannot work, and the criminal classes who cannot be trusted, are, however, it may be admitted, whether numerous or few, always redundant. But as the disciples of Malthus, if there were "two millions of such people in Great Britain," would not hear the public executioner invoked for their destruction, neither can we admit the validity of the argument of that writer when he attempts to reconcile us to the loss of lives by shipwrecks, explosions, small-pox, close habitations on low sites,—by the ignorance of men, the fevers of towns, or the blind fury of pestilences,—which are fatal to all classes of the nation. New births may repair the numbers, but never fill the places, of the dead.

The assumption that subsistence increases at a rate corresponding to any arithmetical progression rests on no authentic observations. The produce of this country has never been valued at stated intervals. Capital, however, increases, it is always assumed, when terms of years are considered, in a geometrical progression; and at compound interest the increase is much more rapid than the increase of population in any European state. The interest of money, indicating the annual increase of value, is the produce of property, and bears a rather close analogy to the increase "of the means of subsistence." At 3 per cent. per annum compound interest the value of capital is doubled in 24 years; and a population increasing at 3 per cent., which is near the natural rate, doubles in the same time; while actually the British population has increased at the rate of 1·329 per cent. annually for the fifty years 1801–51; and has doubled in 53 years. Thus—if we take this indication—the means of subsistence have increased faster than the numbers of the people; for, while the population has doubled, the value of capital under investment at 3 per cent. compound interest has quadrupled. The PRODUCE of Great Britain, which in the present state of commerce *is always convertible into the "means of subsistence,"* has probably not increased at a lower ratio; and no one can pretend, in the absence of the exact facts, that the ratio has been arithmetical.

The assertion falls to the ground that the disappearance of small-pox, of cholera, or of other epidemics, must be followed immediately by famine, or by an increase of other diseases. The principle may hold

of "rabbits," and of animals that have no power of creating subsistence; but its application to civilized men is absurd.—(Census Report, 1851, Occupations, vol. I., pp. liv–lvii.)

It is true that all plants and animals have the power of multiplication; and man in conformity with that law has the power of doubling his numbers every twenty-five years under favourable conditions, and within definite limits of space and time, the limit being soon attained without the exercise of skill and industry in supplying his wants; but his struggles for the means of living, as a race, were greater at first when his numbers were fewer than they are now in England. The numbers of mankind never actually increase as the numbers in the geometrical series 1, 2, 4, 8, 16, 32, 64, 128, 256, 512 . . . . . indefinitely; and subsistence never increases as the numbers in the arithmetical series 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 . . . . . indefinitely. But the population of a country may increase in geometrical progression for a certain number of years, and so may its subsistence, understanding by that all that supplies men's wants. Mr. Malthus found when he wrote that the population of the United States had been said for a century and a half to double itself every 25 years; and now it is known by the Census that the population, after the year 1790, increased very regularly at the rate of 3 per cent. annually for the seventy years ending with 1860; at that rate population doubles itself in $23\frac{1}{3}$ years. The increase, however, was not "by procreation only," but partly by excess of births and partly by immigration of blacks from Africa, of whites from Europe. Population increased in geometrical progression at a certain rate, but subsistence also increased in geometrical progression at a faster rate; so that the pressure of population on subsistence grew less and not greater. In the last 10 years productive labour slackened and the flow of population ebbed; during the civil war English emigrants returned to England; there was loss of life in the field, and although for lack of a national system of registration it cannot be set forth in figures, the marriage and birth-rates must have declined, for the population increased, not 3 per cent., but 2 per cent. annually between the two Censuses of 1860–70. Yet the produce increased, the wheat from 173 to 288 million bushels; the value of all live stock from 218 to 305 millions of pounds sterling.

The increase of produce from 1850 to 1860 may be inferred from two orders of facts. The number of farms rose from 14 to 20 hundred thousand, while the area of improved land from 113 grew to 163 million acres; and the value of live stock rose from 109 to 218 millions of pounds. Population only increased in those ten years from 23 to 31 millions.*

And in the earlier years, though not recorded, the produce increased undoubtedly as nearly in geometrical progression as the population counted at each census; and if the early censuses prove that population increases, the recent censuses prove that subsistence increases in geometrical progression. Had Malthus had before him the returns of produce as well as population in America, he could scarcely have fallen into the error of laying it down that, while population increases in a geometrical, subsistence increases in an arithmetical progression.

There is a limit to the increase of both people and produce: but the tendency now is, as men endowed with skill, weapons, tools, and

* See Journal of Statistical Society, Vol. xxxviii, pp. 74–6; and United States Census.

marvellous machines are diffused over the world, to create subsistence faster than population.

In the first edition of his work* Malthus lays it down that (1) "population cannot increase without the means of subsistence," that (2) "population does invariably increase where there are the means of subsistence;" and (3) "that the superior power of population cannot be checked without producing misery or vice."† Shrinking from the explicit expression evidently implied by his argument that "the superior power of population cannot be checked without producing misery or vice," he left out of account the fact that at the prolific age a large proportion of the women of every civilized population is unmarried and virtuous; this being only partially recognized in the subsequent editions under the phrase "moral restraint." Instead of simply stating that the population is kept down by any causes that diminish the births and increase the deaths, he uses in the last edition the vague phrase, "the checks which repress the superior power of population, and keep its effects on a level with the means of subsistence, are all resolvable into moral restraint, vice, and misery."‡

The theory is as misleading in practice as it is defective in statement, and, as expressed, erroneous in fact. It assumes that the restraint of population is the corner-stone of policy. Had this principle been accepted by the people, the population of the kingdom instead of amounting to thirty-two millions would have remained, as it was at the beginning of the century, sixteen millions. England, in the presence of the great continental states, would have been now a second-rate power; her dependencies must have been lost; her colonies have remained unpeopled; her industry crippled for want of hands; her commerce limited for want of ships. The legal insurance of the people by the land against death by starvation, the efforts to stem the tide of epidemics, the science of healing, hygienic improvement of every kind, must have languished under the cold shadow of this doctrine; and in its name the endeavour to save the lives of children by sanitary measures is even now denounced as either futile or mischievous. And logically it leads to the policy of depopulation; for if increase causes misery, decrease, by parity of reasoning, causes happiness: this principle of population being the fewer the happier. It is a policy that diminishes the numbers of the wise and the good, but has no effect on the masses. Families under this policy die out. Classes, distinguished for any virtue, that accept the restraint under vows, provide for its extinction. The hermits and saints, that forewent "wedded love," and children, at the same time that they provided for their own eternal bliss provided for the extinction of sanctity on earth; while our universities offered by fellowships, forfeited on marriage, one of which Malthus had just acquired at Jesus College, a premium on protracted celibacy, they discouraged the multiplication of their ablest men.§ The economists, the misers, the philosophers, in the same way eliminate prudence, acquisitiveness, and science from the ranks of their race. They are like flowers all bloom. Low pay makes the officers of the army and navy perforce Malthusians, and discourages the propagation of prowess. Few aristocracies are self-sustaining; and if there is a natural tendency in wealth to accumulate by intermarriage, that may lead to its dispersion.

* There is a copy of the first edition in the library of the Statistical Society. It was published in 1798, the year after he was made a fellow of Jesus College, Cambridge, and when he was 32 years of age.

† p. 37.

‡ 6th edition, Vol. I., p. 24.

§ In 1797. *See* Memoir in Principles of Political Economy, 2nd edition, p. xxxv.

The state of nations in the present day, and the history of past ages, prove that the maintenance of equilibrium between subsistence and population is a complicated question. It has been left hitherto to the sense of both sexes. Malthus had the merit of contending that it admitted of scientific investigation; that its problems should be sought in the statistics of nations in every stage of civilization; that it entered into the national policy, inasmuch as it was a matter that concerned, in the highest degree, not only particular individuals, but the whole community, the State. Reduce the constituent roll of a nation too low, and it cannot struggle with success against other forms of life in nature; it cannot hold its own in the face of other powers; it can undertake no great concerted operations; solitary minds in remote dwellings are not quickened by collision with other minds; the quantity of life is lessened on the earth,* and the chances diminished of the rise of men of genius, to whom the world owes progress in the sciences, discoveries in the useful arts, and triumphs in fine art and literature.

Ill effects of too many people willing to work can for centuries only be felt when they are blindly crowded in particular spots, when their labour is not organised, when their acquisitions are insecure, when their dwellings are dens, and when the supply of subsistence is not rendered, continuous, and within due limits equal, by storage, by commerce, by skilful distribution, and by wise laws: then zymotic disease is spread, periodic famines are fatal, and the wretched people are on inadequate diet starved.

The evils of indiscriminate intermarriage of imperfect natures accumulate. Errors on either side of excess or defect are punished as inexorably by the law of population as they are by the law of gravitation. If tribes of men will not breed domestic animals, or cultivate the soil, nothing can sustain them by the side of civilized races. If men and women will not work they may not eat. If classes of men drink alcohol to excess; if they consume impure water; if they herd in rookeries; and if they lead idle, criminal, vagabond lives; they perish. Nature is implacable; the degradation of the human race is made difficult; it is stopped by death. The best races in the end have the best chance of living from generation to generation. And against the severity of the life struggle have to be set the excitements of the battle, the energy it calls forth, and the perpetual selection of finer varieties of the race for survival. England through its centuries of history owes some of its greatness to this principle; it has been led by it step after step up to heights of glory.

The struggle is a consequence, science teaches, of the evolution of the living matter of the earth into higher forms; and that evolution is not yet at an end.

Mr. Darwin applies the doctrine of Malthus "to the whole vegetable " and animal kingdom"; and recognizing "the struggle for existence " amongst all organic beings throughout the world which inevitably " follows from the high geometrical ratio of their increase," he makes it the basis of a vast generalization.† After discussing the question he thus concludes, "all that we can do is to keep steadily in mind that each " organic being is striving to increase in a geometrical ratio; that each

* Sir W. Petty, by a calculation which he describes in one of his Essays on Political Arithemetic, but which it would be difficult to verify, asserts, in opposition to "some sceptics," that two mountains of Ireland were as weighty as all the bodies " that had ever been from the beginning of the world to the year 1680." Be this as it may, the weight of the human race alive at one time does not exceed 60 million tons; for only a small fraction of the surface of the earth exists in the highest form of life.

† Origin of Species, 3rd edition, Introduction, p. 4, p. 67, and p. 82.

" at some period of its life, during some season of the year, during each " generation or at intervals, has to struggle for life and to suffer great " destruction. When we reflect on this struggle we may console " ourselves with the full belief that the war of nature is not incessant, " that no fear is felt, that death is generally prompt, and that the " vigorous, the healthy, and the happy survive and multiply."

This struggle reigns over the whole animal kingdom; nor is man, as is too well known, an exception; but Mr. Darwin modifies the principle which ascribes the great check of population to "misery." Reason too gives man certain prerogatives; for as we have seen it controls fertility, thus adjusting in time and place the results to the infinite varieties of the openings in life, and further, in his humanity man has a protection against the casualties and misfortunes which overwhelm inferior species. The human family, the clan, the town, the tribe, the nation, all acknowledge even now the claims of children, of the sick, of the wounded, and of the infirm, to help in time of trouble. Few men refuse to bind up the wounds of their fellow men. (Supplement to 35th Annual Report, pp. xv–xviii.)

Law of Population.—A population increases in regular geometrical progression when the births exceed the deaths, and the ratio of the births and of the deaths to the population remains constant. Thus in England every 100 persons living in 1801 had increased to 132 in 1821; and every 100 persons living in 1821 had increased to 132 in 1841; the 100 persons living in 1801 had, therefore, increased to 175 in 1841, and at the same rate will amount to 200 in the year 1850, 300 in the year 1879. The mean rate of increase was ·0141 annually; that was probably the excess of the births over the deaths. Grain, fruit, animals also, increase in geometrical progression; but the increase of capital, at compound interest, is the most familiar example of this kind of progression, and may render it intelligible to the general reader. Thus at 1·41 per cent. increase annually, 100 persons became 132 in 20 years, and 175 persons in 40 years; upon the same principle that 100*l.*, put out at 3 per cent. per annum compound interest in 1801, would have amounted to nearly 181*l.* by the year 1821, and to 326*l.* by 1841.

Some statistical writers have given the 10th part of the increase in 10 years as the annual rate of increase. According to this mode of reasoning, as the population of England increased 75 per cent. in 40 years, it must have increased 37½ per cent. in 20 years, and 1·9 per cent. annually; while the actual increase was 32 per cent. in 20 years, and 1·41 per cent. annually; and, by the same reasoning, money that increased 226 per cent. in 40 years, must have borne an interest of 5½ per cent. per annum; while, as has been just stated, money bearing an interest of 3 per cent. per annum would increase 226 per cent. in 40 years, at compound interest.

The increase in 10 years is derived from the increase in one year, by multiplying 1 + the annual rate of increase 10 times into itself. Thus the increase of the population in one year was ·0141; 1 became 1·0141 in a year; and 1·0141, multiplied 10 times into itself, is 1·1507; 20 times, 1·3241. To obtain, therefore, the annual rate of increase from the increase in 10 years, the 10*th root*, and not the 10th part of the decennial rate of increase (1·1507), must be taken.*

* Let p denote the population at any time; p' the population at any previous time; n the number of intervening years; then $\sqrt[n]{\frac{p}{p'}} = r = 1 +$ the annual rate of increase. The division of the logarithm of 2 or 3 by the logarithm of r gives the number of years in which, *at that rate*, the population will double, or triple, &c.

It appears that about 19 in 20 of the people in this country are born in wedlock. In order, therefore, to understand the rate of increase by birth, it will be necessary to inquire how many persons are married, by how many marriage is foregone, and how long marriage is delayed after puberty? In the two last years (30th June, 1839–41), 123,405 women were married annually; hence it is probable that 113,361 women, who had not been married before, were married annually at a mean age of 24·3 years; for it appears from the facts cited in the report that the first marriages of females are nearly 92 in 100 of the total marriages, and are solemnized at that mean age. Let it be assumed, for a moment, that *all* the 113,361 women married at the same age—24·3 years—half a year earlier or half a year later; then if the number of women in the population who entered upon that age be known, the proportion married will be at once demonstrated. It appears from the census returns that the number of women who attained the age in question was about 143,830; and 143,830 is to 113,361 nearly as 100 to 79; the result therefore is, that 79 in 100 women who attain the marriage age (24) are married, and that 21 in 100 are never married. It has been assumed that all the marriages are performed at the same age, to make the proposition more intelligible; but it is evident that the terms of the proportion between the numbers who do or do not marry will not be materially affected by the distribution of the persons over the ages indicated by the registers.

In this investigation I only take the first marriages, because the first marriages represent the number of *persons* who marry annually; the rest of the total marriages, in a long interval of time, being repetitions of the act of marriage by the same individuals, many of whom in the ordinary marriage registers are counted twice; for the returns show that by re-marriages about 100 women marry 108 men, and 100 men 113 women.

It is not so easy to determine the proportion of men who do not marry; but I shall give the results of the same kind of reasoning applied to men, as has been applied to individuals of the other sex. It may be deduced from the ratio of the first to the total marriages, that 123,405 marriages (the average number), imply the annual marriage of 108,386 men, and from the census abstracts that about 132,236 men were enumerated at the mean age (25·5 years) at which men are first married; so that of 100 men enumerated who attain the average age at which marriage is consummated, 82 do marry and 18 do not marry; but the number 132,236 was derived directly from the number of men enumerated, and should be augmented, to include the men (soldiers, sailors, &c.) absent, and escaping enumeration at that age in greater numbers, probably, than at other ages. If we add 7,420 to the males enumerated, on the assumption that the numbers of the two sexes living at the mean age of 25·5 are nearly equal, which is probably the fact, it will be found that the proportion of men who marry is 78, or one less than the proportion which was found for the female sex. The actual difference, it will be observed, between the number of men and women enumerated who attain the respective ages is 11,594; but 4,180 of the number is accounted for by the disparity of age, as the women living at the age of 25·5 were 139,650, and not 143,830.

By reason of the re-marriages, the absolute number of women who marry is greater than the absolute number of men; the proportion is 1·000 to 1·046; and, latterly, as 113,361 spinsters, and 108,386 bachelors, have been married annually, the marrying women have been 4,975 a year more numerous than the men; while, as is shown in the

preceding paragraph, if the number of both sexes at the same age is equal, the women living at the age 24·3, according to the census returns, were 4,180 more numerous than the women living at the later mean age, 25·5 years, at which men marry. The near coincidence affords a remarkable example of the secret adjustments which exist, and of the laws which regulate all social combinations. More women are married than men; but the women are married at an earlier age, when the number of them living is greater than the number of men living at the age when men marry; so that, at the respective ages of marriage, about 79 in 100 of each sex marry. Of 100 women married, 8 were widows; of 100 men, 12 were widowers. It is infinitely improbable that a husband and wife should die at the same moment; for every marriage, therefore, a widow or widower will be ultimately left; and if the number of marriages and of married persons remained stationary in England for a considerable number of years, as 123,405 marriages take place, 123,405 widows *or* widowers would be left every year, namely, 61,702 widows and 61,702 widowers, or 50 widows and 50 widowers to every 100 marriages, if the expectation of life in both sexes were the same at the age of marriage, in such sort that it might be strictly inferred, when 8 in 100 women married were widows that 8 in 50 widows married again, and by the same rule that 12 in 50 widowers married again. As the number of marriages, however, has increased for many years, and the expectation of life among women at the nuptual age is greater than that of men, it is probable that about 1 in 3 widowers and 1 in 4 widows re-marry.

The fact that one-fifth of the people of this country who attain the age of marriage never marry, and that the women, though capable of bearing children at 16, and certainly nubile at 17, do not marry until they attain a mean age of 24·3, the men until they are 25½, proves that prudence, or "moral restraint," in Mr. Malthus's sense of the term, is in practical operation in England to an extent which had not been conceived, and will perhaps scarcely be credited when stated in numbers.

The births of 1,006,132 children, or 503,066 annually, were registered in the two last years (June 1839–1841), when the mean population (without correction for males absent) was 15,716,775. The annual rate of mortality calculated on this population in the two years was ·02245, the rate of birth ·03201, the excess of the rate of birth was therefore ·00956. But the annual increase in the population in the 10 years, 1831–41, was ·01333, or ·00377 more than the excess of the rate of birth over the rate of mortality will account for. As nearly all the deaths are registered, and the number of immigrants from Ireland and Scotland can scarcely have been greater than the emigrants from England, the rate of birth must have been ·03201 + ·00377 = ·03578 = (·02245 + ·01333) to account for the increase of the population, unless the mortality in the two years was much below the average, which there is reason to believe was the reverse of the fact. According to this statement, 100,000 persons lost 2,245 persons by deaths, gained 3,578 by births, and, consequently, increased 1,333 in the year; 3,201 of the 3,578 births having been registered, and 377 escaped registration.

The annual births were 503,066 + 59,280 = 562,346; and, although the precise proportion of illegitimate births is not yet known, I shall assume, from the incomplete information in my possession, that 5 per cent. (28,117) of the children were illegitimate, which would imply that 534,229 children were born annually in wedlock, namely 4·7 to each woman married $\left(\frac{534,229}{113,361}\right)$, and 4·3 to each marriage $\left(\frac{534,229}{123,405}\right)$.

The latter is the usual, the former the best mode of stating this relation; for the object is to show the fecundity of women in different countries at different times; and the second marriages of women are, in this point of view, only a means of extending the period of childbearing to its natural term, and they cannot, on the average, be so fruitful as the first marriages, with which they are confounded. The marriages increased 1 per cent. annually in the previous 14 years; and, though we do not know at what date the persons were married from whom the 534,229 births sprang, it would certainly be at a period sufficiently remote to imply a less number that 113,785. The actual fecundity of the married women of this country may probably be expressed accurately enough, if a correction be made for the increase of marriages, and for the illegitimate children borne before and after marriage by women who marry, at 5 children to every woman married, and 4·5 children to every wedding. The 5 children replace the 2 parents, and those persons who from early death or from other circumstances bear no children.

The number of women living and enumerated, June, 1840, was, in round numbers, 1,630,000 aged 15–25; 1,272,000 aged 25–35; 900,000 aged 35–45; and these three ages, at which 3,802,000 women were living may be considered the ages of childbearing, the middle period being that in which the greater number of children are produced.

The 3,735,000 women living in the 2 years, June, 1839–41, between the ages 15–45, gave birth to 562,346 children annually: 66 women produced 10 children every year: only 1 in 7 women (6·6) at the childbearing age gave birth to a child in the year. Children are occasionally borne at 15, or as late in life as 55; but if the mothers of the 562,346 children had all been aged 17–40, there would have been only 1 annual birth to 5 women living of that age. It has been calculated that, on an average, 2 years intervene between the birth of every child;* or that of 2 women one has a child every year. After a correction has been made for unprolific women, the difference between 1 in 2, and 1 in 5 or 6, corroborates the previous result, and shows how much, notwithstanding the increase of population, the reproductive force is repressed by prudence.

The population of this country may have increased, and may increase by an augmentation in the number of marriages and births; or by a diminution in the number of deaths, and the consequent prolongation of life. The annual number of births may be increased in two ways: by an increase of the number of persons married, and by earlier marriages, which shorten the interval elapsing between successive generations. Thus 113,361 women were annually married (for the first time) in each of the two years ending June 30th, 1841, when 160,000 women attained the age of 20. If 10,000 be subtracted for sickness, infirmity, and incapacities of various kinds, 150,000 will remain who might have married, and thus have augmented the numbers married by one-third (32·7) per cent. The increase by birth, exclusive of illegitimate children, is about 3·4 per cent. annually; and if the marriages and births be increased one-third, or in the above ratio, the increase by birth will rise to 4·3 per cent., leaving, after subtracting the loss by death, (which shall be supposed to remain stationary at 2·2 per cent.,) instead of 1·3, the present rate, 2·1 per cent. annually as the rate of increase, raised to this height by the greater number of married childbearing women.

I shall not discuss the litigated question whether early marriages are more fruitful than late marriages; for, if even women who married at a

* Dr. Granville and Mr. Finlaison, Parl. Friendly Soc. Rep., 1825.

mean age of 30 bore as many children as women married at 20, it will be immediately perceived that the annual number of births, and the rate of increase, will be widely different in the two sets of circumstances. It may be assumed that at the birth of their children the age of the mothers will be advanced equally in both cases—six years, for instance, on an average—from the time of marriage; the mean age at the time the children are born will consequently be 36 years and 26 years. The interval from the birth of the mothers to the birth of the children will be 36 years and 26 years; and, according to the same law, the interval from the marriage of the mothers to the marriage of the children will be equally 36 years and 26 years. Now, in this case, altogether independently of the reduction by death in the 10 years, if the same number of women continue to marry, and if the expectation of life and the fecundity of the women remain unchanged, the births will be raised above or depressed below the present number, in the inverse ratio of 36 and 26 to 30. At present, the interval from generation to generation, from the birth of the parents to the birth of their children, may be 30 years; in the case of the early marriages, a generation would be reproduced every 26 years; of the late marriages, every 36 years; and, as by the hypothesis, the number born in *each generation* would be the same, the number born *in a given time* would differ in the ratio of the intervals which separated the generations.

If the annual number of births preserve the same ratio to the population, a decline of the rate of mortality will raise the rate which regulates the growth of the population. Reduce, for example, the annual rate of mortality from 2·245 to 2·000, and you raise the rate of increase from 1·333 to 1·578 per cent., unless ·215 be simultaneously subtracted from the rate of increase by birth, which would be likely enough to happen in nature. It is scarcely necessary to add, as a corollary deducible from this statement, that where the births are equal in two nations, or in the same nation at distant periods of time, the population will be proportional to the duration of life; that where the births are 1,000 annually, and the mean duration of life 25 years, the population will be 25,000; but that if the duration of life be by any means extended to 50 years, the population will ultimately become stationary at 50,000.

From the incomplete registration of births, the limited number of facts on which the age at marriage and the proportion of first marriages are calculated, and the complications arising from the increase or decrease of the population by birth, death, immigration, and emigration, I do not advance the preceding numerical statements as absolutely correct or definitive; and I hope to be able to resume the examination of these important subjects at a future time, when more extensive materials have accumulated and have been analyzed. None of these qualifications will, however, invalidate the general principles; and the facts prove, beyond all question, that the population of the country is susceptible of an immense expansion; that it is voluntarily repressed, and always has been repressed, to an extent which has not been clearly conceived or stated; and that the means in the hands of nature, and of society, for increasing and diminishing the population are simple, efficient, and quite compatible with our ideas of the benevolence of the divine government of the world.

Writers upon population have, perhaps, exaggerated the influence of the increase of population on the strength and prosperity of states; but its importance is unquestionable, and it must always be interesting to understand the laws which regulate the death—the reproduction of individuals; and which, in the midst of the struggles of the antagonist

forces of disease and death, the losses by war, want, vice, and error, ensure the perpetuity and life of nations.

It is not my intention—and it would be out of place here—to discuss the questions, whether the population of England is increasing too fast or too slowly? whether any steps should be taken to accelerate or retard its progress? whether the Government should encourage or discourage population; or, after obtaining and publishing all the information that can be procured on the subject, leave public opinion and private prudence to come to their own conclusion and to take their own course? I shall merely notice very briefly how the rate of increase in the population is raised or lowered instinctively; as the indications of nature will be found valuable guides by all who seek to influence the opinions and conduct of mankind.

When the rate of increase is to be lowered, the usual course appears to be to defer to the extent required the period of marriage. If the supplies of subsistence were cut off, if science and industry were unable to convert a larger proportion of the materials of nature into food, and all the outlets and demands of emigration were closed, the population might unquestionably be brought to a stationary condition without increasing the deaths—*by reducing the number of marriages.* At present one fifth of the women who attain the age of 24·3 years never marry; if one-half of the women who attain that age never married, and illigitimate births did not increase, the births would ultimately not exceed the deaths, and the population would remain stationary. But the same end would be almost as effectually and less harshly attained, though four-fifths of the women who arrived at the mean age of marriage continued to marry, if instead of beginning to marry at 18, none married under 23, and the mean age of marriage were raised to 30 years; for the interval from generation to generation would be thus extended, the children to a marriage diminished, and the number of women at 30 would be reduced by the loss of the younger lives. The reduction to a stationary condition is put as an extreme hypothetical case, and as one not likely to be called into requisition; but it is evident that if the population could thus reduce itself to a stationary condition, it possesses still greater facilities for reducing the rate of increase any number of degrees below the present standard, without increasing the mortality. If we put another purely hypothetical case, such, for instance, that the population of the south midland division of the kingdom is increasing too rapidly; that the competition among labourers is threatening to be too severe; that their wages will not, in the end, support their families; that relatively to the means of employment and subsistence—the land, capital, and industrial enterprise—the inhabitants are likely to be too numerous; what, in these circumstances, would be the course pointed out by nature for those classes most directly exposed to privation to pursue? Would it not be to defer the present early marriages? And if the 25 in 100 women of Bedfordshire and Huntingdonshire, the 23 in Cambridgeshire, the 22 in Northamptonshire, the 22 in Hertfordshire, the 18 in Buckinghamshire, who now marry under age, deferred the period of marriage until they were 21, 22, 23, or 24 years of age, until they had gained some experience of life, and accumulated some of the means of living, physiologists and economists would probably agree in saying, that this increase of the prudence, which is now in operation, would not—except in special cases—be calculated to deteriorate the health or intelligence of their families. It is well worthy of remark and of careful consideration, that the number of persons who marry under age, as well as the number of marriages and of births, is much greater in some counties than in others; but it must not be

thence inferred that the population is increasing too fast in those counties; for it may happen that a population increasing at a slow rate is increasing too fast, and that another population increasing at double the velocity is barely meeting the demands for hands and skill—in the harvest-field of labour. I stated the case of the south midland counties, therefore, merely as an illustration of the doctrine that, if any part of the population of this country is increasing too fast, the means of repression are simple, would not be harsh in their operation, and are at the command of the immediate sufferers.

The population is increased most naturally by reversing the process described—by earlier instead of later marriages—while a somewhat higher proportion of women marry, leaving still a large residue, including all afflicted with hereditary ailments, and thus affording scope for the selection, which is invariably, though perhaps insensibly, exercised in large masses, and must tend to elevate the moral and intellectual, as well as the physical qualities of the race.

Dr. Price, at the close of the last century, excited alarm by a forcibly drawn picture of the depopulation of the kingdom; and no sooner had the census demonstrated that Dr. Price's fears of depopulation were groundless, than the "increase of population in a geometrical progression," enunciated in the theory of Mr. Malthus, turned the gloomy forebodings of speculators in quite an opposite direction. Both these writers contributed essentially to the development of the true theory of population; both rendered important services to mankind by their investigations; but the facts since elicited, and the further prosecution of the inquiries which they commenced, have shown that while the study of the doctrine of population is fraught with instruction, and is suggestive of prudence, it is calculated to inspire a calmer confidence in the ordinances of nature, and to confirm our faith in the destinies of England. The expansion of which the reproductive force in the population is susceptible, and the progress of science and industry, must set at rest all dread of popopulation; which has apparently never prevailed for any length of time since the earliest historical ages. The population, it has been proved, has increased in a geometrical progression ever since the first census in 1801: and the rate of progression has been such that, if it continue, the numbers will have doubled in 1850: double the number of families will exist, and must be supplied with subsistence in England: but there will also be double the number of men to create subsistence and capital for her families, to man her fleets, to defend her inviolate hearths, to work the mines and manufactories, to extend the commerce, to open new regions of colonization; and double the number of minds to discover new truths, to confer the benefits and to enjoy the felicity of which human nature is susceptible. If the proposition of Lord Bacon be sound, as it unquestionably is, that the "true greatness (of a state) consisteth essentially in population and "breed of men," time has confirmed his prescient assertion, "that out "of doubt none of the great monarchies, which in the memory of time "have risen in the habitable world, had so fair seeds and beginning "as hath this estate and kingdom."* If the population of England had remained stationary from the age of Elizabeth, and had now not exceeded the population of Belgium; or even if the population had been stationary from the time that Malthus wrote, the empire

* Of the True Greatness of Great Britain, Lord Bacon's works, vol. i. p. 502. It is to be regretted that Bacon did not complete this essay; it commences very much in the manner of Machiavelli's "Discorsi," and was probably intended to infuse a little courage into James I.

could scarcely have attained its present power, or sustained its present greatness. Should the time nevertheless come, when the country is sufficiently populous, and it should be desirable to retard or stop the progress of population—the analysis of the marriages, births, and deaths, in connexion with the census returns, will show, as has been already proved, that this may be effected without raising the mortality. The principle of "an increase of the population in geometrical "progression" has nothing in it fatal, irresistible, inexorable; upon a rigorous analysis of the facts, it is seen that it consists of nothing but an excess of births over the deaths, and becomes a negative quantity, or "a decrease of population in geometrical progression," if the births cease to maintain the same ratio to the population; and the births may always be reduced rapidly by retarding the period and number of marriages: so that the mathematical terror, "a geometrical "progression," cannot alarm any one in the light of day. I do not desire to disguise or underrate the gravity of the fact, that the population of England has increased, as the censuses prove,—and the excess of births over deaths leaves beyond doubt—in a geometrical progression for 40 years, and at a rate by which, if continued, it will double every 49 years. But what has called so many millions of people into existence in 40 years? Why have the English increased so much more rapidly than other nations? By what force has the high rate of increase been sustained; and what gave it the velocity of this geometrical progression, but the creative energy and intelligence of the country and race? And can any one fear for the conduct and fate of this people, if they should feel themselves called upon to rear fewer children—to marry less early than during the last 40 years? Will not the same intelligence and energy which increased, diminish the rate of increase to any extent, when they take the form of prudence?

I have only discussed the increase of the people so far as it is immediately connected with and explained by the registered marriages, births, and deaths. But I may illustrate the practical bearing of the inquiry by one inference, and by noticing a fallacy which has perhaps had some influence on the opinions and conduct of practical men.

The growth of a population depends upon the excess of births over deaths; and the number of births is regulated by the number of marriageable women; whence it follows that where there is a permanent demand for labour in colonies, men and women should be induced to immigrate in equal numbers. Colonies can only be *planted by families*. In New South Wales (1841) the number of free females was 40,425, the number of free males 61,324;* 17,551 of the females, and 18,802 of the males were married; now, if 20,000 persons of each sex were under the age of 20, it is evident that the free men were to the free women above 20 nearly as 40,000 to 20,000, and that the immigration of 20,000 marriageable women might double the number of married persons,—double the number of births; which must otherwise remain less than the deaths until the excess of males has perished. The principle holds in all cases. The negro race will probably not experience a higher mortality in the West Indies, than can be replaced by the births in favourable circumstances;† but the population can only be permanently augmented by the immigration of females and males in equal numbers.

* Mr. Porter, in Statistical Companion, by C. R. Weld, 1843, p. 7.

† Major Tulloch has shown that the deaths were more numerous than the births, and that the black population decreased in the West India Islands before their emancipation from slavery.—Annals of Medicine, vol. i. p. 399.

The fallacy to which I have referred rests on this doctrine: "the "population is increasing in a geometrical progression, the means of "subsistence in an arithmetical progression, and unless wars, destructive "epidemics, marshes, dense towns, close workshops, and other deadly "agents, carry off the excess of the numbers born—unless the outlets "of life and blood be left open—the whole people must be exposed to "a slow process of starvation." This has been considered by some the doctrine of population. The nature of the increase in geometrical progression has been already examined; and there is no evidence whatever to prove that while capital increases in geometrical progression (compound interest) the subsistence and power of the people of these islands have increased, or will increase, in arithmetical, and not in geometrical progression. It is not known how much subsistence has increased in the last 40 years; and it is pure empiricism to pretend to say that the rate of progression has been, or will be arithmetical, if anything more be meant by that formula than the plain incontrovertible fact that the increase of subsistence is limited. But independently of these considerations, and of any matters of controversy which it would be inconvenient to advert to here, the facts in the previous part of this paper dispose of the fallacy,—which, if it cannot be employed by any but the most depraved to sanction the destruction of life, might slacken the zeal of some in ameliorating the public health, by lending a colour to the dreadful notion that the excess of population is the cause of all the misery incidental to our condition or nature; and that the population might at the same time be diminished and saved from starvation, by epidemic diseases, unhealthy employments, or pestilential localities. What are the facts? An increase of the deaths can only diminish the population if the number of births remain stationary. It has been shown that the number of births may be increased to an incredible extent; experience has proved that the births almost invariably increase when the mortality increases; and it will be seen, in the Tables of the Report, that where the mortality is greatest, the births are most numerous and the population is increasing most rapidly. An increase of the mortality is therefore no specific for establishing an equilibrium between subsistence and population. The more, in fine, the doctrines of population are studied, the more deeply must be impressed upon the mind the sacredness of human life, and of the safeguards by which it has been surrounded by God and the laws. (Fourth Annual Report, pp. 133–46.)

It is not intended to discuss here what has been sometimes called the *Law of Population*, further than briefly to state how the increase of population depends on many elements, which vary and produce various results—sometimes identical in the mere numbers which they present at the census, but different under all other aspects.

The numbers, and consequently the increase or decrease, of people in a civilized country, depend upon the age at marriage and the age of the parents when their children are born—the numbers who marry, the fertility of the marriages—the duration of life—the activity of the migration flowing into or out of the country. These acts more or less influence each other, and in the present state of statistical observation, the precise effect of a change in any one of them involving others cannot be determined. It will be sufficient to indicate the effect of a change in each element, while the others remain constant.

1. The numbers of the population bear a definite relation to the duration of life, or to the mean lifetime. Thus, if the mean lifetime of

a population is 30 years, then if the births are 100,000 a year and remain uniform, the population will be 30 times 100,000, or 3,000,000. Now, the births remaining the same, let the lifetime be gradually extended to 40 years; then the population will become 4,000,000; or if the lifetime is extended to 50 years, the population, from the extension of life alone, will rise from *three* to *five* millions. The deaths, upon this hypothesis, will be equal to the births; and the same in number when the population is *five*, as when it is *four*, or *three* millions. It is probable that the mean lifetime of the great body of the population did increase from the year 1801 to 1821, when the increase of population was greatest in Great Britain.

2. The interval from the birth of one generation to the birth of their descendants of the generation following, bears also a definite relation to the numbers, which increase as the interval is shortened. Thus, if the population increases at the rate of 1·329 annually, and if the intervening time from generation to generation is $33\frac{1}{3}$ years, it follows that the increase from generation to generation is 55 per cent.; or that every 1,000 women are succeeded, at the interval of $33\frac{1}{3}$ years, by 1,553 women; every *two* couples, male and female, by *three*. If the interval is contracted, and the increase from 1,000 to 1,553 takes place in 30 years, the annual rate of population increases, simply on this ground, from 1·329 to 1·477 per cent.; and, as we assume by hypothesis that the births and the lifetime remain the same, the population would be ultimately one-ninth part more numerous than it was under the former conditions. Early marriages have the effect of shortening the interval between generations, and tend in this way to increase the population.

3. An increase in the fertility of marriages will evidently cause an increase in the population.

4. In ordinary times, a large proportion of the marriageable women of every country are unmarried, and the most direct action on the population is produced by their entering the married state. Thus in the South Eastern Division, comprising Surrey, Kent, Sussex, Hants, and Berks, the number of women of the age of 20 and under the age of 45 amounted, at the last census, to 290,209; of whom 169,806 were wives, and 120,403 were spinsters or widows. 49,997 births were registered in the same counties during the year 1850, or 10 children were born in 1850 to every 58 women living in 1851. Of the children, 46,705 were born in wedlock, 3,292 were born out of wedlock; consequently, 36 wives bore in the year *ten* children, and of 366 unmarried women of the same age (20–45) *ten* also gave birth to children. A change in the matrimonial condition of a large proportion of the 120,403 unmarried women, out of 290,209 women at the child-bearing age, would have an immediate effect on the numbers of the population; and, if continued by increasing the rate of birth to the living through successive generations, would operate on population like a rise in the rate of interest on the increase of capital.

5. The effect of migration on the numbers of the population is evident. It is probable, that the immigration of Irish has contributed to the increase of the population in England; and it is certain that the emigration from the United Kingdom contributes largely to the increase of the population of the United States. The emigrants are a self-perpetuating body in healthy climates; and they increase faster abroad than the general population at home, as they contain an excess of the population at the reproductive age; so that, if their numbers are added together, it is certain that we get in the aggregate, a number much below the number of survivors. The population of the United Kingdom, including the army, navy, and merchant seamen, was 21,272,187 in 1821, and

about 27,724,849 in 1851; but, in the interval, 2,685,747 persons emigrated, who, if simply added to the population of the United Kingdom, make the survivors and descendants of the races, within the British Isles in 1821, now 30,410,595.

6. Finally, the numbers of the population are increased by an abundance of the necessaries of life; and reduced by famines, epidemics, and public calamities, affecting the food, industry, and life of the nation. The pestilences of the middle ages—the famine, the influenza, and the cholera of modern times—are examples of one class of these agencies; the security, and freedom which England has latterly enjoyed, are examples of the beneficent effect of another class of influences, not only on the happiness of the people, but also on the numbers which the country can sustain at home, and can send abroad to cultivate, possess, and inherit other lands.

All these causes affecting the increase of the population of Great Britain, and the precise extent to which each operates, will ultimately be known by means of a continuous series of such observations as have been commenced at this census.—(Census Report, 1851; Enumeration, Vol. I., pp. xxxi–ii.)

Increase and Decrease of Population.—The natural increase of population, instead of proceeding at the actual rate of about 1·3, would, it is said, be in the end 1·8 per cent. annually; it would go on indefinitely, and would double the population every 39 years; at the natural rate actually prevailing, upon this hypothesis the population will double itself in 55 years. This question has, therefore, to be discussed.

Mr. Malthus calculated that the unrestrained principle of population would fill not only the earth with men, but people all the planets of all the suns that shine in the visible universe.* And latterly the President of the Health Officers of London, finding that the proportion of children that die under five years of age is more than 40 per cent. of the total deaths in England and Wales, remarks:†—"If this were not so, the increase " of population would be prodigious; for it is the means whereby the " annual excess of births over deaths is kept down to the reasonable " proportion of 12·8 per 1,000 of the population. If it reached to 18 per " 1,000 * * the population would be doubled in rather less than 40 " years. Consider for a moment the consequences of this. * * In 40 " years the population of England and Wales would be over 45,000,000 " * * in 120 years * * it would be near 182,000,000. * * This " sort of thing could never last; for in about 240 years the population " of England and Wales, unless it was exported in huge masses, would " reach to rather more than 1,550 millions, and it would be as thickly " placed over the whole country as it is in London at the present moment." At the rate here called "reasonable," the population by the hypothesis would double itself every $54\frac{1}{2}$ years, so that the time in which the dreaded

* Malthus had the following passage in one edition of his Political Economy: "If any person will take the trouble to make the calculation, he will see that if the necessaries of life could be obtained without limit, and the number of people could be doubled every 25 years, the population which might have been produced from a single pair since the Christian era would have been sufficient, not only to fill the earth quite full of people, so that four should stand upon every square yard, but to fill all the planets of our solar system in the same way, and not only them, but all the planets revolving round the stars which are visible to the naked eye, supposing each of them to be a sun, and to have as many planets belonging to it as our sun has." [Quotation from Malthus' "Principles of Political Economy," p. 227, in Godwin on "Population," p. 484. I do not find the passage in the second edition of the "Principles"].

† On the Estimation of Sanitary Condition. By H. Letheby, M.B., pp. 20–21.

catastrophe would overwhelm this nation could only be deferred 87 years by the continued Herodian sacrifice. On a par with this is Dr. Price's illustration of the power of compound interest: "One penny put out at "our Saviour's birth to five per cent. compound interest would in the "year 1791, have increased to a greater sum than would be contained "in three hundred millions of earths, all solid gold."*

There is evidently something singularly seductive in these applications of the abstract doctrine of series in geometrical progression to actual facts: even Justice Blackstone is led by geometrical progression to make the following statement:—

"The doctrine of lineal consanguinity is sufficiently plain and obvious; but it is "*at the first view astonishing to consider the number of lineal ancestors which "every man has*, within no very great number of degrees; and so many different "bloods is a man said to contain in his veins, as he hath lineal ancestors. Of these "he hath two in the first ascending degree, his own parents; he hath four in the "second, the parents of his father and the parents of his mother; he hath eight in "the third, the parents of his two grandfathers and two grandmothers; and by the "same rule of progression, he hath an hundred and twenty-eighth in the seventh; "a thousand and twenty-four in the tenth; and at the twentieth degree, or the "distance of twenty generations, every man hath above a *million of ancestors*, as "common arithmetic will demonstrate." This is further explained in the note. "This will seem surprising to those who are unacquainted with the increasing "power of progressive numbers; but is palpably evident from the following table "of a geometrical progression, in which the first term is 2, and the denominator "also 2; or, to speak more intelligibly, it is evident, for that each of us has two "ancestors in the first degree; the number of whom is doubled at every remove, "because each of our ancestors has also two immediate ancestors of his own.

Lineal Degrees.	Number of Ancestors.	Lineal Degrees.	Number of Ancestors.
1	2	11	2,048
2	4	12	4,096
3	8	13	8,192
4	16	14	16,384
5	32	15	32,768
6	64	16	65,536
7	128	17	131,072
8	256	18	262,144
9	512	19	524,288
10	1,024	20	1,048,576

"A shorter method of finding the number of ancestors at any even degree is by "squaring the number of ancestors at half that number of degrees.† Thus 16 (the "number of ancestors at four degrees) is the square of 4, the number of ancestors at "two; 256 is the square of 16; 65,536 of 256; *and the number of ancestors at 40 "degrees would be the square of 1,048,576*, or upwards of a *million millions*." [Chitty's Blackstone's Commentaries, 21st Edition, Vol. 2, pp. 203–204.

Mr. Malthus argues that population, if unrestrained, will double itself every twenty-five years‡; but let it be assumed that the doubling period is lower, or equal to $33\frac{1}{3}$ years—that is the mean interval between two generations—according to the common reckoning, then, beginning at one end of the series, a pair in 40 such periods (1,333 years) will yield more than a million millions of descendants; and beginning at the other end and proceeding backwards, according to Mr. Justice Blackstone each descendant has more than a million millions of ancestors!

The fallacy that deceives Blackstone in the latter case is the want of continuity in the law of the series; a man has, it is true, four ancestors

* Price's Observations on Reversionary Payments, vol. I. p. 314.

† Let a = first term, n the number of terms, and r the rate; then evidently $ar^{\frac{n}{2}} r^{\frac{n}{2}} = ar^{n}$.

‡ Which implies an annual rate of increase of 2·81 per cent.

in the second degree, because the marriage of brother and sister is prohibited and there is a fusion of four bloods; but as the marriage of first, second, and every order of cousins is permitted under this law, no more than four ancestors are indispensable to the fortieth man in descent; without the prohibition the whole of the human race might evidently be traced up to two ancestors—and two bloods. The mind is led on through the first step, as Blackstone was, to the inference that because a man has a father and a mother, and 2 grandfathers and 2 grandmothers —he must have 8 great grandfathers and great grandmothers, and so on; which is not necessary, and if pursued far enough becomes improbable, absurd, impossible.

The hypothesis of increase of population in geometrical progression had been advanced before,* but Malthus in his practical applications of it brought it home to the public mind, and led to further researches, and to exciting controversies. Godwin—a man of genius—whose work on Political Justice had suggested the controversial essay of Malthus in 1798, answered it in his *Enquiry concerning Population*, and Sadler collected a great many facts in his work.† The facts at the disposal of the respective writers were numerous, but they were incomplete, and in England the statistical facts we now possess respecting the conjugal condition of the men and women living at the several ages were then entirely absent, as the information in the early censuses was meagre. All that is further wanted now in the English Birth Schedule to clear up this vital question conclusively is the entry of the ages of the mother and father at the birth of their children, and the order of the births.‡ Instead of discussing the principle of population and the hypothesis of increase in geometrical progression—which its authors have reduced to absurdity—I propose to state enough of what is known to prove that a reduction in the rate of mortality can be attended by none but the most salutary effects to the nation.

Population is sustained when the births equal the deaths in the same time; when the deaths exceed the births population declines, and when the births exceed the deaths population increases. Migration is here left out of account. The balance is affected by the changes in each of two variables; thus, if the population of England was stationary the deaths would be at the rate of 2·447 per cent., the births 2·447 also; the difference is *zero;* but the population increases, as we have seen, so the deaths are at the rate of 2·242, and the births not only equal but surpass the deaths in every 100 of population by 1·264, which is therefore the natural increase. The mean lifetime in England is 41 years. Should it become as long as it is in the healthiest districts it will be 49 years; and instead of 1 death and 1 birth to 41 living there will be 1 death and 1 birth to 49 living, the latter implying an annual rate of 2·041. An increase of the years men live involves a decrease of the annual mortality, but not necessarily any increase of population; for the birth-rate may fall to an equivalent extent.

The death-rate of a population is under control, but not to the same extent as the birth-rate, which depends on voluntary marriage and fertility, which have hitherto been marvellously regulated so as to meet generally the demand for men. Thus, England has an increasing

* Voltaire, after giving it as his opinion that the population of Europe had tripled since the time of Charlemagne, adds with his incisive common sense: "J'ai dit "triplé, et c'est beaucoup; car on ne propage en progression géométrique. Tous "les calculs qu'on faits sur cette prétendue multiplication sont des chimères "absurdes." *Dict. Philosophique*, Art. *Population*.

† Godwin on Population, 1820. Sadler on Law of Population, 2 Vols., 1830.

‡ Done in the Registers of our Australian Colonies.

industry and a vast colonial empire to people, so the births are numerous. In France the death-rate in the ten years was 2·36, differing a little (0·12 in excess) from that of England; but the birth-rate was only 2·63 in France instead of 3·51 as it was in England. France had no colonial demand for population, and so the population was not depressed by a high death-rate but by a low birth-rate. The increase of population was only 0·27 per cent. per annum.

Many species of animals have, as the geological records of the world show, perished; and man could never have survived the perils of his early historic, to say nothing of his prehistoric, life had his race not been endowed with a reserve of reproductive force sufficient to repair the recurrent wastes of famines, wars, and plagues. At the present hour in England half of the women of the child-bearing ages are unmarried; and though the annual births maintain an actual excess over the deaths, they are kept down to half their possible number. A flow of prosperity in the country is immediately followed and marked by the launch of a whole fleet of marriages. The ruin of an industry or the depression of a trade implies a stagnation of marriages. There are thousands of couples always on the look-out, ready to embark as the prospects brighten.

It has been observed that after the ravages of plagues the births increase, so the aching voids are filled up as regards mere numbers. Under ordinary conditions an increased death-rate is attended by an increased birth-rate, so as either to maintain the population stationary or increasing, according to the exigencies of the case. This is only possible within certain limits, for an excessive death-rate is attended with such waste that it cannot be overtaken by the births; the population declines, or is only sustained by immigration. We have the means of establishing this law by English observations.—(Supplement to 35th Annual Report, pp. ix.–xii.)

Influence of Birth-rate upon Population.—The *births*, again, are under control to an extent which has not yet been duly appreciated, but is now rendered clear by the census. This will be shown by an examination of the facts. Leaving unregistered births out of account, the number of children registered as born in wedlock during the ten years 1861–70 was 7,043,090; the wives, all between the ages of 15 and 55, were more than three millions one hundred and fifty thousand, and the number of unmarried women of those ages was full two million seven hundred and ninety thousand, who bore only 457,006 children in the ten years. But as the greater part of the children of this country are borne by women of the age 20–40 we may take them here as the basis of calculation, and then to every 100 wives of that age 35·87 children were born annually (1861–70); while to every 100 spinsters and widows living of the same age only 3·34 children were born. But in 1871 the number of wives enumerated at the age 20–40 was 2,080,991, who at the above rate would give birth to 746,452 children in the year. And the number of spinsters and widows of the same age was 1,423,360, who, if married with the same fertility as the wives, would in that year have borne 510,559 children, but at the actual registered rate only bore 47,540 children, leaving 463,019 over.

The married women are to some extent a selected class, and so, striking off 333,931 from the unmarried women of the age 20–40, there are left 3,000,000 married or marriageable women, living through 1861–70, who at the rate actually observed among the wives would have borne 10,761,000 children, instead of 7,500,096.

At the birth rate cited, to every wife of 20–40 a child is born nearly every three years (2·8); but in some counties the mean interval between

each birth approaches 2½ years, and looked at physiologically it might, after allowing for wives with no children and other drawbacks, be reduced to two years, which, with the additional marriages, would have the effect of doubling the number of births. There is, therefore, no doubt that even in England the number of births in wedlock admits of great expansion, and would receive it in the event of great demands on the resources of the nation to fill up its ranks from losses in war, from the ravages of a decimating plague, from the efflux of a great emigration; or to meet any extraordinary development of commerce and industry.

Then, as only 78,225 of the young women of the ages 15 to 21 are wives, of ages ranging in number from 151 at 15 to 43,652 at 20, there remains a further reserve of 1,246,743 maidens unmarried; so that England is in truth fertile in men, *ferax hominum*, and holds an ample reserve to meet whatever demands may be made upon her by fate in the future. (Census Report, 1871, vol. 4, pp. xv.–xvi.)

Censuses and Population Registers.—In the intervals between two Censuses there is a continual inflow and outflow of people of all ages, some entering the gates as visitors, some as settlers, some as new-born infants; and others leaving it as travellers, as emigrants, as passengers to that "country from whose bourne no traveller returns." If we had had such registers of population as have been recommended by the Statistical Congress, starting from the nominal list of the Census of 1861, the numbers who came into the country in any way would be added to the register, and the numbers who left would be struck off; the difference between the incomers and the outgoers, added to the numbers of 1861, should, when the balance is struck, equal the population of the Census of 1871.

Unfortunately, no such population register exists; but it does not follow that we have no means of determining approximately the inward and outward movement of the people. Statistics is in some respects, in the present day, dealing with men like trigonometry dealing with lines and angles, able to deduce from certain given data others of which there is no trace; from a basis of observed facts other facts can be determined; thus by means of the English Life Table, the number of persons enumerated at the several ages, the number of persons born in other countries at successive Censuses, and the number of English birth in other parts, it is possible to determine the income and outgo of people from the English and Welsh divisions of these islands.

For the exact determination, accurate enumerations of the population, complete registers of births and deaths, and true returns of all emigrants and immigrants, are required. We may assume that the enumeration of the population was rather more complete in 1871 than in 1861 or 1851; but this may be left out of account. The births have been more fully registered every year since the Act came into operation in 1837, yet some are still missed; but the births in the preceding ten years can be very accurately calculated from the number of their survivors enumerated under ten years of age on the Census Day. That has accordingly been done, and the calculated can be compared with the registered numbers in the three decennia, 1841–71. (Census Report, 1871, Vol. 4, p. xxiii.)

The finally revised results of the eighth decennial Census show that on the 3rd April 1871 the total population of England and Wales was 22,712,266, having increased by 2,646,042 persons, or at the rate of 13·19 per cent. since the Census of 1861. This the largest decennial increase, relatively as well as actually, that has taken place since

1831-41; and some, at least, of the causes which have led to this arrest of the tendency of the population to increase at the decreasing rate observed from 1811 to 1861 will no doubt be elucidated when the analysis of the conditions, occupations, and birth-places of the people is completed. But the effect of a particular cause or set of causes in augmenting or diminishing the rate of increase between any periods can at the utmost be traced approximately so long as the marriage, birth, and death registers, an obviously defective record of emigration, an entire absence of knowledge respecting immigration, and a Census taken once only in every ten years, are the sole available guides. The interest of the public at large in statistical inquiry is as yet undeveloped sufficiently to justify an attempt to establish a Population Register,* or a record of the migration of every person going into or coming from Scotland, Ireland, or elsewhere beyond seas; and it is of little use to speculate upon the nearness or remoteness of the probability of obtaining statistics complete enough to demonstrate the part played by each of the many factors concerned in producing a growth or decline of the population. (34th Annual Report, p. vii.)

Period in which Population doubles itself.†—The rate at which the population of Great Britain increased from 1801 to 1851 is such, that if it continue to prevail uniformly the population will double itself every 52·5 years; in England and Wales the period of doubling on the same hypothesis is 51·0 years. (Census Report, 1851; Enumeration, Vol. 1, p. xxx.)

5. Density and Proximity.

Proximity.—The population may be looked at in another point of view. Every person is in direct or indirect communication with other persons surrounding him; and the extent, intimacy, and number of the relations between people depend very much upon the degree of their proximity. If the persons, houses, villages, towns, are twice as far apart from each other in one country as they are in another, the force and interaction of the two communities will differ to an inconceivable extent. Proximity can be expressed with the same precision as density of population, upon the same hypothesis of equal distribution; and its relative value in different countries and districts is equally interesting. Thus, the people of England were, on an average, 152 yards asunder in 1801, and 108 yards asunder in 1851; the mean distance apart of their houses was 364 yards in 1801, and 252 yards in 1851. On the line of proximity depends the distance which an enumerator, or a messenger who has to call at every house, travels on his mission. A messenger to deliver 1,000 letters at 1,000 houses of average proximity in 1801 would travel 206 miles (362,000 yards); in 1851, to deliver 1,000 letters at 1,000 houses of average proximity he would travel only 143 miles (252,000 yards). The population on the same area has doubled; the

* Population registers are kept in Sweden, Belgium, and Holland. By a decree of His Majesty the King of Italy, dated 4th April 1873, a register of the fixed population is to be established in that country: it is to consist of three parts, one relating to houses, one to families, and one to individuals. For each person the register is to show the name, surname, and sex; the names of his parents; the place and date of his birth; his civil condition, whether single, married, or widower, and if married the name of his wife, ulterior changes of condition being duly posted up; his rank, profession, or occupation; his residence; his declared civil domicile; and a reference to the folio relating to families under which he will be found inscribed.

† See also *Principle of Population*, last paragraph but one on p. 15; and *Law of Population*, note to p. 19, for formula to calculate the number of years in which a population will double itself.

proximity has increased—the separation has diminished—in the ratio of 3 to 2. In the London division the mean proximity in 1801 was 21 yards, in 1851 it was 14 yards. The population on the same area increased 146 per cent., or in the proportion of 100 to 246; the difficulty of personal communication, of delivering letters, parcels, goods, to every person—expressed by multiplying the distance from person to person into the numbers—increased only 57 per cent., or in the proportion of 100 to 157. (Census Report, 1851; Enumeration, Vol. i. p. li.)

Density.—Density implies degree of proximity of people to each other; but it may be convenient to express explicitly this important relation of nearness, of neighbourhood which differs so much, not only in foreign countries, and in colonies, but in English counties. The proximity may be here given in a few illustrative instances. It is deduced by dividing first the area of a country by the population. Now the acreage of England being constant and the population increasing, the number of acres to a person is continually diminishing; thus the number of acres to a person was 4·12 in 1801 and 1·64 in 1871; and going back to a period for which there is a probable estimate of population, the end of Elizabeth's reign (1600), there were then 7·71 acres of land to each person living. The acres of land to each person in the three successive periods were 7·71, 4·12, and 1·64 acres, and the proximity expressed in yards was 208, 153, and 96.

It will be noticed that the difficulties of intercommunication between all the individuals of a population do not increase as much as its numbers; for if the population of a county has increased four-fold the distance to be travelled by a messenger proceeding from person to person, or from house to house, is only doubled; and generally the distance to be travelled in going from person to person in two equal counties is inversely as the square root of the numbers on the same area. This has an important bearing on every kind of intercommunication. The distance to be travelled in going from person to person in England and Wales, if the 9,060,993 persons living in the middle of the year 1801 had been equally distributed would have been 781,086 miles; while the distance to be travelled in visiting the 22,782,812 living in the middle of 1871 would only have been 1,238,553 miles.

The mean distance from house to house in 1801 was 364 yards; in 1871 only 221 yards. On the hypothesis of uniform distribution the distance to be travelled by a postman, for instance, in visiting all the houses would have been 325,744 miles in 1801, and only 536,345 miles in 1871.

It will be seen how much the concentration of the people in houses diminishes the distance to be travelled; it is reduced in the ratio that the square root of the number of persons to a house bears to unity.

The concentration of houses in cities while it increases the proximity of masses of the people diminishes the distances to be travelled in visiting the houses of those cities, and at the same time economises the connecting roads and all the other channels of communication. (Census Report, 1871, Vol. 4, p. xxviii.)

Method of calculating Density and Proximity.—Let the area of a place be expressed by A in any superficial units, and the population by P: then $\frac{P}{A} = D$ = mean population on those several units. This is generally called the density of population, and by M. Prony the specific population. It enables us to express with precision the notions conveyed

when we say this country is populous, that is thinly peopled, that is a desert; the value of D in the latter case being *zero*.

We have taken a square mile as the measuring unit of area in the table, which implies that although the number of people may differ on every square mile of a country, still on an average of the whole the number is as there stated. Thus the populousness of the several countries can be compared.

Now, instead of dividing the population (P) by the area (A), we may divide the area (A) by the population, and then $\frac{A}{P} = a =$ the mean area to each person. It may be called, for the sake of convenience, the areality of the population; it is the mean number of acres or hectares, square yards, or any other units expressed by A, to each unit of population. $a = \frac{1}{D}$, so a is the reciprocal of D. Divide the area by the Houses (H) and we have $\frac{A}{H} = a' =$ areality of Houses.

The nearness of house to house or of person to person varies in every part of a country, but assuming that the mean areality is given, the mean proximity of each person can be at once determined, as the proximity varies in the ratio of the square roots of the areality.

Thus the areality of the population of England in 1871 is expressed by 1·64 acres, or of 7,928 square yards to a person; in 1801 it was 19,934 square yards to a person; and the proximity of person to person, which was 96 in 1871, was 152 in 1801.

Assuming that there were five persons to a household in 1801, and the same number in 1871, then the proximity of the households is found by multiplying the proximity of persons by the square root of 5. It would be 339 in 1801, and 214 in 1871.

Again, as persons are grouped together in houses, houses are grouped together in towns, and if the areality of towns is determined by the same convention as in the case of persons and houses, the proximity of towns can be determined by the same method.

The general formula for proximity when the areality $\frac{A}{P} = a$ is given is—

$$p = 2\left(\frac{\cos 30^\circ}{3}\right)^{\frac{1}{2}} a^{\frac{1}{2}} = \frac{2^{\frac{1}{2}}}{3^{\frac{1}{4}}} a^{\frac{1}{2}}$$

$\frac{2^{\frac{1}{2}}}{3^{\frac{1}{4}}} = c$ is a constant, and $\log c = 0{\cdot}0312347$.

NOTE.—The *degree* of proximity may be expressed by taking contact as unity and dividing this unit by the distance from person to person. (Census Report, 1871, Vol. 4, p. xxviii.)

6. SEXES.

*Sex proportion of Population.**—The enumeration of the population of England and Wales at the various Censuses shows that there is an excess of females living over males living, and it is noteworthy that this excess is greater now than it was some years ago.

* This subject, with special reference to its effect upon the death-rate of a population, was discussed in a paper by the Editor, read before the Statistical Society in 1874 on "The value of Death-rates as a Test of Sanitary Condition."

NUMBER of MALES LIVING to every 100 FEMALES LIVING (exclusive of the portion of the Army, Navy, and Merchant Seamen abroad).

Census Years.	To 100 Females the Number of Males in England and Wales.
Mean of 1821–31 - -	96·35
„ 1831–41 - -	95·87
„ 1841–51 - -	95·80
„ 1851–61 - -	95·51
„ 1861–71 - -	94·96
„ 1871–81 - -	94·84

Thus to every 100 women living in England and Wales at the Censuses of 1821 and 1831 the mean proportional number of men living was 96·35, but this number fell in 1841 and 1851 to 95·80, and fell still further in 1861 and 1871 to 94·96.

This disparity in the proportion of males and females living is attributable to the higher rate of mortality, and the much greater amount of emigration among males than among females. The emigration returns of 1877 show the relative proportion of the *sexes* of emigrants of *English origin;* when they have been published for a series of years they will throw some light on this interesting point. The number of male emigrants of *English* origin in 1877 was 39,829, and of female 23,882. (40th Annual Report, p. xx.)

7. AGES.

Census Enumeration of Ages.—The ages of the British population were first returned in 1821: in 1801 and 1811 "age" formed no head of inquiry. In 1821 the answers to the question of age were "purposely "left optional, both as regarding the returning officer, and the persons "to whom the question was to be proposed by him." Yet the returns of ages, under this voluntary inquiry, embraced 8 ninths of the persons enumerated; and where no returns were made it was apparently the fault of the overseers, rather than of the people; for the omission was not in individual returns, but in whole parishes and townships. In 1831 the number of males of 20 years of age and upwards was demanded; and the inquiry extended no further in this direction. In 1851 the name and age of each person were written in a schedule, either by the head of the family or by the enumerator; as indeed had been done, with a little less accuracy, in 1841.

The ages of 52,565 vagrants and others were not stated in 1841, and nearly as many ages of the same classes were, probably, omitted in 1851; but as it is necessary for the purposes of calculation to distribute the numbers *proportionally* over the several periods of life, it was deemed most convenient to carry out this distribution at once, by inserting their probable ages in the books, with distinctive marks to indicate the interpolation. With this qualification, the numbers, as they were returned,

of males and females separately, under 5 years of age, of 5 years and under 10 years, and for each subsequent quinquennial period of life up to 100, are given in the Tables for each of the 11 divisions, the 52 counties, the 624 registration districts, the 2,190 sub-districts of England and Wales; for the two divisions, the 32 counties, and some towns of Scotland; and for the Islands in the British Seas.

Mr. Rickman noticed that in 1821 and 1831 the number of males *under twenty* years of age and the number of *twenty* years of age and upwards were nearly equal; and this proportion has since been regarded as invariable, or it has been assumed that the males of the age of *twenty* and upwards are equal in number to a fourth part of the whole population. The Census of 1851, however, reveals a very different state of things. (Census Report, 1851; Occupations, Vol. 1, p. vi.)

In 1851 the precise age at the last birthday of each person in this country was, under the Census Act, for the first time demanded; and the opinion which we entertained, of the probable general accuracy of the returns within well-defined limits, is confirmed by the tabular results. The mean age of the females, as they are returned in England, exceeds the mean age of the males by *ten months;* so that the tendency in women to understate their ages has only operated on comparatively small numbers; and there is no doubt of their general truthfulness.

A comparison of the series of numbers living at different ages, and of the numbers of males and females at the same ages, confirms this view; but it indicates, at certain ages, some evident mis-statements, which a comparison with the returns of ages in 1841 enables us to calculate and define. Persons of the age of 20 in 1851 must have been 10 years of age in 1841, and persons of the age of 25 in 1851 must have been of the age of 15 in 1841; and as there is a certain number of losses by death, it is evident that, excluding the effects of migration, the numbers at the age 20–25 in 1851 must be less than the numbers living at the ages 10–15 in 1841, of whom they (20–25) are the natural survivors. What are the statements which the abstracts of ages express?

1841.	The number of girls, age 10–15, was -	1,003,119
1851.	The number of young women, age 20–25 was, as stated in the returns - -	1,030,456

Now, as the first number could never have swollen in the ten years to the magnitude of the second, we are driven to the hypothesis that in 1841 and 1851 the heads of families returned several thousands of ladies of the higher ages at the age of 20–25; and the hypothesis is confirmed by comparing the diminished numbers returned at the age of 30–35 in 1851 with the numbers returned as 20–25 in 1841, where it is evident that the latter number is in deficiency as much as the former number is in excess.

1841.	The number of young women of the age of 20–25, as stated in the returns, was -	973,696
1851.	The number of women of the age of 30–35, as stated in the returns, was - -	768,711

(Census Report, 1851; Occupations, Vol. 1, pp. xxiii–iv.)

Effect of Birth Rate on Ages of Population.—If the numbers of births in each year were equal, and if all men lived a hundred or any other definite number of years, the numbers that, at a Census, would be found living at each age, would be equal; so the old men would be as numerous as the young men, and as the children, in the population. The great disparity in the actual numbers living at the five ages shows

conclusively that few of the people of this country have hitherto lived the natural lifetime. Thus to a *hundred thousand* children and young people under the age of 20 there are only 68,593 of the *second age* (20–40); 36,895 of the *third age* (40–60); 14,803 of the *fourth age* (60–80); and 1,355 of the *fifth age.*

The whole of these differences is, however, not due to premature death, but to the gradual increase of births (Census Report, 1851; Occupations, Vol. 1, p. xvi.)

The population is now younger than it would be by the natural standard; but as one of the causes of the depression of age operates with more force in other countries where the mortality is greater, the people would be on an average older in Great Britain than elsewhere, were it not for the interference of the increase of births within the last hundred years, by which the proportion of children and young persons has been so much increased that it may be questioned whether the people of any country in Europe are so young as the people of England and Scotland.

The English Life Table enables us to show what the distribution of the population would have been in 1851 if the mortality had remained uniformly at the same rate, and the births had been stationary. To 100 persons at ages under 20 years the proportions at four vicennial ages, commencing at 20, 40, 60, and 80 years, would, upon this hypothesis, be 81, 63, 33, and 3; while the actual proportions are 69, 37, 15, 1.

One practical consequence may be immediately deduced from this fact:—Although the births of Great Britain and the mortality remain stationary, the population will go on increasing; for the same number of births which, within the 20 years 1831–51 have produced persons under 20 years of age, will produce nearly an equal number in the next 20 years; but the survivors at the ages 20–40 will be many more than the number now living at those ages; and the numbers at each succeeding age will increase until the population ultimately amounts to *forty-one* times the births.

The First Census of Great Britain, it will be recollected, was taken in 1801. The ages of the population were first discriminated in 1821. Only a portion of the deaths and births in England were returned, as burials and baptisms according to the rites of the Church of England, up to 1837, when the Act for the Registration of Births, Deaths, and Marriages came into operation. Even since that date a certain number of births has escaped registration, and the accounts of the immigration and emigration are incomplete, so that, through the want of data, the investigation of the profound change that has been wrought in the constitution and distribution of the population as to age is attended with extraordinary difficulty. The general nature of the change can, however, be satisfactorily explained.

Assume that a small community of 4,114 persons has been sustained for a long period by 100 annual births, and that the mortality has been such that the numbers at each years of age, from the first to the tenth, are found at a census to be 90, 83, 79, 76, 75, 74, 73, 72, 71, 71, and slowly diminish, so that there are 66 in the 21st year, 53 in the 41st year, and so on decreasing to the last age. Now, let the births from any cause suddenly increase, and instead of 100 be 200 annually, then the population will increase, and if a census is taken at the end of 20 years it will be found that the population under 20 years of age is, instead of 1,449, twice that number, or 2,898. While the numbers of

the population under the age of 20 years were to the numbers of the age of 20 years and upwards at the first census as 1,449 to 2,665, the proportions at the second census will be as 2,898 to 2,665. The births remaining the same, if a third census is taken at the end of forty years the numbers under 20 years will be found to be still the same as at the second census (2,898); but the numbers at the age 20–40 will be doubled, and instead of 1,204 be 2,408. The proportional numbers under—and at or above 20 years of age—will be as 2,898 to 3,869. Finally, at the end of a century the population will consist of 8,228 persons, of whom 2,898 will be under 20 years of age, and 5,330 will be of the age of 20 years and upwards. The population at each age will be in the original proportions; but all the parts of which the whole number is composed will be doubled. The disturbance in the *proportions* of the youthful and the adult population will be greatest for some years after the increase of births commences, and will gradually disappear as the wave of population advances, unless the number of births increases every year, and maintains the population in an intermediate stage between the first state and the last change in the illustration. The community will in successive periods contain an excess of boys; of boys and youths; of boys, youths, and young men; of persons in the first (0–20), second (20–40), and third (40–60) ages; and the general temper, strength, and intellectual state of the population will exhibit, to the eyes of the attentive observer, corresponding changes. Some such change as that here sketched has taken place in Great Britain; but the increase of births, at first gradual in the last century, has since proceeded at a rate accelerated but variable in the several classes of the population and in the different parts of the British Isles. (Census Report, 1851; Occupations, Vol. 1, pp. xix–xx.)

Effect of Prolongation of Life on Population.—The prolongation of the life of generations, as well as the increase of births, tends to increase the numbers living at one time; that is, the numbers of the population. Thus, of 100,000 children born in Liverpool, only 44,797 live to the age of 20, while in Surrey that age is attained by 70,885 out of the same number of children born: the probable lifetime is about 6 years in our unhealthiest towns, 52 years in Surrey, and other comparatively healthy parts.* In Manchester, where the mortality is high, 100,000 annual births only sustain, at the ages 20–40, a male population of 38,919; while in all England and Wales, where the mortality is now much lower, the same number of births produces a constant force of 61,215 men at that age; and at other ages similar disparities in the numbers living exist. Now, the mortality was not much less in all England formerly than it is now in Manchester; and the great diminution in the mortality of England evidently took place at such a period of the last and present centuries as left proportionally more survivors at the ages 20–40 in 1851 than at the corresponding ages in 1821, for the dangers and loss of life incurred by the generations born in the 40 years 1781–1801 were greater than those which were encountered by the generations born in 1811–31. (Census Report, 1851; Occupations, Vol. 1, pp. xxii–xxiii.)

Factors of Population.—Leaving immigration out of account, the numbers found by the Census living in the country at any age depend on two totally distinct factors: (1) on the numbers born in the year of their birth, and (2) on the numbers of them that (*a*) die or (*b*) leave the

* See Registrar General's 5th Report, 8vo. pp. 46, 47.—In Manchester 100,000 children born are reduced to about half that number (49,910) in *six years*.—Registrar General's 7th Report, p. 334.

country between the date of birth and the date of enumeration. The mean ages of a population may therefore be reduced in three ways: (1) most obviously by a high rate of mortality shortening their lives, inasmuch as numbers living at the advanced ages will all thereby be reduced; (2) by the emigration of adults in undue proportion; and (3) less obviously but as certainly by increase of births, for then the numbers at advanced ages are fewer than they should be in *proportion* simply because the numbers of children born years ago, of which adults are the survivors, were fewer than the children born in recent years. Thus the 806,722 men of the age of 50–60 in the year 1871 are the survivors of the 1,689,578 boys of the age of 0–10 when the Census of 1821 was taken; and if the boys of that early age had amounted in 1821, as they did in 1871, to 2,896,209, the 806,722 men of 50–60 would have been raised in the same proportion to about 1,400,000, the expected number of surviving men at that age half a century hence.—(Census Report, 1871, Vol. 4, pp. xii–xiii.)

Length of a Generation.—The Egyptians, or the Greeks, discovered that there was an average interval of *a hundred* years between the births of children and the births of their great grandfathers; or that the interval in ascending a genealogical table from the birth of the son to the birth of the father was about $33\frac{1}{3}$ years. This time, called a *generation*, has been found to agree with modern observation; "but," says Sir Isaac Newton, who adopts the computation, "if the reckoning "of generations proceed by the eldest sons, they are shorter, so that "three of them may be reckoned at about 75 or 80 years; and the "reigns of kings are still shorter, because kings are succeeded not "only by their eldest sons but sometimes by their brothers; and "sometimes they are slain or deposed, and succeeded by others of an "equal or greater age, especially in elective or turbulent kingdoms." "Kings reign,"* he adds, "one with another, about 18 or 20 years "apiece." Many of the errors of the ancient chronologies arose from the confusion, under the term "generation," of the long complete life of man with the portion of that life extending to the birth of the next generation; or with the reigning years of kings in times of violence and often of anarchy. Generations overlap each other so that a man who completes his life lives nearly $66\frac{2}{3}$ years contemporaneously with his children, $33\frac{1}{3}$ years with his grandchildren, and many years with the great grandchildren of the eldest branches of his family; his direct influence extends to the second, third and fourth generations.—(Census Report, 1851; Occupations, Vol. 1, pp. xv–xvi.)

Centenarians.—Many instances are cited of men living in the ancient world more than a hundred years; and Lord Bacon in his History of Life and Death, quotes as a fact unquestioned that a few years before he wrote, a morris dance was performed in Herefordshire, at the May-games, by eight men, whose ages in the aggregate amounted to eight hundred years. No populous village in England was then without a man or woman of fourscore years old. In the seventeenth century, some time after Bacon wrote, two Englishmen are reported to have died at ages greater than almost any of those which have been attained in other nations. According to documents which are printed in the Philosophical Transactions of the Royal Society, Thomas Parr lived 152 years and 9 months, Henry Jenkins 169 years. The evidence in these extraordinary instances is, however, by no means conclusive, as it evidently rests chiefly on uncertain tradition, and on the very fallible memories of

* Newton's Works, tom. V. pp. 37–40.

illiterate old men; for there is no mention of documentary evidence in Parr's case, and the births date back to a period before the parish registers were instituted by Cromwell in 1538.

Until the system of Registration and the Census have been for many years in operation, the evidence of extreme ages must remain indecisive; but there can be now no doubt that some of the twenty-one millions of people in Great Britain have lived a *century; which may therefore be considered the circuit of time in which human life goes through all the phases of its evolution.*—(Census Report, 1851; Occupations, Vol. 1, pp. ix–xii.)

In the Report of 1851 we questioned the value of the evidence alleged in support of some historical instances of extreme longevity, and since then the instances investigated tend to show that while a certain number of individuals in each generation live, as the ancients discovered, 100 years (*sæculum*) or more, the number of such cases is exaggerated among the illiterate in every country where birth registers are not kept. It must not, however, be assumed for a moment to be impossible that a small remnant out of a vast number of people should live over a century. The probability is the other way; for under an ascertained law the numbers of a generation fall off at a rate of mortality continually increasing, but yielding a series of lives terminating at no definite point; and man goes through successive changes, which are not completed in less than a hundred years, to which term a perfect life may in ages to come approximate. All that is here insisted on is that these exceptional instances are now rare, and require the support of strong evidence, which should only be accepted after having undergone the searching criticism of competent inquirers. The Census itself, by recording the ages every ten years, tends to check the disposition to put on the dial of life as age advances, and it is probably to this that must be ascribed the progressive diminution since the year 1841 of recorded centenarians, rather than to any decline of their actual numbers. The persons of the age of 100 and upwards when the ages were first returned amounted in 1821 to 216, and in 1841 to 249; in the two Censuses following to 215 and 201; in 1871 the number fell to 160, to 41 men and 119 women. Many of these men and women must have been born before 1771,—before Lord Liverpool, a prime minister now historic, was born —in the early part of the reign of George III.; and in those years the births certainly exceeded the births previous to 1721, of which the centenarians of 1821 were the survivors.

NUMBERS RETURNED of the age 100 and upwards.

Sex.	1821.	1841.	1851.	1861.	1871.
Males - - -	68	83	78	55	41
Females - -	148	166	137	146	119
Total - -	216	249	215	201	160
Born in or before -	1721.	1741.	1751.	1761.	1771.

The registry of Baptisms in the church since the sixteenth century and the civil Registration of Births in operation since 1837 have led to a more exact knowledge of the ages of the population in England than in some other countries, and if the people had all been taught to read and write, the ages would have no doubt been returned as accurately as they have been in Sweden. As it is, a certain excess has been thrown on the decennial years, 50, 60, 70, and so on, at the expense of the contiguous ages. These inequalities are rectified in the graduated table, where the numbers are distributed at the several ages by the method of differences, which takes into account the law of the decrement of the living in England, either by age or emigration. The numbers between the ages of 15–25, and every successive decenniad, agree with those returned, for no attempt has been made to correct any but accidental mistakes.—(Census Report, 1871, Vol. 4, pp. x–xi.)

The interest which attaches to cases of reputed centenarianism has induced me to bring together into one view the particulars of such cases as were recorded in the death registers of 1871. From time to time I have to announce in my Weekly, Quarterly, and Annual Reports the deaths of persons whose ages *as stated in the registers*, amount to or exceed 100 years. It will not be deemed superfluous by those who take note of the newspaper correspondence which so frequently follows the announcement of a case of extreme longevity, for me to remind the public that the district registrars have no authority, even if they had the means and the leisure for so doing to investigate the truth or otherwise of the statements as to age made by the legal informants of deaths; the informants are alone responsible for the correctness of those statements. As a most able and painstaking writer upon this subject in his recent work remarks: "The Registrar-General has no "alternative but to tell the tale as it is told to him."* In 1871 the deaths of 69 persons were registered at the following ages, *as stated by the informants;* 27 at 100, 17 at 101, 10 at 102, 5 at 103, 3 at 104, 2 at 105, 2 at 106, 1 at 107, 1 at 108, and 1 at 109 years. Of these reputed centenarians 25 were males and 44 females. From 1861 to 1871 inclusive the registered deaths at 100 years of age and upwards have amounted to 856, namely, 231 males, and 625 females; so that on an average 21 men and 57 women go to their graves every year with the renown of centenarianism attaching to their memories. And the Census returns show that about 180 persons out of the entire population would, on enumeration, return themselves as having attained their hundredth year of life; the annual rate of mortality at this advanced stage would therefore be about 43 per cent. By the English Life Table the mortality at the ages 100 and upwards would be 58 per cent., and that implies 116 deaths annually out of 200 living. There is evidence† that it would be unsafe to attempt to draw any precise conclusion as to the limits of the duration of human life from the unverified statements of individuals in the death registers; all that may be said with certainty is that instances such as that of Jacob William Luning, whose death in 1870 at the age of 103 years was clearly established by documentary evidence submitted and published in the Weekly Return, show that the limit of life is not absolute at 100 years, however exceptional may be the cases in which it is exceeded.

It is worthy of note that the experience of Life Assurance Societies in this country supplies only one example of an insured life completing

* "Human Longevity," by W. J. Thoms, F.S.A.

† Mr. Thoms gives examples of 30 cases investigated by him: 4 only of these turned out to be demonstrably centenarians; 4 were doubtful; 22 are either disproved absolutely or are shown to be unsupported by proof.

its hundredth year, namely that of Jacob William Luning above referred to. The difficulties attending an investigation of cases of reputed centenarianism are no doubt considerable, but the question is one of scientific importance.—(34th Annual Report, pp. xviii–xix.)

Mean Age of Population.—The mean age of the English population has remained constantly since 1851 at 26·4 years. This is the same result as is obtained by adding up the ages of every persons living, and dividing by the total number of such persons. The mean age of males was less than the mean age of females by 0·8 of a year, for the mean age of the males was 26·0, of the females 26·8 years. The mean age in England of the people of 20 years and upwards remained also very constant; it was at the three last Censuses 40·4, 40·7, and 40·8 years.

The fact to observe is that the people of England, which calls herself Old, are younger than the people of many other countries, and certainly younger than the people of the countries of stagnation, not because life is shorter, but because the births, instead of remaining stationary, are continually increasing, and infusing youthful blood into the people. The emigration of adults also reduces the mean age of those left.

The mean natural age of the people living, deduced from the Life Table, is actually 32·1 years—of the males 31·77, of the females 32·33. That would be the actual age of the population had there been no migration and had the births remained constant.—(Census Report, 1871, Vol. 4, p. xiii.)

8. Civil or Conjugal Condition.*

Age at Marriage.—Marriage is the institution by which the population is primarily regulated; and while it is the great adjuster of the numbers it is at the same time the guardian and the educator of the generations to come. To the urns of Death all contribute; but with the annual marriages and the births the great mass of the population, the young and the old, have nothing directly to do. These events are under the control of about one fourth part of the population in the prime of life. The fertility of marriages is determined first by nature, and, in the second place, by the age of women at marriage, as is evident, in spite of all controversy. If the marriage age of women become 20, or 30, or 35, the number of years of marriage and of children to a marriage changes; so does the interval between generations, and the probability that the parents will both live to rear and to launch their offspring in the world under favourable auspices.

Men and women intermarry at all ages; but eight in ten of the brides and bridegrooms at their first marriage are between the ages of 20 and 30, when growth is completed and the frame has attained maturity, the mean age of both sexes at their first marriage is 25—the bridegrooms being $25\frac{2}{3}$, the brides $24\frac{3}{10}$, according to the registers. The real disparity is probably about a year.

Mean Age of Persons who Married in 1861–70, above the Age of 15 Years.

Age.	Bachelors.	Widowers.	Bachelors and Widowers.	Spinsters.	Widows.	Spinsters and Widows.
15 and upwards -	25·65	42·40	27·80	24·30	39·10	25·60

* For further extracts bearing upon statistics of marriage, *see* Part II., pp. 67–83.

Mean Age of Persons Living in 1871, above the Age of 15 Years.

Age.	Bachelors.	Husbands.	Widowers.	Total Men.	Spinsters.	Wives.	Widows.	Total Women.
15 & upwards	25·30	43·10	59·95	37·09	26·50	40·60	58·90	37·60

(Census Report, 1871, Vol. 4, p. xviii.)

Duration of Married Life.—The mean time that a couple of such lives survives can be calculated; it is 27 years; that is the probable duration of married life, during which children enjoy the protection of both parents; who may, therefore, both expect to see their first surviving child attain the mean age of marriage. But there is the further mean life-time of the surviving parent, which in the case of the father is 9·44 years, of the mother 11·31. The duration of the longest life is 47·84, during which both parents, or one, may be expected to survive, and to look after the interests of their children.

The proportions of the married couples to the widowers and widows would be expressed by the above numbers; there would be to 27 married couples 9 widowers and 11 widows; whereas in consequence of re-marriage the actual number of widowers is less than 3, of widows 6, to 27 married couples. This disruption of families by the death of one parent and by the survival of another, and the reparation by re-marriage, is of so much social importance that by way of further illustration it may be mentioned that to 2,940,782 couples first married at the same ages as now rule, if there were no re-marriages there would be living 1,024,769 widowers and 1,227,769 widows; but in the actual distribution such large numbers lose these titles by re-marriage that the existing widowers are 398,202, the widows 879,173, and the married couples, represented by wives living, 3,948,527, the latter including, therefore, large numbers of re-married widows.

The mean age of the married population is 41·85 years, and the mean age at marriage being 26·70 years, the mean term of existing married life is 15·15 years. Upon an average husbands and wives have lived so long together. This term is reduced by the increase of marriages raising the proportion of the younger married couples to the whole; for the mean age of the married at the above ages by the English Life Table would be 44·33 and the mean term of existing unions 17·63 years. —(Census Report, 1871, Vol. 4, pp. xviii–xix.)

Effect of Alteration in the Age at Marriage.—The age of marriage being of prime importance, it may be interesting to show what the effect of any great alteration would be, such for instance, as Aristotle, one of the greatest naturalists that ever lived, proposed: for certain reasons he lays it down that the man should marry at 37, the woman at 18. The effect of this would be to reduce the joint mean marriage life-time to 24 years, while the widowers would be 4, the widows 18, to 24 married couples; so the proportion of widows would be augmented to an extraordinary extent, and orphans, and still more fatherless children, would be multiplied. This would seriously affect the nurture of the offspring of such marriages, especially among free workmen and artizans. All late marriages increase the proportional number of orphans. It is evident then that the problem is much more complex than those economists who take the people to task for marrying early imagine; and on the theory of the survival of the fittest it is probable

that nature's many solutions of the problem as to the most suitable age to marry yield, if not the best, at least as good results as Aristotle's. Plato in his Republic asserts that the citizens should be the offspring of women of 20–40, of men of 25–55, which is in close accordance with existing facts. (Census Report, 1871, Vol. 4, p. xix.)

Proportions of Married Males and Females at different ages.—Without the sanction of the laws of physiology, or of common sense, a girl may—but in the present day rarely does—marry at the age of 12, a boy at the age of 14, under the existing laws of England; but the consent of parents and guardians is required in certain cases where either party has not attained the age of twenty-one; and the proportional numbers of either boys or girls who marry under the age 20 is happily small. The mean age at which marriages are *first* contracted in England and Wales is 25·8 years for males, and 24·6 years for females; while 54 in every *hundred* brides, and 54 in every *hundred* bridegrooms, are 20 and under 25 years of age. As the marriages subsist on an average about 27 years, the numbers and proportions of persons in the married state increase as age advances, until they are reduced by the rapid dissolution of marriages by death. Thus, under the age of 20, of 100 youths only 0·4 are married; at 20–25 the proportion amonst men rises to 20; at 25–30 to 54; at 30–35 to 71; at 35–40 to 78; at 40–45 to 80; at 45–50 to 81—in 100 at each age respectively. The proportional number of men in the married state declines after 55 and 60 rather rapidly, so that at the fifth age of 80 and upwards only 37 of 100 men have wives.

With respect to women, the proportions differ from those above; for at 15–20 the married are 2·5 per cent. of the whole number of that age living; at 20–25 the proportions rise to 30 per cent.; at 25–30 to 57; at 30–35 to 70; at 35–40 to 75 per cent., which is the highest proportion ever attained, as among women it never happens that more than 3 in 4 at any age are in the married state, while of men 4 in 5 at the age 40–50 are married.

At the age 40–45, of 100 women 74 are married; and the proportion falls to 52 per cent. at the age 60–65, and to 12 per cent. at the fifth age of 80 and upwards, for then only 12 in *a hundred* women have husbands.

The proportional numbers of the persons in the married state at advanced ages are sustained by remarriages of widowers and widows; and as the widows remarry much less frequently than widowers, the comparison of the relative proportions of the married in both sexes shows that widowers enjoy a portion of the married life of men of 35, and a very considerable proportion of the married life after the age of 55.—(Census Report, 1851; Occupations, Vol. I., p. xxxi.)

Effect of Marriage on Population.—In every part of Great Britain a large number of men and women who live to advanced ages never marry. Of the population at the ages of 20 and upwards, about 1 in *ten* men and 1 in *eight* women may be referred to this category; or in Great Britain *one* in *ten* of the *survivors* of the young men now living, and *one* in *eight* of the survivors of the young women now living, will die as bachelors and spinsters if they live to the age of 60 and upwards; besides the great numbers who die unmarried at younger ages. Celibacy, as well as marriage without children, is therefore to be considered the natural state of a portion of the population; for under no circumstances that can be conceived will the whole of the people marry. Certain duties of the most exalted as well as of the humblest kind in the world are most efficiently performed by these classes; and although the

proposition, that "the best works and of greatest merit for the public "have proceeded from the unmarried or childless men" may not be absolutely true, as it is put by Bacon*; they have unquestionably contributed their full share to public works, which often absorb the powers of the mind to an extent that would embarrass him that in "wife and children has given hostages to fortune." There is also evidently a large number of both sexes in this class who from infirmity and diseases, either acquired or hereditary, cannot marry, and some who have a total disinclination to marriage.

The British population contains a great reserve of more than a million unmarried men, and of more than a million unmarried women, in the prime of life, with as many more of younger ages; and if the whole of the population were married the births in Great Britain would be 2·3 times as numerous as they are *if they bore the same proportion to the wives at different ages as they do now.*

From the state of things which the Census discloses it is evident that the strength, the rate of increase, and the colonization now proceeding can be sustained by the marriages of only a part of the population; hence it follows, that if by any judicious means the increase of the incurably criminal, idle, insane, idiotic, or unhappily organized parts of the population can be without cruelty repressed, under a system of religious discipline, to a greater extent than it is at present by the selection that pervades, more or less, the whole system of English marriages,—the character and good qualities of the race will be immeasurably improved, without checking the tide of population or the increase of numbers. Hitherto the flower of the British youth have been in ignorance sent to the alluvial lands of the tropics, where our race cannot live, or where it inevitably degenerates; while, in defiance of the principles of physiology, and of the doctrines that are inculcated on the breeders of the inferior animals by the Royal Agricultural Society,—convicts have been thrown broadcast over some of the healthiest colonies in the world, and may now, without due precaution, multiply at home, like the *forçats* in France, and prove a leaven of social disorder and disorganization.

The proportion of children to a marriage, and consequently the population, are regulated, not so much or so immediately by the numbers of the people who marry as by the *age at which marriage is contracted.* The mothers aad fathers of nearly half of the children now born are under 30 years of age; and if all the women who attain the age of 30 should marry, and none should marry before that age is attained, the births would decline to about two-thirds, and if the marriage age were postponed to 35 the births would fall to one-third part of their present number: so the population would rapidly decline; firstly, because the number of births to each generation would grow less; and, secondly, because, as the interval between the *births* of successive generations would increase, and the duration of life by hypothesis remain the same, the numbers living contemporaneously, in other words, the population, would be further diminished. The age at which *first* marriages take place necessarily varies according to circumstances in different populations and in different classes of the same population; in the eldest and youngest sons of noble families; in the various rising or declining professions; among skilled artizans, and labourers.—(Census Report, 1851; Occupations, Vol. I., pp. xliv–vii.)

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* Bacon's Essay—VIII. On Marriage and Single Life.

9.—Occupations.

Census Inquiry and Classification.—In 1801, at the first Census, this branch of inquiry was very simple. The total population of England and Wales, exclusive of army, navy, and merchant seamen, was simply classed under three heads, after excluding 443,235 not returned as of any occupation; namely, 1,713,289 *persons* chiefly employed in agriculture; 1,843,353 *persons* chiefly employed in trade, manufacture, or handicraft; and 4,873,103 *persons* not employed in either of the preceding ways, including probably children and indefinite numbers of women.

In 1811-21-31 for *persons* families were substituted: thus in 1821 it appeared that 847,957 *families* were returned as chiefly employed in agriculture, 1,159,975 as chiefly employed in trade, manufacture, or handicraft, and 485,491 as not comprised in either of the two great classes. In 1831 a further important step was taken in the right direction; the defective character of the classification by families grew evident; so the several occupations of males of 20 years of age and upwards employed in retail trade or in handicraft, as master or workmen, were separately returned.

In 1841 the name, age, sex, &c., and occupation were returned as a "each man's description of himself," and the results were published in Alphabetical Tables, with a synopsis under a few heads, showing the number of males and females under 20 and above 20 years of age.

In 1851 special instructions were given to the enumerators; these were extended again in 1861 and 1871, so as to guard against mistakes and vagueness; and in the three Reports the two sexes have been classified under their respective occupations, with distinctions of age.

The classification by families is of some use in simple populations, where labour is not much divided; but in England the members of the same family,—the husband, wife, and children—are often engaged in different occupations, even when the children are at home. Our classification is in principle a *classification of each individual under his principal occupation on the Census day.* The distinction of age enables us to compare the number living in each well-defined occupation with the number dying registered at the corresponding ages; and thus to determine the influence of employment on health and life. The age is important in another way, as showing whether the persons employed in any particular manufacture, or trade, or profession, are children, young men or old; and by the relative numbers at early or advanced ages, at what period professions are entered, or whether they are increasing or decreasing. It thus increases the value of the return of occupations tenfold; yet singularly enough, England is the only country where this attempt at a complete classification of the population according to occupations and age has been carried into effect. This is probably in part due to the mechanical difficulties of the analysis, which can only be executed adequately by a number of well-trained clerks. In France the population was for some time classed in large groups, as formerly in England, showing the number of individuals living directly or indirectly by the several professions. This is no doubt an interesting view of a population, but to carry it out would be a matter of no ordinary difficulty in England, where it would not be easy for either man or woman to return the precise number of individuals living on his professional earnings. And there would necessarily be many men, women, and children living on the earnings of more than one individual of more than one profession; so that they would often be returned twice.

Interesting as this information might be, if it could be obtained with tolerable accuracy, it is of infinitely less value than a return of the individuals in each separate occupation. Thus, in the return in question, the force of the army would not be shown, inasmuch as the wives and children would be confounded with the soldiers and officers on whom the country relies for its defence. This defect has been felt in France, and in the last Census the persons directly engaged in the several professions are distinguished from their so-called families. But to obtain this information the ages of the people in the several professions have to be sacrificed.—(Census Report, 1871, Vol. IV., pp. xxxviii–ix.)

Double occupations.—Double occupations are as great a source of difficulty as the varying degrees of the subdivision of labour in the manufacturing and other districts. The same person is a member of parliament, a magistrate, a landed proprietor, and an occupier of land; in a lower circle, an innkeeper and a farmer; a maltster and a brewer; a fisherman in the season, a farmer or a labourer in the rest of the year. The enumerators were instructed to this effect, that "a person following "more than one distinct trade may insert his occupations in the *order* "*of their importance;*" and in the classification the first occupation was generally taken.

The whole population had to be passed in review, and every man had to be referred to some one head, although his time might be passed in two occupations; but if a class thus sometimes obtains more constituents than it deserves, it on the other hand often sustains counterbalancing losses.

The first and most obvious distribution of the population is into the two great groups of (1) those who work, and of (2) those who professedly have no definite occupation. After a due correction has been made for the persons who are infirm or who have retired in advanced age from their trades or professions, the number of the latter class in this country will not be found to be numerous.

It would be out of place here to insert a disquisition on the principles of classification; to attempt to show the impracticable nature or the imperfections of other classifications; and to vindicate in all its details the arrangement that has been adopted. But this arrangement possesses one advantage that should not be overlooked: it is not a mere arrangement on paper such as that of the people into producers, distributors, and consumers; but an arrangement in which it has been found practicable to find a place for every one of the twenty-one millions of people in Great Britain, and in which we can pass them rapidly and distinctly in review. (Census Report, 1851, Occupations, Vol. I., pp. lxxxii–iii.)

Industrial Census.—A Census in the most extended sense, and as it has been understood in some countries, embraces an enumeration of the visible property and of the annual produce; it includes, therefore, industrial and agricultural statistics. The present Census was restricted by the Act to an enumeration of the population, and of certain circumstances illustrative of their condition and occupations. No attempt could therefore be made to enumerate the number of manufactories, shops, or separate properties in the country; but in connexion with occupation it was thought desirable to distinguish masters from men, and for this purpose to ask the masters in trade and manufacture to so distinguish themselves by writing "master" after the names of their respective occupations, and by adding the *number of men* on the Census day in their employ. Farmers, who are *masters* of a particular occupation, were requested to state *how many acres* of *land* they occupied, and *how many labourers* they employed, with a view of giving a

definite idea of the term "farmer," and of laying the foundation of a further inquiry.

This information can evidently only be made perfectly accurate by a careful and laborious revision on the spot; but, in the absence of this revision, the returns furnish information of so much interest on a matter so imperfectly understood, that it was thought proper in 1851 to construct tables showing the size of farms in each county, together with the number of labourers that were employed.

The return of the masters in trades is imperfect; all the masters have not so returned themselves; and it can only be rendered complete in the event of the Census being extended to an Inquiry into the Industry of the country. (Census Report, 1861, Vol. 3, p. 29.)

10. Infirmities.

Census enumeration of Infirmities.—An inquiry into the numbers of the Blind and of the Deaf-and-Dumb in Great Britain was instituted for the first time at the Census of 1851. Notwithstanding the great interest attaching to these classes, both in a social and a physiological point of view, the statistics of blindness and deaf-muteism in this country have not hitherto advanced beyond estimates and conjectures founded chiefly upon returns obtained in foreign states, or the limited experience of a few public institutions. Great disadvantages have resulted from this entire absence of authentic information, not only to society at large, but more especially to these afflicted persons, on whose behalf the appeals and efforts of philanthropy, unsupported by a reference to facts illustrative of their numbers and condition, have lost much of their intended effect.

Before noticing the chief results of the inquiry, it may be proper to state the mode in which the information was acquired. The plan adopted was the very simple one of including in the "Householder's "Schedule" left at every house to be filled up with the required particulars relating to its inmates, a column in which was to be written the word "Blind" or "Deaf-and-Dumb" against the name of any member of the family so afflicted. In the performance of his duties, the enumerator was required to use the utmost care to prevent omissions, and when such were detected he was to supply the defective information, either from his own knowledge or the statements of credible persons, as far as he might be able. Owing to the difficulty of ascertaining the existence of dumbness in extreme infancy, the number of cases returned under that head must necessarily be slightly deficient; but as no motives are apparent to induce an intentional suppression of facts usually well known beyond the limits of the household, it may be presumed that the returns of the Blind and Deaf-and-Dumb, although subject in common with the other branches of the inquiry, to accidental omissions, are on the whole tolerably complete.

It was not thought desirable to divert the attention of the persons making and collecting the Census returns from the great and essential points of the general enumeration by any attempt to obtain, with respect to these special classes, information as to the circumstances of their affliction—such as whether it was congenital or acquired; nor was it found practicable at a later period to enter upon a further investigation of the cases in reference to these and other questions of undoubted interest. In Ireland, the Census Commissioners had fortunately no difficulty in pursuing the subject to its full extent. By means of that admirably organized body, the Constabulary force, and eminently aided

by the experience of the Assistant Commissioner, Mr. Wilde, who has paid great attention to the subject, they were enabled successfully to follow up each case; and they have embodied the results in a Report, recently presented to Parliament, which forms an extremely valuable contribution on a branch of vital statistics hitherto comparatively unexplored.* (Census Report, 1851, Occupations, Vol. I., pp. cviii–ix.)

The Blind.—In Great Britain and the Islands of the British Seas there are 21,487 persons—11,273 males and 10,214 females—returned as totally blind. The number in England and Wales is 18,306 of both sexes; in Scotland, 3,010; and in the Islands of the British Seas, 171 persons. These numbers furnish a proportion relatively to the whole population of 1 blind in every 975 persons in Great Britain, 1 in every 979 in England and Wales, 1 in 960 in Scotland, and 1 in 837 in the Channel Islands and the Isle of Man.

These results admit of favourable comparison with the relative numbers in Ireland, which, according to the Census, are 1 in every 864 inhabitants. In the level portions of Europe, comprising Belgium, Hanover, parts of Germany, and the plains of Lombardy and Denmark, the proportion is stated to be 1 blind in every 950 inhabitants—but slightly differing from the average of Great Britain. In more elevated regions the proportion is considerably lower; but in Norway it is found to be 1 in every 482 inhabitants.†

In reviewing the distribution of the Blind over the different parts of Great Britain, it should be remembered that the institutions which have been established for the reception and instruction of persons deprived of sight are located in the principal cities and towns. Where, however, the towns are very large, the inmates of these establishments only slightly affect the proportion which the Blind bear to the general population. Thus in London, notwithstanding the number of cases brought from other parts, the proportion is 1 blind in every 1,025 inhabitants. Other large towns present the following results:—

Manchester	-	1 blind in every		1,107	inhabitants.
Liverpool	-	1	„	999	„
Birmingham	-	1	„	1,181	„
Leeds -	-	1	„	1,203	„
Sheffield -	-	1	„	1,141	„

It has been generally considered, and is no doubt to a certain extent true, that crowded dwellings and other circumstances attendant upon dense populations, by inducing diseases of the organs of sight, have caused a greater amount of blindness in towns than in rural localities. It has also been thought that blindness has been increased by many of the employments followed in populous manufacturing towns. But whatever may be the influences prevailing in towns, it is clear from the returns that a much larger proportion of blind persons is found in agricultural than in manufacturing and mining counties. For example, in Wilts, Dorset, Devon, Cornwall, and Somerset there is an average of 1 blind in every 758 inhabitants; in Essex, Suffolk, and Norfolk, 1 in 888; and in the northern counties of Scotland, which include the Highlands, 1 in 823. The highest proportion, 1 in 665, is observed in Herefordshire.

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* The Report is entitled,—"Census of Ireland for the Year 1851.—Part III. Report on the Status of Disease."

† Census of Ireland.—Report on the Status of Disease, p. 41.

In striking contrast with these are the following manufacturing or mining counties:—

Yorkshire, West Riding	-	1	blind in every	1,231	inhabitants.
Cheshire and Lancashire	-	1	„ „	1,167	„
Durham - -	-	1	„ „	1,163	„
Staffordshire - -		1	„ „	1,082	„

Conclusions unfavourable to the rural districts should not, however, be deduced from a mere comparison of the Blind to the population living at all ages. Blindness is a common infirmity of extreme old age, and an examination of the ages of the Blind shows that nearly one-half of the persons deprived of sight are above 60 years of age. It follows, therefore, that in those localities in which the largest numbers of old men and women are living, the largest proportion of the Blind will be found. In the great seats of manufacturing industry the population generally is much younger than in most of the agricultural counties, where, as shown in a former section of this Report, persons in large numbers, and especially females, are living, in circumstances favourable to longevity, at very advanced ages. Thus, in the counties presenting the highest and lowest proportions of blind persons, the influence of age is sufficiently apparent:—

Counties.	Proportion per Cent. of Population aged 60 Years and upwards.	Proportion per Cent. of Blind aged 60 Years and upwards.	Population at all ages to One Blind.
Hereford - - - -	10·5	61·1	665
Wilts, Dorset, Devon, Cornwall, and Somerset - - - -	9·0	53·7	758
Essex, Suffolk, and Norfolk - -	8·8	50·1	888
Northern Counties of Scotland -	9·3	54·7	823
Yorkshire, West Riding - - -	6·1	43·1	1,231
Cheshire and Lancashire - -	5·4	31·8	1,167
Durham - - - - -	6·3	52·8	1,163
Staffordshire - - - -	6·0	42·0	1,082

The proportion of the Blind aged 60 and upwards to the persons *living* who have attained that age, shews how close a connexion exists between blindness and advanced years:—

Proportion of Blind Persons to 100,000 *living*.

Counties.	Blind. To 100,000 *living* at		
	All Ages.	60 to 80.	80 and upwards.
Hereford - - -	150	748	2,019
Cornwall - - - -	137	596	3,120
Devon - - - -	136	609	2,942
Dorset - - - - -	132	608	2,800
Somerset - - - - -	129	618	1,887
Wilts - - - - -	121	643	1,705
Yorkshire, West Riding - -	81	475	2,002

So, in other counties, according to the proportion of old and young persons living, a greater or less amount of blindness is generally observed. But, while the question of age is of great importance in investigating the distribution of blindness, it will not explain all the variations presented in the returns, as in some localities other influences are doubtless at work.

In the early years of life the numbers of the Blind are not large. Of the 21,487 blind persons in Great Britain, only 2,929, or less than 14 per cent., are under 20 years of age—a circumstance tending to show that cases of blindness at birth are not very common. Between 20 and 60 years of age there are 8,456 persons, or about 39 per cent. of the whole number; while 10,102 persons, or 47 per cent., are at the advanced ages above 60. These facts point to the conclusion that blindness in many cases may have arisen as a natural infirmity attendant upon old age.

Of the persons in Great Britain returned as blind 11,273 are males and 10,214 females. Accidents and diseases resulting in loss of sight are more likely to arise in the employments followed by males than in those of females. The proportions are 110 males to 100 females in Great Britain, and 113 males to 100 females in England and Wales. In Scotland the females returned differ but slightly from the males, a result probably traceable to the preponderance of aged women in that country. Compared with the general population, we find to every 10,000 living in Great Britain 11·0 males and 9·5 females blind. In England the proportion is nearly the same. To every 10,000 inhabitants of Scotland there are 10·7 males and 10·2 females blind. The males generally exceed the females until 70 years of age is attained; from that period of life the blind women are much more numerous. The disproportion of females at all ages is greatest in Monmouthshire, Devon, Cornwall, Hereford, and Huntingdon. The Irish returns show a proportion of the sexes the converse of that observed in Great Britain, namely, 111 females to 100 males. (Census Report, 1851, Occupations, Vol. I., pp. cix–xii.)

Occupations of the Blind.—The returns do not admit of a rigid distinction between the employments followed by the Blind and those subsequently acquired by them. Instances are common of blind persons being engaged in pursuits apparently quite incompatible with loss of vision. The employments taught in the institutions for the Blind are usually basket-making, sack and net making, knitting, and music. Most of the other occupations detailed in the Tables must be regarded as those followed *previous* to blindness.

The present or previous occupations of the Blind have been classified in Tables for each sex, distinguishing the ages in quinquennial periods.* This affliction, it will be seen, is not confined chiefly to particular classes and trades, but exists amongst all ranks, and in a great variety of employments. None of the great branches of manufacturing industry seem to be peculiarly liable to it; indeed the small numbers returned against cotton, linen, silk, woollen-cloth, iron, and earthenware are remarkable, when the immense amount of labour employed in these manufactures is considered. Factory workers are, however, mostly young persons; and none would be employed in the midst of machinery with any defect of vision.

Amongst the items which present the largest numbers in the classification of employments are Agricultural Labourers, of whom there are 907; Labourers not otherwise described, 512; Chelsea Pensioners and Soldiers, 586; Greenwich Pensioners, 70; Farmers, 505; Domestic

* See Summary Tables, Census Report, 1851, pp. cccii–cccix.

Servants (chiefly females), 438: Weavers, 295; Coal-miners, 195; Copper and Lead miners, 68; Stone and Limestone quarrier, 51. Of the class described as "Annuitants" and "Living on Alms" there are 1,062; and 2,833 blind Paupers are returned in workhouses without any statement as to previous occupation. Of the Blind following employments presumed to have been acquired after loss of sight there are—musicians and teachers of music, 535; mat, sacking, and net makers, 127; and knitters, 92. With respect to 2,853 males and 5,960 females, no returns respecting their actual or previous pursuits are made. (Census Report, 1851, Occupations, Vol. I., p. cxii.)

Distribution of Blindness.—Blindness it is supposed becomes gradually more prevalent as the equator is approached from the poles, and fixed ratios of the blind to the sighted have even been assigned to different parallels of latitude. No sufficient data exist, however, for any certain conclusions of this nature; and although the prevalence of blindness in tropical countries is well known, we believe the fact may be ascribed to causes which exercise a more powerful influence than climate. In countries where the masses of the people are badly fed and lodged, where sanitary laws are disregarded, and where there is little knowledge of ophthalmic surgery, blindness will always be common, and it will be little modified by the circumstances of mere geographical position. In the subjoined Table we give the latest statistics accessible to us relating to foreign countries and to a few of our colonial possessions. It will be observed that in Norway the ratio is as high as 1 blind

RATIO to POPULATION of the BLIND in the undermentioned Countries.
(From the Report on the Status of Disease in Ireland, 1861.)

Countries.	Ratio to Population.	Countries.	Ratio to Population.
Norway	1 in 540	Newfoundland	1 in 1,426
Ireland	1 „ 864	Wurtemberg	1 „ 1,436
Savoy	1 „ 884	Denmark	1 „ 1,523
Piedmont	1 „ 887	Hanover	1 „ 1,579
France	1 „ 938	Holland	1 „ 1,663
Scotland	1 „ 960	Oldenburgh	1 „ 1,720
England and Wales	1 „ 979	Prussia	1 „ 1,738
United Kingdom	1 „ 994	Nova Scotia	1 „ 1,788
Hesse Darmstadt	1 „ 1,231	Prince Edward's Islands	1 „ 1,880
Belgium	1 „ 1,233	Bavaria	1 „ 1,986
Saxony	1 „ 1,386	United States	1 „ 2,470
Sweden	1 „ 1,419		

to every 540 inhabitants, or nearly two to one as compared with Great Britain. In the American States the ratio of blind to the whole population is 1 in 2,470, and of blind slaves to all slaves, 1 in 2,616; in several of the southern states between 26 and 33 degrees of latitude the proportion is much lower, tending to show that climate has here had little or no direct influence. But it must be borne in mind that in the United States, and in several of our own colonies, where the people are largely recruited by the immigration of young and healthy persons, the blind will naturally be in a low ratio to the rest of the population. Persons labouring under deprivation of sight, like the sick, the maimed, and the decrepit, rarely emigrate; and, apart from this circumstance, the comparatively small proportion of aged persons in the population of these

countries will sufficiently account for the inconsiderable numbers of the blind.

With regard to the distribution of the blind in different parts of England, the recent returns lead to the same conclusion as those of 1851, namely, that this affliction is more common in the rural districts than in those chiefly devoted to manufacturing, mining, and commercial industry. For example, in the south-western counties, comprising Wilts, Dorset, Devon, and Cornwall, the average proportion is 1 blind in 793 inhabitants; in the eastern counties (Essex, Suffolk, and Norfolk) it is 1 in 902, and in North Wales 1 in 880; these parts of the country being for the most part agricultural and pastoral. On the other hand in the north-western counties (Cheshire and Lancashire) the ratio falls to 1 in 1,253; in York, West Riding, it is 1 in 1,296; in Durham 1 in 1,252; and in Bedfordshire, where young persons are largely employed in the straw-plait manufacture, 1 in 1,325. But to whatever causes the high ratios in the agricultural counties are due, it is certain that the crowded dwellings and defective sanitary arrangements of large towns, combined with the occupations usually carried on amongst dense masses of people, are extremely conducive to diseases resulting in loss of sight. The lower proportions observed in the manufacturing and mining districts must therefore be mainly ascribed to immigration, and the comparative youthfulness of the population in those localities. Loss of sight being greatly influenced by age, part of the excess of blind persons in the rural districts is owing to the fact that they contain a larger proportionate number of persons in advanced life than the towns and manufacturing districts; while the immigrants into the latter are chiefly young persons who labour under no physical disability to interfere with their employment in the factories, in domestic service, or in trade as apprentices and work-people. (Census Report, 1861, Vol. 3, pp. 43–4.)

Causes of Blindness.—The mode of procedure adopted in taking the Census precluded the enumerators from pausing in the performance of their appointed task for the purpose of making special inquiries, which would be of great interest if they could be efficiently carried out, in reference to the blind; such as the causes of their infirmity and the period of life at which it commenced, their circumstances with regard to instruction, and their means of support. An attempt was made, for the first time, upon this occasion, to ascertain the extent of congenital blindness, by means of an instruction in the Householder's Schedule, to the effect that persons *blind from birth* were to be so described; but whether the information thus obtained may be regarded as tolerably complete and satisfactory we are not prepared to say. It appears that the term "born blind" is often applied to children losing their sight in the early years of life as well as to those actually blind from birth; and no doubt the difference is slight between those who never beheld the light and those who lost the faculty of vision before they had used it long enough to acquire permanent impressions. To what extent the vague employment of this term, thus sanctioned by popular usage and similarity of condition, has affected the value of the statistics of the born blind, we are unable to state; but it is not improbable that while some of the persons making the returns would use the words in a popular sense others would restrict them to their literal meaning, and that imperfect information would be the result.

Small-pox has undoubtedly been one of the most prolific causes of blindness in England. Of 1,456 pupils received into the Liverpool School from 1791 to 1860, no less than 250, or more than one-sixth, are said to have been blinded by small-pox; and of the pupils admitted to the London asylum a large proportion had been deprived of sight by the

same disease. Purulent ophthalmia, with which the new-born infant is frequently attacked a few days after birth, is a disease quickly destructive of sight unless arrested by careful treatment. Many other forms of disease result in this calamity; but happily the great advances made in the knowledge of the anatomy of the eye have enabled surgeons to treat successfully many of the structural causes of blindness, and to restore sight in cases which, not many years ago, would have been considered hopeless. If all diseases of the eye cannot be traced to their origin, there can be no doubt that the bulk of them, when not attributable to advanced age, are induced by the unhealthiness of dwellings, the want of cleanliness, bad or insufficient food, and other well-known causes of physical deterioration, as well as by every description of overwork involving a considerable strain on the organs of vision, whether that of the student, the needlewoman, or the mechanic. To these undoubted causes of blindness must be added the various accidents to which all classes, and the labouring classes in particular, are constantly exposed. (Census Report, 1861, vol. 3, pp. 44–5.)

The Deaf and Dumb.—In Great Britain 12,553 persons (6,884 males and 5,669 females) are returned as Deaf-and-Dumb. Of this number, 10,314 are in England, 2,155 in Scotland, and 84 in the Islands in the British Seas. The proportion which the Deaf-and-Dumb bear to the general population in Great Britian, is 1 in every 1,670, in England 1 in 1,738, in Scotland 1 in 1,340, and in the Islands 1 in 1,704. These numbers and proportions would be slightly increased if allowance were made for the omission of infants, with respect to whom, owing to the difficulty of ascertaining the existence of deafness and consequent muteism in the first years of life, the returns are unavoidably imperfect. The above numbers will therefore be received as an under-statement of the actual state of Deaf-dumbness. But as the same defect of necessity exists in the returns of other countries, no erroneous conclusions will be formed from using them for the purposes of comparison.

According to the most recent returns, the average proportion of the Deaf-and-Dumb to the population of Europe generally is found to be 1 in every 1,593 persons.* In Holland, Belgium, and other states presenting chiefly a flat surface, the proportion is much smaller than in Norway and Switzerland; indeed, in some of the Swiss cantons, where cretinism is prevalent amongst the mountain passes, there is 1 Deaf-mute in every 206 inhabitants. In Ireland, the average is 1 in 1,380 persons; and in the United States of America, where however, the returns are admitted to be very defective, 1 in 2,366.

* Ratio to Population of the Deaf and Dumb in the under-mentioned Countries. (From the Report on the Status of Disease in Ireland, 1861.)

Countries.	Ratio to Population.	Countries.	Ratio to Population.
Savoy	1 in 443	Hanover	1 in 1,450
Piedmont	1 „ 563	Saxony	1 „ 1,629
Wurtemburg	1 „ 901	England and Wales	1 „ 1,640
Ireland	1 „ 1,026	France	1 „ 1,671
Norway	1 „ 1,200	Bavaria	1 „ 1,774
Scotland	1 „ 1,311	Denmark	1 „ 1,920
Prussia	1 „ 1,334	Belgium	1 „ 2,277
Sweden	1 „ 1,360	Holland	1 „ 2,714
United Kingdom	1 „ 1,432		

Looking at the distribution of the Deaf-and-Dumb over the face of Great Britain, we find them to be more common in the agricultural and pastoral districts, especially where the country is hilly, than in those containing a large amount of town population. The Northern Counties of Scotland, which include the wild and mountainous region of the Highlands, present the highest average,—1 in 1,156 of the population; then the South-Western Division of England, with 1 in 1,393; followed by the Southern Counties of Scotland, 1 in 1,480; and the Welsh Division, 1 in 1,542. We have already seen that the South-Western and Welsh Divisions of England and the Northern Counties of Scotland contain the largest proportional number of blind persons.

Cretins, most of whom are Deaf-mutes, are found in some of these localities; the disease of cretinism is also accompanied by mental imbecility in a greater or less degree.

The proportion of Deaf-mutes is lowest in the Northern Division of England—1 in 2,058 inhabitants; and in the North-Western Division (Cheshire and Lancashire), where a nearly similar average prevails—1 in 2,014.

Although as a general principle a greater degree of prevalency of Deaf-dumbness seems to exist in rural and hilly localities than amidst urban and manufacturing populations, yet exceptions are remarked on applying this test to the counties, and the smaller sub-divisions composing them. The following English counties, for example, present widely different results, scarcely to be explained by a reference to their physical or geographical peculiarities :—

Yorkshire, East Riding.	1	deaf-and-dumb	in every	2,231	inhabitants.
Monmouthshire	1	„	„	2,300	„
Kent (*Extra-Metropolitan*).	1	„	„	2,343	„
Durham	1	„	„	2,480	„
Huntingdon	1	„	„	3,016	„
Hereford	1	Deaf-and-Dumb	in every	1,054	inhabitants.
Worcester	1	„	„	1,160	„
Derby	1	„	„	1,272	„
Cornwall	1	„	„	1,278	„

The relative numbers of the sexes are in all countries much more disproportionate amongst the Deaf-and-Dumb than amongst the Blind. In Great Britain and in England and Wales there are 121 male Deaf-mutes to 100 females; in Scotland the inequality is somewhat greater, namely, 125 to 100 females; in the Islands in the British Seas there are 121 males to 100 females. The Irish Returns give the reversed proportion of 111 females to 100 males.

In every 10,000 of the general population of each sex in Great Britain, 6·7 males and 5·3 females are Deaf-and-Dumb. But while the returns for the whole country exhibit a larger proportion of males, the reverse obtains in some localities; thus in Berks, Bedford, Salop, Derby, and Monmouth, more females are returned than males relatively to the numbers living of each sex.

Of the 12,553 Deaf-mutes, only 783, or 6·2 per cent., had reached 60 years of age,—a fact showing the unfavourable position of this class as regards length of life; while those under 20 years of age, although the numbers are unquestionably deficient, amounted to 47 per cent. The incompleteness of the returns for the years of early life, arising from the uncertainty which must exist with respect to infants, and the natural

indisposition of parents to form a painful conclusion on the subject while the slightest grounds for doubt exist, has already been adverted to. A rough estimate of the omissions from this cause may be made by assuming the Deaf-mutes under 5 years of age to bear the same proportion to the general population of the same age as the persons aged 5 years and upwards bear to the residue of the population. There were in Great Britain, of 5 years of age and upwards, 18,222,518 persons, of whom 11,993 were deaf-and-dumb. If a like proportion existed amongst the population under 5 years of age (2,736,959 persons), 1,801 Deaf-mutes, instead of 560, would have been returned under the first quinquennial period of age. The addition of 1,241 cases would raise the percentage of those under 20 years of age to 52, and that of the ages above 20 to 48; but as the omissions would not be so frequent in the fourth and fifth years of age as in the earlier years, the supposed number to be added is probably too large. (Census Report, 1851, Occupations, Vol. 1, pp. cxiii–xv.)

Congenital mutism.—Very little success attended the attempt to ascertain at the Census the number of congenital cases of Deaf-mutism, by means of an instruction in the householders' schedule to the effect that persons deaf-and-dumb "from birth" should be so described. In many instances the fact was duly noted, but it was evident that in many others the instruction had escaped notice, or the person filling up the return was unable to give the information. Even the schedules of more than one institution for the class under consideration were altogether silent on this point. As incomplete statistics would be of no value, we considered the partial information not worth the labour of extracting. In Ireland, where a further investigation of every case of Deaf-dumbness returned at the Census was made by the constabulary and police, much difficulty was experienced in ascertaining whether the individuals were born deaf or not. From a large number of facts derived from the experience of various institutions in Europe and America, collected with much labour by Mr. D. Buxton, Principal of the Liverpool School for the Deaf-and-Dumb, that gentleman has arrived at the conclusion that it is hopeless at present to expect to establish any fixed ratio between cases of congenital deafness and those which have resulted from accident or from disease acquired after birth. Another writer, who is connected with the London School for the Deaf-and-Dumb, states that out of 3,050 well-authenticated cases within his own knowledge, 2,241 were *born deaf*, 759 resulted from various diseases, and with respect to 50 no positive information could be obtained; and adding to these the results of 2,805 other cases in different institutions and countries, he concludes that the actual preponderance is about 60 per cent. on the side of the *congenitally deaf*, while 40 per cent. are *accidentally deaf*.

The causes of congenital mutism have engaged the attention of eminent physiologists and pathologists, but they are still enveloped in much obscurity. One thing appears certain, that the organic defect which results in real deafness from birth is always incurable. Among the most common causes assigned for the appearance of congenital deafness in families are fright and morbid mental impressions on the part of the mother during gestation, consanguinity of the parents, and the transmission of the defect itself, or of the predisposition to it, from parents to their offspring. (Census Report, 1861, Vol. 3, pp. 56–7.)

Blindness and deaf mutism at groups of ages.—On comparing the ages of the Deaf-and-Dumb and of the Blind with those of the general population, the most opposite results are shown with respect to these two classes. In the case of the Blind, the numbers *increase* at each

period from infancy to old age, after 55 very rapidly, and nearly in the same ratio as the general mortality. Of the deaf-and-dumb, the highest proportions are at the periods of age ranging between 5 and 25 years, and the numbers then gradually *diminish* as the ages advance.

PROPORTION of the BLIND and the DEAF-AND-DUMB at DIFFERENT AGES to the MALE and FEMALE POPULATION in 1861.

YEARS of AGE.	To every 100,000 living at each age, the proportion of			
	BLIND.		DEAF-AND-DUMB.	
	Males.	Females.	Males.	Females.
ALL AGES.	104·8	88·5	70·0	52·4
0– -	21·6	17·5	21·9	19·2
5– -	27·8	23·4	85·2	66·1
10– -	41·8	31·3	98·4	70·8
15– -	49·7	36·5	83·6	59·9
25– -	74·7	42·2	73·3	52·6
35– -	104·0	62·7	68·1	47·1
45– -	148·8	101·4	67·2	54·8
55– -	263·4	216·6	64·7	54·6
65– -	558·3	504·3	59·9	49·4
75– -	1216·6	1233·4	55·6	43·2
85 and upwards	2468·5	2321·9	61·5	63·1

The increase in the proportion of the Blind at the higher ages is the result of the additional numbers every year becoming blind. And the rate of increase after puberty is governed by the same law as that which governs other sickness. The facts relating to deaf-and-dumb children under the age of 5 are from their nature imperfectly recorded. The diminution of the proportion of the Deaf-and-Dumb after the age of 15 can only be accounted for by their mortality being at a higher rate than that of the general population. (Census Report, 1861, Vol. 3, p. 58.)

11. ECONOMIC VALUE OF POPULATION.*

Various attempts have been made to estimate the amount and the increase of the capital of the United Kingdom. The most recent attempt of the kind has been made by the chief of the statistical department of the Board of Trade. The value of the most important part of the capital of the United Kingdom and its increase have yet to be determined; I mean the economic value of the population itself. To this I propose to call attention briefly.

As lands, houses, railways, and the other catagories in the income tax schedules are of value, because they yield annual returns; so, for the same reason, and on the same principle, the income of the population derived from pay of every kind for professional or other services and wages can be capitalized; not precisely, it is true, unless the income of every person living were returned at least as nearly as the incomes subject to income tax; but sufficiently near to the true value to show

* See also "Cost, and the Present and Future Economic Value of Man", pp. 531–7.

that the value of the population itself is the most important factor in the wealth of the country.

It will be sufficient to state here that the capitalization of personal incomes always proceeds upon the determination of the present value at any age of the *future annual earnings* at that and all future ages; hence the value of future wages rises from the date of birth, when it is a notable quantity; is highest in the labouring classes at the age of 25; and declines as age advances, until in extreme age, when no wages are earned, it disappears. The living by the Life Table are most numerous in childhood, and gradually fall off till they are all extinct; and so in the population enumerated at the Census the numbers decline from the first year to the ultimate year of age. While the rates of wages rise rapidly from birth to the age of manhood, and afterwards decline, the numbers living constantly decline. Taking a series of observations on the wages of agricultural labourers* some years ago at different ages; determining their value by a Life Table at five per cent. rate of interest for each age; and multiplying the numbers living by these values, it is found that the mean gross value at all ages is 349*l.* But the mean value of the subsistence of the labourer as child and man, determined by the same method, is about 199*l.*; and deducting this sum from 349*l.*, there remain 150*l.* as the mean net value of the male population, estimated by this standard of the *agricultural labourer*. To extend the value to the whole population, including females, the standard might be lowered from 150*l.* to 110*l.* a head.

Then multiplying the population of the United Kingdom by 110 we have as the aggregate value £3,640 million; this including only as much of the income as approximates in annual amount to the wages of agricultural labourers. Only a small part of it is subject to assessment under the income tax schedules. The gross assessment under the income tax affords the means of estimating the value of incomes exceeding 100*l.* a year under Schedules D. and E.; excluding companies, mines, and works, these profits and salaries amounts to £214 million a year, to which about £92 million a year may be added for incomes above 30*l.* and below 100*l.* a year; thus making the aggregate of such incomes £306 million a year; which when the assessments of B. (farmers') are added becomes £373 million a year. Deduct the *half* of this revenue as due to external capital, and as required for the necessary sustenance of farmers, tradesmen, and professional men and there remain £186½ million a year as pure profit; which cannot be capitalized as a perpetuity inasmuch as the interest is limited by the lives of the producers, but taking life contingencies into account may be capitalized at ten years' purchase. This makes the value of these incomes £1,865 million. Allowing £255 million for the part of the incomes of about a million people paying the income tax previously valued in the £3,640 million, and for other deductions, £1,610 million remain, which, added to the £3,640 million already obtained, make £5,250 million.†

Thus by capitalizing the earnings, fees, salaries, wages of the professional, mercantile, trading, and working classes, £5,250 million are obtained as an approximation to the value which is inherent in the people, and may be fairly added to the capital in land, houses, cattle or

* See Journal of the Statistical Society, Vol. xvi., pp. 42–43 Extracts from this paper will be found on pp. 531–7 of this volume.

† Mr. Giffen makes the value of the capital in other forms £8,500 million; making with the value of the population itself, £13,750 million. See Journal of the Statistical Society, Vol. xli., pp. 1–31.

stock, and other investments. The amount would be increased by taking into account the rise of wages, and the income omitted in the returns of Schedule D. With an industrial Census an accurate estimate can be made of this most important part of the capital of the country.

The minimum value of the population of the United Kingdom, men, women, and children, is 159*l.* a head; that is the value inherent in them as a productive, money-earning race. The incomes chiefly under schedules D., E., and B., raise the mean value from 110*l.* to 150*l.* (see above).

Again, it must be borne in mind that the value under Schedule A. is dependent upon the population; where there is little population land itself is of little value. The increase of the value of house property is directly due to the increased numbers and earnings of the inhabitants. The railways yield no profit where there is no population. The profits of quarries, mines, ironworks (Schedule D.), and other concerns are mainly due to the skill and industry of the masters and men who work them. Upon the other hand the products of human industry are multiplied a hundredfold by the tools, machinery, steam power, and all the appliances which capital commands and represents. Should the population of a country decay, the value of its capital might sink to the vanishing point.

What I wish further to point out is that during the 39½ years this office has existed there have been added to the population of the United Kingdom 7,619,759 people who, valued as land is valued by the annual yield of net profit, constitute an addition of £1,212 million to the wealth of the nation.

The value of labour—that is of working men—varies, and is greatest where there is the greatest facility for profitable use, and where it is in greatest demand. Thus a large stream of the population of England flows to the Metropolis; and England is to the United Kingdom what the Metropolis is to England. So the populations of Ireland and Scotland flow into England, where they find more profitable employment, and are of more value than they are at home.

For the same and other reasons large armies of the population of the United Kingdom passed into the colonies and the United States; during the thirty-nine and a half years (1837–76) the excess of births over deaths was nearly 16 millions, of which nearly 8 millions augmented the ranks of the population at home, and more than 8 millions settled in other lands; chiefly in the midst of the old English stock of the United States and in the Colonies extending from Canada in America, to Africa and to Australasia.

Of the 8,013,267 people who must have left the country, only about 6,580,000 are accounted for by the Emigration Commissioners, whose returns were imperfect in two ways; they neither included the whole of the emigrants nor recognised emigrants returning recently in large numbers.*

The emigrants are chiefly adults married and unmarried; the men greatly exceeding the women in number. A few infants accompany their parents. Valuing the emigrants as the agricultural labourers have been valued at home—taking age and service into account—the value of emigrants in 1876 was 175*l.* per head.

If we may venture to apply this standard to the whole period it will follow that the money value of the 8,000,000 people that left England, Scotland, and Ireland in the years 1837–76 was £1400 million, or on an

* See Census Report, 1871, where this was first demonstrated; and Emigration Report, 1877.

average about 35,000,000*l.* a year. In round numbers taking into account their aptitude to earn wages in future years at the home rates the annual industrial army that went out was worth at starting 35,000,000*l.* Many of the emigrants are skilled artizans, and considerable numbers are returned as farmers, gentlemen, professional men, and merchants; some of whom no doubt carried away a certain amount of capital which is not here brought into account.

The policy of the people of this country has thus been a policy of progress; instead of resting as they were in 1837, they have added since that year on an average of 192,873 souls annually to the population at home, and sent 202,868 sons and daughters to seek their fortune abroad in other fields of labour. The women, instead of to 644,214 children, who would just replace the population removed by deaths, have given birth to 1,039,987 annually, at a certain loss of their own lives with intermingled sorrows and joys such as befall mothers in rearing children: while the men instead of expending the whole of their gains on themselves have devoted a large share to their wives and families; besides that, as we have seen, the external wealth of the country has increased, as the nation has, without conquering territory or levying heavy contributions on its European neighbours.

The value of men varies with their earnings, which differ considerably in the colonies from the earnings of agricultural labourers at home; and on the whole before the civil war the emigrants to the United States got higher wages, and at the same time gave a higher value to the territory.

It may be contended that emigration is a loss to the mother country. It seems so. It is like the export of precious goods for which there is no return. But experience proves that simultaneously with this emigration there has been a prodigious increase of the capital of the country, especially in recent years. Wages have risen, and the value of the labourer has risen in proportion. In Norfolk, where wages are intermediate between the rates in the north and south, the rise has apparently been about 20 per cent.; so a fifth may be added to the estimated value of the workman. When the man leaves the village where he was born and bred, he leaves the market open to his fellows; he removes to a field where his work is in demand, and carries his fortune with him. It is the same when he emigrates to the colonies. His parents in rearing him have expended their gains in the way most agreeable to themselves. They have on an average five children, instead of two or three, or none. Taking a wider view, the emigrants create articles of primary use with which in exchange they supply the mother country; they have sent to England in the 39 years wheat, cotton, wool, gold to the value of hundreds of millions. What is of still more vital importance, they grow into new nations; they multiply discoveries; by confederation they will be to the Anglo-Saxon race outposts of strength across the Atlantic, in the Pacific, in South Africa, and in Australasia on the flank of India. And, moreover, to all it is an advantage to speak a wide spread language, and thus to be in social, literary, and scientific communion with millions of the same race. The increasing numbers enable them, advanced as they are in the arts, in the sciences, and in civil government, to do more for the good of kindred races; and to endow them with advantages which could not be attained in other ways for centuries. They govern India.

The economic value of a population depends very much on their command over the powers of nature; which they acquire by education. Put barbarians in possession of the land, the mines, the manufactures, the machines, the ships, the triumphant position of these islands on the

sea between two continents, and what would be the result? Another Asia Minor, Egypt, or Syria? The better educated the English people become, the more skilful they will become, and the more valuable in an economic sense they will be. The clever artisan is worth more than the rude labourer. Now the art of reading and writing their own language is by no means proof of complete education, or of any technical training, but it is a proof that men in possession of it are preparing to enter on the heritage of thought, and knowledge, and sentiment, which men of all ages have bequeathed to mankind, and which is enshrined in the writers of an admirable language.

In 1837 not more than 58 in 100 men and women possessed this art; but there has been progress, and I have year by year assiduously noted the increase of their numbers in the 39 years, so that I am now able to report, that instead of 58, *eighty-one* in a hundred write their names in the marriage registers.

It is evident that there are other elements on which the economic value of the working population depends; and foremost among them stand health and long life. The longer men live, and the stronger they are, the more work they can do. Epidemic diseases in rendering life, render wages, insecure. These diseases are most fatal in cities whither the population—to secure all the advantages of the division of labour—have been congregating every year in increased numbers: villages have become populous or have grown into towns; so the population has been growing denser. And that by a definite law, other things being equal, tends to increase weakness, sickness, and mortality. There have been counteracting agencies in operation in the *thirty-nine* years. Asiatic cholera was epidemic in England in 1831–2; influenza followed at intervals in 1833, 1837, and 1847; and laid thousands of the population low; in 1848–9 the cholera epidemic in England and Wales alone was fatal to *fifty-three thousand people*;* its ravages in every corner of the kingdom were described; the conditions of its diffusion and fatality were brought to light, and the further investigations of the slighter epidemics of 1854 and 1866 prove that this plague is under the control of science. Other epidemics have since been fatal especially to children, and fever has struck at princes and peers as well as peasants; but upon the whole the great zymotic diseases have been quelled. Plague in its various forms has been kept at bay by a series of defences based upon minute precautions. In some epidemics I found it necessary to publish daily particulars respecting deaths in the Metropolis. By pursuing such inquiries, year after year, not only many of the causes that induce sickness and destroy life have been discovered, but observations of the same kind have shown that their removal has been followed by health and longer, more vigorous life. The economic value of the population of several towns has been increased by sanitary measures. The truths established, the facts ascertained, the remedies discovered in the thirty-nine years past await their full administrative applications in the years to follow; and the savings of time wasted in sickness, as well as of precious lives prematurely lost in youth and manhood, will enhance the value of the population to an incalculable extent. The famines so fatal in Ireland are not likely to recur; part of the population has emigrated to England or to America, and the intelligent landowners of Ireland, through the extension of the Poor Law, now insure their countrymen against death by starvation. The same beneficient law has in the thirty-nine years been extended to the Highlands of Scotland. Every improvement in health recorded makes it clearer and clearer that the

* Registrar General's Report on Mortality of Cholera in 1848–9.

gloom of sickness and premature death flies away before sanitary measures; and when the qualified health officers whom the Universities are offering to examine, are in suitable positions under enlightened local authorities all over the country they will no doubt prove as efficient in preventing as their medical brethren are in treating sickness. The result on human happiness cannot be calculated; but a future Industrial Census will show in a very definite shape its effect in raising the economic value of the population. The mean lifetime by the English Life Table is 40·86 years; by the Healthy Life Table it is 49·0 years, which is attainable in every well organized State. It is fair to assume that if a fifth part be added to the mean lifetime, at least a fifth part will be added to the worth of a living and labouring population. Upon this estimate £1,050 million will be added to the economic value of the population of the kingdom. Its value will increase with its numbers, and so will the value of its emigrating thousands.—(39th Annual Report, pp. vi–x.)

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OF

PART II.—MARRIAGES.