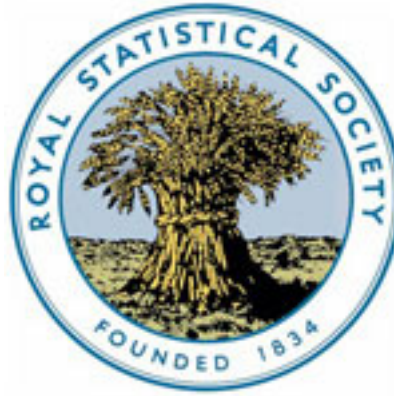


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The Term "Statistics."

Author(s): V. John

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The term "STATISTICS." Translated from a WORK by DR. V. JOHN, Professor of the University of Berne, entitled "Der Name "Statistik—Eine Etymologisch-historische Skizze." Berne: Verlag von K. J. WEISS, 1883.

MILL says, "We should study *names* before *things*; but it may be "objected that the meaning of names can guide us at most only "to the opinions, possibly the foolish and groundless opinions, "which mankind have formed concerning things, and that as the "object of philosophy is truth and not opinion, the philosopher "should dismiss words and look into things themselves to ascertain "what questions can be asked and answered in regard to them. "This advice, which fortunately no one has it in his power to "follow, is in reality an exhortation to discard the whole fruits "of the labours of his predecessors, and regard himself as if he "were the only person who had ever turned an enquiring eye "upon nature. What does our own personal knowledge of things "amount to after subtracting all that one has acquired by means "of the words of other people?"

The term "statistik" has been discussed at great length by many scientific writers, and so conflicting have been the opinions expressed as to its actual meaning and derivation, that Mohl calls it a psychological curiosity, and Fallati asserts that the word is open to many varying interpretations and definitions. Looking at the actual science which this term represents, if we accept Fallati's theory, it may be taken as evidence of the rapid progress which has been made in the science itself, as each of the definitions represents a degree of development; "For the main purpose of scientific "definitions, whether they are definitions of scientific terms or of "common terms used in a scientific sense, is to serve as a landmark "of classification; and since the classifications in any science are "continually modified as scientific knowledge advances, the defini- "tions in the science are also constantly varying."

For the most part, however, it may be said that no particular importance need be attached to the varying interpretation of the word "statistik;" of scientific interest only is the historical change which has taken place in its original meaning; as Mill says, "A "technical term invented for the purposes of art or science, has "from the first the connotation given to it by its inventor, and "retains this connotation as long as the art or science remains."

Among the many curious meanings which have been given to

the term, we may cite the following of Peuchet in his "Statistique Élémentaire de la France." (Paris, 1805): "This term has only come into general use within the last few years, and may be derived from the word *statera*, a balance, for the reason that statistics weigh and measure the producing power and wealth of a country, comparing it with its previous position, or with other countries; or again, as some assert, it may be derived from the Latin word *status*, as the science shows the condition of a State and its actual position; or again, it may be of German origin, and taken from the word *Staat*, signifying the same as the English *State*, or body of men existing together in social union, as those who first made use of the term 'statistik,' employed it to signify the examination and analysis of the production, wealth, &c., of a town or State."

The German statisticians were for the most part inclined to the opinion that the word was of Latin origin, and derived from *status*, though Hassall in his "Lehrbuch der Statistik" (1822) expressed an opinion that the same should be combined with the Greek ἀριθμητική written by him, ἀρίμετικη, to arrive at the actual term "statistik," and this view is shared by Schubert in his "Handbuch der Statistik" (1835). He says that the terms "statistik," "diplomatic," "heraldic," are all used to express separate and distinct branches of knowledge; while Jonak, in his "Theorie der Statistik" (1856), observes: "According to its etymology, the term 'statistik' is derived from the Latin *status*, this word having the same meaning as the German *Zustand*, which signifies *condition*; or it may be taken as meaning *Staat* or *State*, so that the term 'statistik' actually means a knowledge of the *State*, or body of men existing together in social union, or a knowledge of the *condition*." The conflicting opinions which were expressed as to the true definition of the word led at last to the determination to combine the two general meanings, and thus "statistik" came to denote the *science of the condition of a State*. This rendering was accepted by Butte, who says, on p. 158 of his "Statistik als Wissenschaft" (1808): "According to its derivation it is a branch of learning (*disciplin*) which treats of the *condition of the State*."

Kniess, in his work entitled "Die Statistik als Selbstständige Wissenschaft," forcibly protested against this acceptance, and says: "Granted that the word is of Latin origin, and derived from *status*, signifying *state* or *condition*, either the former or the latter meaning must be taken, as in no case could it mean both at the same time."

Rümelin takes up the consideration of this vexed question, and deals with it as follows: "The word *status*, *état*, *state*, neither means

"state (*Staat*) nor condition (*Zustand*), but 'position' " (*Standt*), from the Latin *sto, stare*. By position we are to understand that particular point in a path on which a body is moving, and in which it is situated at the time of our observation, in the same way as we speak of the position of the sun, the position of a law suit, &c. By the word "condition," however, we should not speak of any movement nor any relation of one body to another, but only as a quality or property which determines the nature of a thing, an attribute or accident in a logical sense. Additional light was thrown on the meaning of the word by Wappaeus, in his "*Allgemeiner Bevölkerungsstatistik*" (1859-61). After the publication of his work the term "*statistik*," using it in Gottfried Achenwall's sense, came to be more generally used. Gottfried Achenwall was professor of law and politics at Göttingen from 1749 to 1776, and he is regarded as the very father of statistics, though neither the name itself, nor the science it represents, really owe their origin to him, for as early as the year 1672 there appeared a work entitled "*Microscopium Statisticum*," written by Helenus Politanus; in 1675 P. A. Oldenburger published his "*Itinerarium Germaniæ Politicum*;" and in 1701 Thurmann issued his "*Bibliotheca Statistica*."

The first account which we have of any instruction being given in the particular branch of learning to which the name "*statistik*" had been given appears to have been on the 20th November, 1660, at Helmstædt, in the University of Brunswick, a course of lectures being delivered by the learned Hermann Conring under the title of "*Notitia rerum politicarum nostri ævi celeberrimarum*." The example of delivering university lectures on this science was speedily followed at all the German Universities, and we find that the learned professor of history and law, Martin Schmeitzel, lectured on the subject at intervals during the period comprised between 1723 and 1731 at Jena, and continued to teach it at Halle until 1747. So it is evident that the credit of giving the name to the science it represented cannot entirely be Achenwall's; in fact Achenwall himself did not lay claim to it, as in his "*Habilitations Dissertation*," dated the 7th September, 1748, he speaks of Hermann Conring as *parens notitiæ rerum publicarum in academiis tractandæ*, and in the same work he modestly assigns to himself the last place in a list of distinguished names, comprising, among others, Meibom, Gundling, Struve, Spener, Otto, Köhler, Schmauss, Hofmann, Bude, Schmeitzel, *aliorumque celeberrimorum virorum*, and who were all distinguished successors of Conring, and who had studied and expounded this *pulcherrima disciplina*, as he termed it, before him. In this work, of which the full title was "*Notitiam rerum publicarum academiis vindicatum, consentiente ordine philosophorum amplissimo, præses Gottfried Achenwall, pro loco in facul-*

"*tate philosophicâ obtinendo, ad diem vii Septembris, MDCCXLVIII*
"disputatione publica defendet respondente Joanne Justo Henne,
"Göttinga," Achenwall speaks of the science, not in the words of Schmeitzel, whose pupil he had been at the high school of Halle in 1741, as we find from his diary, but gives it Conring's title, *Notitiæ rerum publicarum*.

It was only later that he added the words *vulgo statistica*, as we find from Wappaeus's "Introduction to the Study of Statistics," which was published in 1781. On the title page of the first edition of Achenwall's work, "*Abriss der Staatswissenschaft der Europäischen Reiche*," the word "*statistik*" does not appear, while all the subsequent editions, including the sixth, which was published in 1781 by Schlözer and Sprengel, bear the title "*Staatsverfassung der heutigen vornehmsten Europäischen Reiche und Völker*," this title following very closely Conring's *res publicæ nostri avi celeberrimæ*. By the term "*Staatsverfassung*" must be understood the judicial, financial, and agricultural condition of the various States, as Achenwall remarks in his preface.

It is evident that the terms "*statistik*" and "*statistical*" must have both been familiar to Achenwall, as in the preface to the first edition of the work to which we have alluded, and which bears the date of April, 1749, he calls his "*Abriss der Staatswissenschaft*" "*a guide to statistical studies*." Again, on his arrival at Göttingen, he spoke of the system on which he proposed to treat the questions affecting the extent, limits, subdivisions, and natural relations of States and their constitution, as "*a preparation for statistics*." In the preface of a later edition of his work he gave as his reason for altering his title, that the word "*Staatswissenschaft*" really signified the "*science of government*," and as his work was intended to deal with the actual condition of a State under all its aspects, territorial, educational, industrial, commercial, and financial, the better term to employ would be "*statistik*." This is clearly shown in a manuscript which, among many others, was left as a legacy by Achenwall to the University of Göttingen. In this manuscript, which bore the inscription "*Anfang der Vorbereitung zur Statistik*," and headed, "*An etymological argument*," the following passage occurs: "*The word 'statistik' does not owe its derivation to the 'German word 'Staat,' but is taken from the Italian 'ragione di stato,' unde barbarum voc. latinum effectum ratio status;—disciplina de ratione status, which was taken by practical politicians to mean a knowledge of the State and its constitution; and further, from ragione di stato the Italians first coined the word 'statista,' meaning the same as the French 'homme d'état,' and the English 'statesman.'*" Again in another place he says, "*statistik— a term not new, derived from ragione di stato.*"

It is well known that towards the end of the middle ages practical politics as well as arts experienced their *renaissance*, and they were denoted by the term *ragione di stato*, from which was taken the "*ratio status*" so frequently used in the Latin treatises of those days, or by the term *disciplina de ratione status*, which again was contracted into *disciplina de statu*. In like manner the word *status* was used instead of *respublica*, *civitas*, *imperium*. As an example of the many curious explanations given by Achenwall's successors of the derivation of the words "Staat" and "Stand," we may quote the following passage in Butte's work entitled "Statistik als Wissenschaft" (1802): "The word 'Staat' owes its derivation to the 'Persian 'stathma,' a resting place for the sovereign on his 'journeys. The word 'Stand,' however, originates from the old German *Notsstallon* or *Notstatton*, signifying one who is necessary 'for the maintenance of order in a State or district!'"

That the word "statista," as derived from *ragione di stato* was in very general use at this period in connection with those "versed 'in the science of government,'" there is abundant evidence to prove; for example, the following passage occurs in the fifth act of Shakespeare's "Hamlet:"—

"I once did hold it as our *Statists* do
A business to write fair, and laboured much
How to forget that learning."

and again, in the second act of "Cymbeline"—

Posthumous to Philario. "I do believe
(*Statist* though I am none, nor like to be)
That this will prove a war."

and in Webster's "Appius and Virginia," the following is found:—

"To you the *Statists* of long flourishing Rome."

In Germany, Philander von Sittewald, in his "Somnium Itinerarium Historico Politicum," published at Frankfort in 1649, says, "You are a *statist*, and have studied the interest of rulers;" and in the work to which we have already alluded, Oldenburger's "Itinerarium," on p. 824, the eminent statesman Veit Ludwig von Seckendorf is styled "egregius statista Christianus." It may be mentioned here that at the International Statistical Congress which was held in London in 1860, the suggestion which was made on the part of the English delegates to substitute for the term "statistician" then in vogue, the old name "statist," did not receive the unanimous approval of the other representatives.

Everything points to the soundness of Achenwall's views in insisting upon the adoption of the word "statista." From this came the Latin adjective "statisticus," and from this the distin-

guishing title "disciplina politico statistica," soon abbreviated into "statistik," was applied to that branch of learning (*disciplin*) which, to use the words of a distinguished authority on all statistical matters, "is an indispensable adjunct of so many sciences, and particularly of that which deals with the condition and progress of society." As Achenwall observes, "it is not only useful, but indispensable, not only to those who care to study the practical bearings of the facts of history and geography on the conditions of man, but also to the legislator and the political economist, whom it supplies with facts on which to base their arguments and from which to draw their inferences. It is especially useful to those who desire to know the extent to which trade and commerce is carried on; to those who travel in foreign countries and who desire to gauge the relative importance of the countries through which they pass, and it is, above all, necessary to those who are entrusted with the negotiations of international treaties."

In spite of the fact that Schlözer—one of the most distinguished followers and disciples of Achenwall—denounced the use of this term "statistik," which he calls a *vox hybrida*, "neither Latin, German, nor French," and recommended in its place the adoption of the word "Staatskunde," or "Staatenkunde," which really signifies State science," this *vox hybrida* has been universally adopted, and is now in use throughout the whole civilised world.

As an illustration of the description of miscellaneous information contained in a volume devoted to "statistics," using the word in Achenwall's sense, we cannot do better than call attention to the contents of a volume entitled "Statistique de la France," by Maurice Block, published in the year 1860, and which was a *résumé* of the voluminous official publication, "La Statistique Générale de la France." In that part relating to questions affecting the acreage and production of crops, the author gives in the first volume a detailed account of the best geographical works and charts; he enters into a minute description of the character of the country and extent of surface; of the abundance or scarcity of water; the degree of heat or cold, dryness or humidity; and even goes so far as to give an interesting account of the fauna and flora of France, a subject to which M. Block appears to have devoted some careful attention. He tells us how scarce fruit trees originally were in France, and traces the history of their growth and cultivation; we are informed that the truffle is found in Angoulême and Périgord; that the cherry tree was originally introduced into France by the Romans, the vine by the Emperor Probus; that the raspberry came from Mount Ida, the Indian cress from Peru, the tomato from Mexico, parsley from Sardinia, and a variety of other interesting

and valuable information, which at the present day no one would expect to find in a statistical publication.

Neither Conring nor Achenwall appeared to have devoted so much attention to these matters of minor importance, as they considered them, as their successors, in fact the latter remarks that he modelled his "*Res publicæ nostri ævi celeberrimæ*" on Aristotle's chief work, and Zenophon's "*State of the Athenians*," and Achenwall confines his review of the agricultural production in his work entitled "*Plenty and Want*," strictly to an account of the actual productions of the country, without for example going into any details as to the origin of the various roots and crops.

About the same time that Conring published at Helmstædt his "*Programma*," dated 20th November, 1660, a work bearing the title, "*Natural and Political Observations upon the Bills of Mortality*" was issued by Captain J. Graunt, and presented to the Royal Society of London. In this work it was stated, among other information, that the two sexes were almost numerically equal, the basis on which Captain Graunt founded his observations being the London Bills of Mortality from the year 1593, and the registers of births for the period comprised between 1629 and 1661. The result of his observations was the opinion expressed by him, and repeated up to Oettingen's time, that "monogamy was a divine institution." Captain Graunt also established the fact that male births are continually in excess of female births, and demonstrated that the proportion of male to female children annually born is in the ratio of 14 to 13. He tells us that the decrease of the population caused by the ravages made by the Great Plague of London was counterbalanced by the large influx of persons migrating from the provinces to settle in London; that the "opinion of plagues accompanying the entrance of kings is false and seditious;" that the effects of wars upon the population did not exercise any perceptible influence upon the proportion of the sexes; that the city of London was steadily spreading westward; that there was always a sufficiency of men to maintain the English army and navy in a state of efficiency, and a variety of other information on the subject of the movement of the population. The author, speaking of himself, says, though not an educated man, and depending mainly upon the "mathematics of his shop arithmetic," he hopes that the facts which he had drawn attention to, and which had hitherto escaped the notice of scientific writers, would receive a favourable reception at the hands of the public. His desire was to inaugurate a new branch of political science, and to provide the practical politician with certain facts indispensable to good government. These observations were ordered to be printed

by the Royal Society in 1665, and Graunt was afterwards elected a member of this distinguished body.

Knapp, from whose "*Theorie des Bevölkerungswechsels*" (1874) the above facts have been taken, as it was impossible to obtain a copy of the original publication, tells us that Graunt had also devoted considerable time and careful study to the question of mortality, and had even formed a very clear estimate of the proportion of deaths to births, the ages at which deaths occurred, &c.; and this is the more remarkable when we consider how little reliable data there existed at that time on which to form any conclusions, as the bills of mortality upon which he chiefly relied for his information did not distinguish the deaths according to age. He stated as the result of his observations that the proportion of children dying before the expiration of their sixth year was in the ratio of 36 per cent., and with this slender basis to work upon, he founded his conclusions as to the mortality in the more advanced ages, arranging these ages in decennial sections.

In the year 1702, with the object of calling attention to the great benefits which would be derived throughout the whole of Germany by the publication of similar registers of deaths, a German translation of Graunt's work was issued, entitled "*Natural and Political Review of the Bills of Mortality of London; its Government, Religion, Extension, Commerce, Climate, Hygiene, &c., by J. Graunt, Fellow of the Royal Society; translated for the benefit of the German nation.*" The honour of laying the foundation stone of the systematic examination of the social condition of the State, its progress in civilisation, and its natural resources, and the determination of the nature and forces of the various circumstances in the history and condition of a people that assist in forming their character—a science which afterwards received the name of "*statistics*"—may be considered to be in great measure due to Graunt for his "*Natural and Political Review of the Bills of Mortality.*"

Graunt found a worthy successor in continuing his investigations in the science of Political Arithmetic, as it was then termed, in Sir William Petty, who was a man of great literary attainment, a friend of Hobbes, and a fellow of the Royal Society, and, according to Roscher, justly admired by his contemporaries. In fact, Petty may be looked upon as the first theorist of the new science. In the preface to his chief work, entitled "*Essays in Political Arithmetic*," dated 1679, he says, "The method I take to do this is not yet very usual, for instead of using 'only comparative and superlative words and intellectual arguments, I have taken the course (as a specimen of the political

"arithmetic I have long aimed at) to express myself in terms of "number, weight, or measure; to use only arguments of sense, and "to consider only such causes as have visible foundations in nature, "leaving those that depend upon the mutable minds, opinions, "appetites, and passions of particular men to the consideration of "others;" and on p. 98 of his "Several Essays" he says, "I intend "to express myself in terms of number, weight, or measure, to use "only arguments of sense, and to consider only such causes as have "visible foundation in nature; observations which, if they are "not already true, certain, and evident, yet may be made so by "sovereign power." The essence of this political arithmetic is found in the smaller edition: "A discourse concerning the "extent and value of lands, people, buildings, husbandry, manu- "factures, commerce, fishery, artisans, seamen, soldiers, public "revenues, interest, taxes, registries, banks, valuation of men, "increasing of seamen, of militias, harbours, shipping, &c., as the "same relate to every country in general, but more particularly to "the territories of His Majesty of Great Britain and her neighbours "of Holland, Zeeland, and France." It may be said that to Sir William Petty is due the credit of initiating the study of statistics, using the term in the sense in which it is employed at the present day. Roscher, in his work, "The History of English "National Economy," referring to Sir William Petty's observations, writes at great length on the subject, and though he appears to take exception to the manner in which Petty has grouped his figures, he praises his efforts to deal with the statistical material of the most important countries at the same period, and appears also to thoroughly appreciate the manner in which only what is really of importance and general interest is clearly brought out.

Petty's experiments in political arithmetic, together with those of Graunt, were afterwards taken up by the celebrated mathematician and astronomer, Halley. In the third volume of "The Philosophical "Transactions of the Royal Society" there appears a notice of a work by this author, entitled "An Estimate of the Degrees of the "Mortality of Mankind, drawn from various Tables of the Births "and Funerals in the City of Breslau, with an attempt to ascertain "the Price of Annuities upon Lives." In this work, which was published in 1693, Halley based his calculations and estimates on the Bills of Mortality relating to the period comprised between the years 1687 and 1691, which were the first published by the city of Breslau. He drew up a table of mortality from these sources, and showed how the probabilities of life and death, and the value of annuities and assurances on lives might be determined, which he pointed out had until then only been done by an imaginary valuation. One particular table which he drew

up—a statement showing the numbers of the population living at Breslau, classed according to age—is still known as Halley's Bill of Mortality. An interesting pamphlet, entitled, "Edmund Halley and Caspar Neumann," by Dr. J. Grätzer, was published at Breslau at the commencement of the present year, and contains a mass of interesting and authentic information bearing upon Halley's works. We can do no more here than merely refer to this publication, as space will not admit of our quoting at any length from it.

The study of political arithmetic, using the term in Petty's sense, was continued later by King, Davenant, Derham, Short, and others, by all of whom the subject was carefully treated, and about the middle of the eighteenth century it attracted the attention of the two Dutch professors, Kersseboom and Struyk. The former, Knapp speaks of "as a man of great literary attainments, and "possessed of a logical, discerning, and critical mind, who brought "a powerful intellect to bear upon all questions into which controversial matter might enter, and subjected them to a thorough "sifting and a rigorous examination." Kersseboom stated as the result of his researches, that the proportion of male to female children annually born was in the ratio of 18 to 17; that in early life the mortality is greater among the male than the female sex, and after this period a greater regularity appears to be maintained. Writing on this subject he says, using the words of his friend Professor S'Gravesande, to whom he submitted his tables and literary productions previous to their publication: "*Quot non sunt causæ a quibus hominis vitæ terminus pendeat? Regularis tamen in majore numero . . . est morientium series.*" Knapp also mentions another abstruse subject which presented itself to Kersseboom's mind—a subject which afterwards attracted considerable attention—this was the theory of the disappearance of accidents in quantitative aggregate observations. Kersseboom on this subject again quotes S'Gravesande: "*Nulla data irregularitas nihil fortuitum est, si ad res ipsas tendamus; hæc ignorantiam nostram spectant. Irregulare id vocamus cujus regularitatem propter variarum causarum concursum non percipimus. Fortuitum id dicimus quod non videmus a causâ determinatâ pendere, quamvis re vera a tali pendeat. Sæpe vero regularitas quæ consideratis paucis effectibus nos fugit ubi plures ad examen vocantur detegitur.*" The titles of the seven treatises of Kersseboom's, which appeared in the period comprised between the years 1737-47, together with a detailed account of their contents, are given in p. 60 of the first volume of Knapp's work.

Kersseboom recognises Halley, whom, however, he left far behind, as his predecessor and master in the science of determining the rates of mortality, and the method he employed to

determine these rates was somewhat similar to the one used by Graunt, viz., by taking in the first place his data from the Bills of Mortality, and basing his conclusions upon them. His system was, however, a far more perfect one than Graunt's, and more likely to lead to accurate and reliable results; he took a table giving the number of persons living at a given age, and in order to discover the actual mortality, traced this number into a later period of life. A detailed account of Kersseboom's literary contributions to statistical science, his estimate of the mean probable duration of life, his calculations of the actual numbers of the population founded on his observations of the bills of mortality, is given on p. 62 of the first volume of Knapp's work. Out of these rough calculations and estimates grew that important branch of statistical science which is known at the present day as "Vital Statistics." The actual phenomena of birth, existence, and death form in themselves a most interesting study, and one whose importance cannot be overrated; this was clearly recognised by Graunt and others who followed him, and who devoted much time and careful study to the solution of the many intricate problems of human phenomena. The question of the movement of the population is one which must always be of vital importance both to the student and the statesman. On this point Achenwall observes: "Man is essentially the first consideration of the State; the growth of a country's population is the pedestal on which it builds up its greatness. Passing through European countries, the traveller cannot fail to be impressed with the very considerable differences existing in the numbers of the population of the various countries. In some the population is so sparse that they would appear to be almost uninhabited, in others there is such a density that they would almost lead one to believe that the population must be out of all proportion to the means of existence. If we seek to account for these diversities, we find that they are influenced by a variety of causes. To thoroughly investigate these causes should be our first aim." In spite of this excellent advice, Achenwall and his school appear to stop here, and to remain content with merely theorising, and calling attention to these phenomena, without actually endeavouring to throw any light upon the question of the causes affecting the distribution of the population.

It is true that at first Graunt and Petty both treated the population phenomena as a question on which some attention might with advantage be bestowed, but at the same time they were of opinion that it did not properly come within the range of science. The astronomer Halley, however, went very much deeper into this question, and subjected it to a mathematical treatment, and he

insisted upon the great value and practical utility to everyday life, of a thorough knowledge of the subject. The Dutch professor Kersseboom devoted much time and careful study to the subject, and derived considerable assistance from it in the solution of intricate financial and economical problems. An account of his works is given in the "*Bulletin de la Commission Centrale de Statistique*," vol. iii, Brussels, 1857, under the heading of "*Notices sur la vie et les ouvrages de Gr. Kersseboom*;" and Knapp also calls attention to them in p. 66 of the first chapter of his work. The Frenchman Déparcieux also devoted considerable attention to the population question, and published in the year 1746 his "*Essai sur la probabilité de la durée de la vie humaine*," in which he had drawn up several new and valuable tables of mortality, one of them constructed from the registers of the nominees in the French tontines, principally those of the years 1689 and 1696, and the rest from the mortuary registers of different religious houses. Four of these showed the mortality that prevailed among the monks of different orders, and another that which obtained among the nuns in different convents in Paris. Déparcieux appears to have been the first to give the average duration of life after any age, and showed how to calculate it correctly from tables of mortality. His tables formed the basis on which the rates were fixed by the French "*Caisses générales de retraite de France*" for the purchase of annuities (Knapp, c. 1, p. 68).

The results of the investigations into this branch of statistical science which had hitherto been obtained were all carefully noted by Susmilch, and further enquiries were made by him into the subject. He took great pains to collect the number of annual deaths in the different intervals of age, which he published in his "*Divine Orders*," issued in 1741, and of this a second edition, which was in reality a fresh work, twice the size of the first, appeared in the year 1761. The detailed and exhaustive information which this work contains, and the scientific manner in which Susmilch handled his subject, obtained for him the justly merited reputation of being the most valuable contributor to that branch of statistical science which treats of the question of population.

As regards the increase of the population, Susmilch also devoted much careful attention to this subject, and many things suggested themselves to his mind which were afterwards taken up and so successfully dealt with by Malthus. He was the first to observe that in nearly every country the number of births far exceeds the deaths, and that in consequence the population must be continually increasing; but he was of opinion that all things were ordered for the best, and that the increase of the human species would of itself be kept down to the level of the means of existence. Suss-

milch's views on the question of the fruitfulness of marriages were entirely original, and it fell to him to clear the ground of many fallacies, and to definitely declare the inaccuracy of many assertions which had hitherto remained unrefuted. As regards the proportion of the sexes, the result of his observations was that the proportion of male to female births was as the ratio of 21 to 20. Sussmilch may be truly considered a worthy successor of Kersseboom in following up the train of thought which the latter in his turn inherited from S'Gravesande, namely, the employment of statistics as a method in investigating the conditions and events by means of mass observations (*Massenbeobachtung*), and its application to all phenomena, human and physical, which reveal themselves as produced by constant and variable causes simultaneously. To arrive at an accurate conception of the laws which govern human phenomena it is necessary not to take any individual case, but to consider similar facts for the same country for different periods, or for different countries at the same time, and by noting the difference of circumstances in each, a true knowledge of the principles that are constantly at work in society is obtained. It would seem that the very fundamental point of the moral philosophy afterwards founded by Quetelet seems already to have been grasped by Sussmilch, as he goes on to say: "Is there not frequently to be observed disorder in moral things? . . . but may we not hope that in time we shall be enabled to judge of everything correctly, and to trace the connection of everything when we are in a position to grasp all the minor events in all their bearings, and to subject them to the clear light of scrutiny?" That Sussmilch far excelled all his predecessors in the selection of material which he employed in his researches is clearly shown by the fact that all his successors, even up to Quetelet's time, bore testimony to the general excellence of his work, and taking into consideration the great practical value of the materials with which he worked, the systematic order in which his data were classified and arranged, and the skill which he brought to bear upon their manipulation, he may be looked upon as the first true statistician, using the term in the sense in which it is employed at the present day.

Not only did he excel as a statistician, but he may also lay claim to the honour of being a distinguished economist, as he devoted much careful study to the question of the influence of production in determining the numbers of the population; and he also formed a thoroughly accurate conception of the manner in which the new science should best be applied to the solution of the intricate problems and vexed philosophical questions of the day.

His views on the mutations of human society taken in conjunc-

tion with the somewhat simple opinions he had expressed on political questions, was the cause of the undeserved contempt with which his views were looked upon for nearly a century. The very fact that Malthus, his immediate successor in the doctrine of population, and like him a Deist and theologian, took up a totally different ground, necessarily drove Sussmilch into the background; for Malthus only recognises an active God in the creation of the world and of humanity, but considers that after the creation both were left to their own independent development according to their innate natural laws. In particular he looks upon human society as an existence totally dependent on natural external influences, and within these bound up in its development with the natural internal impulses in so far as they cannot be subjected to the domination of the intellect and of the moral force thereby awakened. Malthus's conception is therefore essentially a natural historical one, which regards the whole development of society beyond the sphere of human intellect as by nature compulsory; whereas Sussmilch looks upon God as the eternal and sure arithmetician who orders everything temporal and natural according to measure, number, and weight. As a philosopher also Sussmilch was still further put into the shade when the well known views of the encyclopædists came to be generally adopted; and finally his opinions on the principles of population lost much of the original weight which was attached to them when Malthus, who using the data employed by him, propounded an entirely new theory. In spite of this there can be no doubt that Sussmilch was regarded as the legitimate successor of Graunt and Petty, in continuing the study and endeavouring to perfect the science of political arithmetic; and his efforts in this direction were attended with such signal success that he may be considered the most brilliant exponent of the new doctrine.

It is worthy of note that he, following the example of his predecessors, never made use of the term "*Statistik*" in connection with his observations; and even in the fourth edition of his "*Divine Orders*," which was published in the year 1775-76, there is no mention of this term. In the year 1809 Hoffmann, the father of Prussian official statistics, whom Engel calls a "statistician whose rare merit has been universally recognised," speaks of "Petty's Political Arithmetic" and not "Achenwall's Science" as the doctrine which occupies itself with the extent, limits, subdivisions, and natural relations of States, their advantages, their history, and their origin. In his well known "Promemoria" of the 21st February, 1809, speaking on the subject of the organisation of a statistical bureau in Prussia, Hoffmann remarks that at the head of such a department there should be placed a man who, with

a certain knowledge of the ground work, would be enabled, with the assistance of political arithmetic, to work up from the raw materials such clear and comprehensive statements as would show at a glance not only the condition of the population, the production or trade of a country at a given time, but by comparison show the progress or decline which had taken place in them. In recommending Professor Hobert to fill this post, Hoffmann remarked that if he were to bring to his new duties that skill and intelligence which he displayed in the management of the "Widows' Fund," he would be eminently qualified for the position of chief of the statistical bureau of the State. And yet the term "Statistik" must have been frequently employed when speaking of "political arithmetic" at the time this "Promemoria" was published. It was indeed about this time that a violent attack was made upon the political arithmeticians, chiefly directed by the followers of the Achenwall school, who appeared even then to foresee the preference which would before long be given to the distinguishing title of "political arithmetic" over that of "Statistik." An article couched in very violent terms appeared in the "Göttingen Journal" of the year 1806, vehemently reproaching the political arithmeticians with retarding the progress of statistical science. It went on to say: "These short-sighted persons not only deluded themselves, but attempted to make others believe that one could ascertain the importance of a State by simply measuring its area, estimating its population and national income, and then adding the number of its live stock." And in the "Jena Allgemeine Zeitung," on p. 130 of the issue of 1811, appeared the following passage: "The practice of ordinary politicians and statisticians, who measure everything by numbers and ordinary calculations, and who, wishing to agree to everything to a hair's breadth, would by means of the corporeal, gauge what is actually the spiritual, is beyond all expression supremely ridiculous." Thus the Göttingen school, which spoke of the science of statistics as the "highest and noblest," was in direct opposition to the English school of political arithmetic, which was identified by Sussmilch with the system of "tabular statistics." Tabular statistics, however, had their origin in Denmark, where the learned Anchersen, a contemporary of Sussmilch and Achenwall, was the first to compile in the year 1741 a valuable tabulated statement of certain important States, showing at a glance the area, population, religion, finance, army, coinage, weights, measures, &c. The example set by Anchersen in Denmark was soon followed in Germany by A. F. Brandel (Berlin, 1786 and 1792); by J. G. Bötticher (Königsberg and Leipzig, 1789); and by A. L. Crome, who produced the well known atlases of the area, population, and production of Europe, most valuable

works of reference of which many editions were published. In France also, Beaufort compiled, in the year 1789, very valuable statistical information in tabular form, and in other countries Anchersen's example was followed by many well known authorities on statistical subjects. Between "tabular statistics" and "political arithmetic" there is a considerable difference, for while the former has this in common with Achenwall "Statistik," that it considers facts collected without reference to their mutual dependence, with the principle of political arithmetic it is in harmony so far that it only considers those facts which are capable of numerical expression, without indulging in the high-flown phraseology of the Göttingen school. Thus "tabular statistics" would appear to form the connecting link between the two sciences, and by reason of its clear and comprehensive array of figures, it may be taken as the basis on which the statistics of the present day were formed, which proceed wholly by the accumulation and comparison of facts, stating them in figures and tabular exhibitions, disregarding any kind of speculation, and applying the epithet "statistical" only when a fact has been mathematically demonstrated.

It is well known that "tabular statistics" became the foundation of the comparative statistics of Büsching, and which were largely employed by Niemann and Malchus in Germany. In Austria they particularly found favour, and the system of comparative statistics was employed by all the leading Austrian statisticians, from Lucca down to Brachelli. It must be borne in mind that the political arithmetic of Graunt and Sussmilch is not to be confounded with that branch of mathematics which comprises the method of calculation employed in insurance offices in connection with matters relating to annuities, tontines, &c., which by reason of the State supervision under which they were placed, received the name of political arithmetic. Again the term political arithmetic has been imagined by many to specially refer to the population statistics, and *vice versâ*. Even both Rumelin and Wagner seem to have fallen into error, the former when he asserted that Kniess (in his justly celebrated work published in 1850, "Statistics as an independent Science") "in the separation of the heterogeneous elements of the word statistics had not gone to the root of the question;" while the latter says that Kniess has appropriated a signification to political arithmetic which rightly belonged to Sussmilch's science, between which and the political arithmetic there existed a very considerable difference.

Lueder, who was a witness of the storm which broke over the political arithmetic school, says in his "Kritik der Statistik und Politik," published in the year 1812, on p. 57, that "ordinary statisticians," referring to the political arithmeticians, "earned

"for themselves everlasting gratitude for the investigations which led to the discovery of the laws of mortality; a discovery to which was due the improved system in the management of the 'Widows' Fund;" absolutely nothing was done by the higher statisticians." Niemann, in his "History of Statistics and Politics," 1807—less bigoted than the majority of the contemporaries of the Göttingen school—says of political arithmetic, "its employment in determining the social conditions of men by the consideration of facts which have a bearing upon them; in considering these facts for different periods in order to compare them and then see how far and in what particular, progress or decline had taken place; in studying the influences exercised by physical and political causes, has done more for the improvement of the political condition of States" (*Staatskunde*) "than the mere piling up of figures which are frequently so little to be relied upon." Niemann quotes extensively from Simond, Necker, Young, and Adam Smith, though the latter would appear, by his observations in "The Wealth of Nations," to have been no great believer in political arithmetic, as he says, "I have no great faith in 'Political Arithmetic,' and I mean not to warrant the exactness of either of these computations."

Among the celebrated statisticians of this age, the philosopher Lueder appears to have been the only one who foresaw the great revolution of ideas which was fated to take place consequent, on the one hand, upon the English discoveries of the last century and the observations of the encyclopædists, and, on the other, upon the French revolution and the Napoleonic victories. He remarks, "Ideas, if they had taken deep root, had to be given up and exchanged for others; one prejudice after another had to be acknowledged as a prejudice; so little by little one frail prop after another was removed, until at last the whole fabric of statistics, to my no little astonishment, gave way, and carried with it politics, which, without statistics, are of little value." On the title page of his "Kritik" he puts Bacon's sentence as a motto—"*Homo naturæ minister et interpres tantum facit et intelligit, quantum de naturæ ordine, re, vel mente observaverit; nec amplius scit aut potest.*"

It was more particularly in France that the example of Halley and Newton was followed, and the studies which they initiated were elaborated and continued by Laplace, who, by his "*Mécanique Céleste*," gained the respect and admiration of his contemporaries. This work is worthy of honour, as it was the first in which minute investigations had been made into the mathematical nature of the theory of probabilities. The result of his researches were made known in the excellent work entitled "*Essai philosophique sur la*

"théorie de la probabilité," in which he observes, "what does chance mean? Chance seems conveniently to veil our ignorance; we employ it to explain effects of whose causes we are ignorant. To one who knew how to foresee all things there would be no chance, and the events which appear to us most extraordinary would have the natural and necessary causes in the same manner as do the events which seem most common to us. We should therefore be able to attain a thorough knowledge of the future if a human intellect were capable of grasping not only what has taken place, but what will take place, in the same manner as an astronomer reads the heavens."

Laplace in the French Chamber of Peers endeavoured to initiate a new and more perfect system of collecting, arranging, and comparing those facts which can alone form the basis of correct conclusions with respect to social as well as political government, and the time was the more ripe for this necessary improvement, as it was about this period that a question arose in the French Senate respecting the number of the population then existing in France, a question which none then appeared to be able to answer. It may truly be said that the French Census of 1802 was in a great measure the direct result of Laplace's efforts in the cause of statistical science.

The work so ably commenced by Laplace was afterwards taken up by the celebrated mathematician and physician Fourier, who, according to Knapp, after the fall of Napoleon, was appointed by Chabrol, the Préfet of the Seine, as chief of the Statistical Bureau of Paris.

The cause of statistical science is largely indebted to Fourier for his efforts, which in a great measure contributed to bring it into the state of perfection in which we find it at the present day. Laplace and Fourier both exercised considerable influence over the young Belgian mathematician and astronomer Quetelet; indeed, it was with the object of obtaining his opinion on the then burning question of the organisation and establishment of an observatory at Brussels, that Quetelet personally made the acquaintance of the former. So it will be seen that political arithmetic experienced its revival and development at the hands of these two highly gifted and talented scholars.

Quetelet opens his well known *chef-d'œuvre* of 1835, with this remark, "L'ouvrage que je présente au public est en quelque sort le résumé de tous mes travaux antérieurs sur la statistique." Quetelet's two chief works were those entitled "Sur l'homme," published in 1835, and the "Système Sociale," in 1848; his others, more especially his treatises and notes, are not so well known. Knapp rendered a very valuable service to science when he under-

took the review of Quetelet's profound scientific works; and his task must have been by no means an easy one, as he carefully went through sixty-five of his works (among them being a few pamphlets and short sketches). The result of his labours appeared in Hildebrand's "Jahrbuch," editions of the years 1871-78, pp. 167-74, 342-58, and 427-45. Even the short notices contributed by Quetelet to the Academy of Brussels were enumerated, almost without exception, only the very unimportant ones, those for instance, which relate merely to the circulation of, or the reception accorded to a previously published work, being omitted. For a detailed account of the whole of Quetelet's works, Knapp refers to the "Tables générales analytiques du recueil des Bulletins de l'Académie de Bruxelles," 1858 and 1867.

It appears from Knapp's review that the better known of Quetelet's chief works are to a great extent reproductions of his earlier single treatises, as he points out that the greater part of his "Essai sur l'homme," the "Système Sociale," in its more important part, and the "Physique Sociale," published in 1848, were almost literal reproductions of Quetelet's earlier literary compositions. According to Knapp, Quetelet appeared to have been in the habit of contributing numerous short sketches and memoranda on any original subjects and opinions, which were published in the bulletin of the Brussels Academy, and on these notices he built up his own more important works. Knapp separates the whole statistical literary efforts of Quetelet into the periods 1826-35, 1836-48, and 1849-74, the year of his death, concluding with his "Physique Sociale," and the "Anthropomachie;" and he divides his pamphlets into two distinct categories: "Social statistics" and "Anthropology;" the latter treating of the physical and psychological conditions of man as individual things, and introducing his theory of the typical human unit or average man (*l'homme moyen*), and the tendency to crime (*penchant au crime*). In the former he goes more deeply into the question of the effects of social influences over man, and deals not only with the individual actions of man, but also with the natural phenomena of births and deaths, for apart from economical, moral, and political conditions of society, the number of marriages and the rate of mortality in early infancy are just as dependent on the social conditions and manner of life, sanitary regulations, compulsory vaccination, &c., as they are upon place, season, period, &c. It is manifest, however, that one description of cause, such as astronomical or meteorological, is entirely beyond the range of human influence, while other causes are to a certain extent in the sphere of human will; thus we are enabled to distinguish between natural and social causes. But as Knapp remarks, "it is impossible to rid ourselves of one or the other of

"these causes, and as the death-bringing influence always attains its end physically, it would be incorrect to denote one description of cause as though it were of a different order to the other."

The sixty-five works of Quetelet which Knapp reviewed were classified by him in the following groups:—Anthropological, Demographical, Moral and Mathematical (his "Theory of Probabilities" is an excellent example of this category); and finally his works on statistical method and the three already mentioned chief works, which treat at the same time of questions relating to political and social statistics, and also to anthropology. The contents of these works Knapp again separates into three distinct categories; the first in which the typical human unit, or *l'homme moyen*, and his physical and mental construction is carefully worked out; he points out in particular how the tendency to crime is treated in an essentially anthropological sense. A further point to be noticed is the revival of vital statistics, and the theory of regarding society as a system whose motive power had to be established. The question as to what extent man is responsible for his actions, which are in a great measure dependent upon social conditions, is here touched upon, and hence the question of the legality of human actions also arises; on this point statistics may be relied upon to render material assistance, for by reason of their mathematical treatment it is eminently adapted to the solution of these intricate problems. In the second category Knapp discovers among other things that anthropology is extended to all bodily and mental qualities of man, and finds the earlier investigations into crimes combined with marriages under the heading of "moral statistics;" and finally in the third category Knapp dwells upon the theory of probabilities, whose method enables us "to express more precisely the results of experience, as it teaches us also in the main to do with more regularity and precision that which even the most judicious have hitherto done in a manner more or less vague. It tends, moreover, in the phenomena with which we have to occupy ourselves, to substitute science for that which is conventionally termed practice or experience, and which is most frequently but blind routine."

On the subject of population statistics Quetelet does not appear to have formed any original views; to a great extent he relied mainly upon his predecessors from Graunt to Susmilch and Malthus, though he only casually refers to the former, and he does not appear to have thoroughly grasped the grand conception of Malthus. His chief merit lay in the stimulus he gave to the adoption of the official method of dealing with the question, and to the perfection of its mathematical treatment. Having inherited the doctrines of Laplace and Fourier, he and his contemporary Moser

laid the foundation of the improved method of treatment employed in dealing with that branch of statistics relating to the population known as "Vital Statistics," which was only developed and perfected in later years by Engel, Wittstein, Baumhauer, Farr, and Korosi, and more particularly brought into notice by the works of Knapp, Zeuner, Lexis, and others. Political arithmetic received at Quetelet's hands a fresh stimulus by reason of its adoption in connection with "moral statistics," and in the employment of its methods in connection with the question of anthropology; and although Guery published in 1833 his "*Essai sur la Statistique morale de la France*," it was mainly due to Quetelet's efforts in 1847 that the importance of political arithmetic in connection with moral statistics was first clearly brought to light. Everything points to the fact that not only did "statistics" owe their identification with the old "Political Arithmetic" to Quetelet, but also by reason of the employment of its methods in connection with the then new social science, the term became very much more general, and it may justly be considered to be far more properly applied to Quetelet's science than to Achenwall's.

Fallati and Schubert, who were the two most eminent theorists of the Göttingen school, were opposed to the appropriation of the old title by Quetelet, and the former propounded the theory that "statistics" should be divided into the "abstract" and "concrete," according to whether they are used in a general or a particular sense. The former he defines as the "ideal condition," "the visible regularity of clearly accidental external appearances;" the latter, the "real condition," or the "sum of these appearances" "which commend themselves easily to ordinary understandings." The proper foundation of true scientific statistical knowledge, viz., "concrete statistics," according to Fallati, lies in the investigation of all phenomena *quæ vitam hominis excedunt*, which include the religion, the composition, and administration of a State, its climate, nature of the soil, public laws, historical and geographical conditions, &c. Fallati would even appear to go further than this, and says that we should also take into consideration all the "broad facts relating to the life and constitution of States." "The functions of the 'ideal condition' are to bring to light these general facts, and search out and decide upon the causes affecting the variability of such phenomena as births and deaths, human industry, and commercial activity; matters in fact which form the very basis of a nation's progress or decline, its wealth or poverty." "Concrete statistics" may be accepted as comprising the "special scientific knowledge of a State," and according to Fallati, "has much in common with what is now understood as 'the non-statistical branch of Achenwall's 'Statistik.'"

In "abstract statistics" we have before us an array of units of different values, and its aim is to arrive at a basis on which a comparison of these units could be founded. It is obvious, therefore, that to obtain any accurate and reliable results, the connection of arithmetic with abstract statistics is indispensable, just as logic is necessary to other branches of statistical science. But arithmetic, and particularly "political arithmetic," can have no more claim than logic to be considered as actually forming a branch of statistical science. Fallati goes on to say that he looks upon "abstract statistics" as identical with "political arithmetic," and acknowledged that it was in great measure to Quetelet's efforts that its perfection was due. He remarks that "Quetelet, in his work '*Sur l'homme*,' laid the foundation of a new theory of " 'abstract statistics,' whose main point is that of the 'typical " 'human unit,' and which, although it particularly treats man as a " fragment of the social body, that is, as a social being, and though " it takes up from this point the result of the old political arithmetic, it does not confine itself to it, but is extended to the " whole abstract statistics of mankind."

Fallati thoroughly recognised the social scientific character of "political arithmetic" and its development by Quetelet, and says, "the sphere of 'abstract statistics,' as a particular branch of " statistics or as a particular doctrine, has not up to the present " (1843) any specially defined limits; it is only very recently that " it appeared to be confounded with 'concrete statistics,' though in " its eagerness to become independent of the latter it went far " beyond the range of 'concrete statistics,' more especially by the " pretensions it had of discovering the laws not only of present " phenomena, but also of the past and future; so that it interfered " to a considerable extent in the sphere of other sciences."

Kniess, in his "Statistics as an Independent Science," goes deeply into the subject of the relative functions of these two branches of the science, and concludes a discursive review of the subject by declaring himself entirely opposed to Fallati's theory, though he cannot withhold from him a high tribute of praise for the clear and comprehensive manner in which he dealt with his subject. As a method applied to all phenomena, both past and present, Kniess is strongly in favour of the adoption of the name "Statistik" for "political arithmetic," called by him "mathematical statistics," to distinguish Achenwall's and Schlözer's science, as the doctrine which treats of questions affecting the political and social conditions of nations; and he is also in favour of a descriptive as well as a mathematical treatment. Even the term "demography" or "demology," which was employed for the first time by the French statistician Guillaud

in his "*Elément de la Statistique humaine*," and accepted by Engel, could not restrain the general use of the name "*Statistik*," and the less so as the term demography, which chiefly through the efforts of Bertillon had been first brought into use, is regarded by those who are most in favour of it as of somewhat vague and uncertain meaning. That meaning, however, has been universally accepted which Kniess was the first to establish as a perfectly independent one, and which could not be confounded with that which had hitherto been attributed to it. On this point Rümelin, after an exhaustive review of all the cases in which the terms "statistical" and "statistics" are used in every description of scientific work, observes, "it is, furthermore, possible to prove statistically that at the present day the meaning of the term 'statistics' is generally accepted to imply the result of any arithmetical computation. On the other hand, the interpretation theoretically and professionally adopted by an university statistician, belongs to the above classification also, of a description (the distinguishing feature of which is the selection of words used) of the constitution of existing States, of the domestic customs of races, &c., can be considered as coming within the range of statistics."

It is obvious that in the scientific world statistics do not now occupy the same position in relation to history as Achenwall imagined, but are more akin to astronomy, geometry, and other kindred branches of science, for they have become an actual science of observation in the service of social science. It is a science with a definite aim, an orderly classification of subjects, a numerical method with its strict rules of synthesis and analysis, by which it is endeavoured to illustrate by facts the conditions and prospects of society, in fact, according to Roscher's "*History of National Economy in Germany*," "the present meaning of the term 'statistics' is exactly identical with the realistic tendency of that national economy which was designated by Knapp as 'the minor German branch of the social scientific realists,' termed by Wagner 'the school of social politicians,' and represented principally by Schmaller, Knapp, Neumann, and Schonberg."

Knapp in his "*New Theory of Moral Statistics*," says that "in dealing with the condition and progress of society, statistics enable us to take a comprehensive view of society in all its relations and progress, and by comparing the condition at different times they throw light upon the causes which determine the conditions of men, and afford the means of verifying theories which have been propounded on the subject of social science."

A decided historical change has taken place in the original

meaning of statistics. Achenwall's "Statistik" was synonymous with "Staatskunde" or "State science," and regarded as a historical and descriptive doctrine, and one of paramount importance to the legislator; the statistics of to-day is a doctrine of measurement and calculation, applied to the investigation of social phenomena, not necessarily as Knapp observes, to "discover" the laws which govern the condition and progress of society, "but to obtain an insight into facts which by comparison will acquaint us with the characteristics and the course of development of the subject treated. It has for its basis the observation of measurable facts, whose necessary expression are numbers, and whose indispensable adjunct, mathematics." As Zeuner says, "Even on the very threshold of the scientific realisation of this valuable adjunct it is clear that a great future awaits our present statistics, and we may reasonably anticipate that the combination of statistics and analysis will create a science which will excel every other based on mathematics, not even excepting astronomy, mechanics, and physics."

The progressive exactness and similarity of the observations of all the measurable phenomena of social life are indispensable to the progress of our insight into the development of the social world, and the observation of these social facts, and of their relationship, depends mainly on the so called official or practical statistics. The greatest attention should therefore, in the interests of society, be devoted to the increased development and the perfection of these social observations.
