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WILLIAM STANLEY JEVONS

1835-1882

A CENTENARY ALLOCUTION ON HIS LIFE AND WORK AS ECONOMIST AND
STATISTICIAN.*

By J. M. KEYNES.

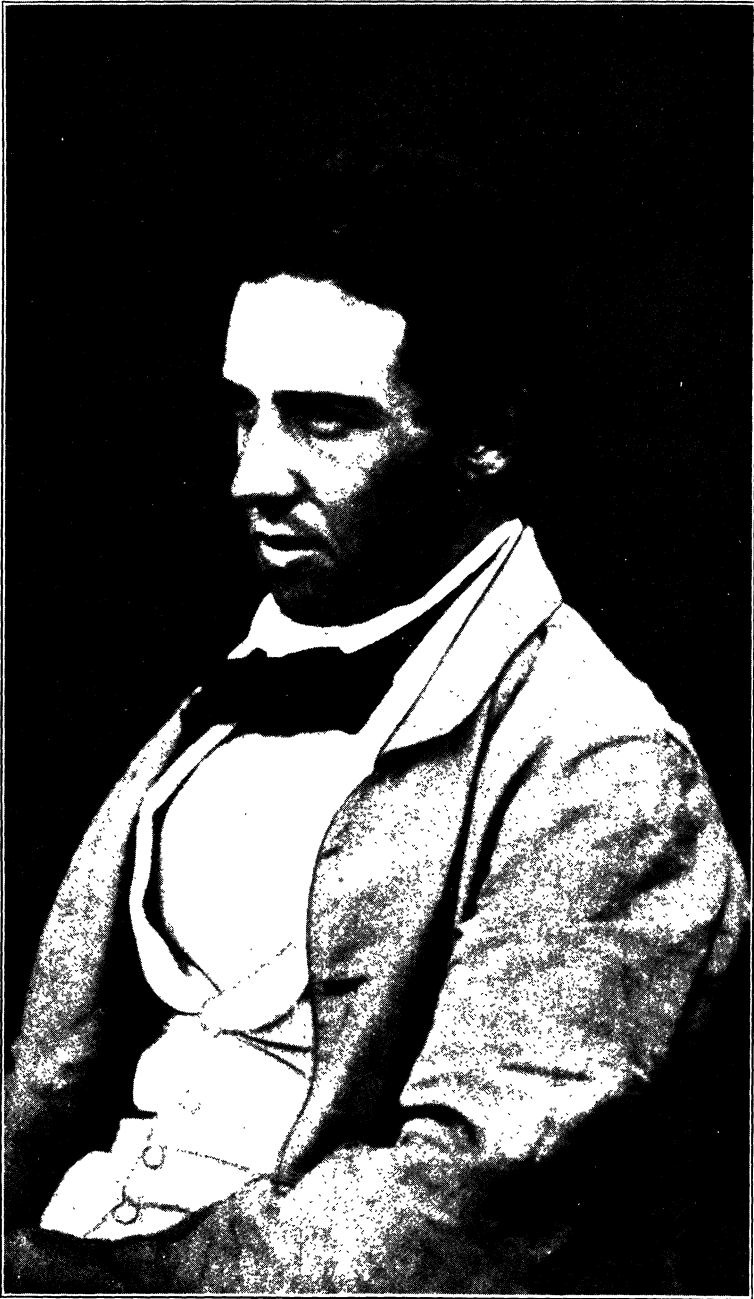
[Read before the ROYAL STATISTICAL SOCIETY, April 21st, 1936, the
PRESIDENT, PROFESSOR M. GREENWOOD, F.R.S., in the Chair.]

I.

STANLEY JEVONS was born in the year after Malthus's death. But he was only seven years senior to Marshall and ten years senior to Edgeworth. Professor Foxwell lectured in his stead at University College *before* Jevons took up his professorship there. He examined my father in the Moral Sciences Tripos of 1875, his name being known to me from my early years as, in my father's mind, the pattern of what an economist and logician should be. Thus, though we celebrate to-day (a little late) the centenary of his birth, though it is sixty years ago that Professor Foxwell lectured in his stead and more than fifty years since his death; nevertheless, Jevons belongs to the group of economists whose school of thought dominated the subject for the half-century after the death of Mill in 1873, who are the immediate teachers and predecessors of ourselves here assembled to pay our duty to his memory.

His family belonged to the class of educated nonconformists, who, without academic connections, made up, in the first half of the nineteenth century, the intelligentsia of Liverpool, Manchester, Leeds and Birmingham, and became the backbone of Bentham's foundation (in 1826) at University College, London, and of Owens College, Manchester (founded in 1846). The family, and many of their connections, were Unitarians; and in substance Stanley Jevons remained of that faith to the end of his life. His father was an iron merchant, a friend of Stephenson, much interested in the engineering innovations of the age, said to have constructed (in 1815) the first iron boat that sailed on sea-water, a supporter of the construction of the Thames Tunnel to his own financial loss, author of a small book on law and of an economic pamphlet. His mother, whose ninth child he was, herself a poetess, was the eldest of the gifted family of William

* I have, of course, drawn freely on the main source for Jevons's life—his *Letters and Journal* edited by his wife. I am also much indebted for information to his son, H. S. Jevons, who is a member of our Council to-day.



WILLIAM STANLEY JEVONS

[To face p. 516.]

Roscoe, the solicitor and banker of Liverpool, collector and dilettante, but also a learned historian, author of the *Life of Lorenzo de Medici* and the *Life and Pontificate of Leo X* amongst much else (including the children's classic *The Butterfly's Ball and the Grasshopper's Feast**). Stanley Jevons himself married a daughter of J. E. Taylor, the founder of the *Manchester Guardian*, and was a connection by marriage of R. H. Hutton of the *Spectator*.

His father and his grandfather Roscoe, though both unusually gifted and of unquestioned probity, were both of them bankrupted, the former in the financial crisis of 1848 and the latter through a run on his bank in 1816; so that he had good hereditary cause not to overlook the phenomenon of business fluctuations. Stanley Jevons took much interest in his own investments and financial position, which he managed, if certain hints in his correspondence are to be trusted, with close regard to his theories concerning the Trade Cycle and the gradual exhaustion of our reserves of coal. His own capital was small, but his wife had some means of her own, and Jevons, I am told, augmented their income by good investment of their savings. He was an example of a man who at every critical stage of his affairs sacrificed his income relentlessly in order to secure his major purposes in life, but was far, nevertheless, from despising money, and suffered severe pangs each time that a sacrifice was called for. In many, perhaps in most, respects he was a good Victorian, averse both intellectually and morally to the outlook of the extreme Left, appreciative alike of a Conservative Party "desirous at all costs"—I quote his own words—"to secure the continued and exclusive prosperity of this country as a main bulwark of the general good," and, on the other hand, of a Liberal Party "less cautious, more trustful in abstract principles and the unfettered tendencies of nature." †

The circle in which Stanley Jevons grew up was interested in social and economic problems. His grandfather, William Roscoe, was an ardent social reformer, active over the abolition of the slave trade. His father wrote a pamphlet entitled *The Prosperity of the Landlords not Dependent on the Corn Laws*. It is recorded that his mother read with him Archbishop Whateley's *Easy Lessons on Money Matters*. His headmaster, Dr. Hodgson, at the Mechanics' Institute High School in Liverpool, where he first went to school,

* "With Step so majestic the *Snail* did advance,
And promis'd the Gazers a Minuet to dance.
But they all laugh'd so loud that he pulled in his Head,
And went in his own little Chamber to bed."

Written to amuse his own children, it was published in 1807, sold 40,000 copies in the first year and was popular for at least three-quarters of a century after that.

† *The Coal Question*, p. xviii.

was afterwards Professor of Political Economy at Edinburgh. Nevertheless, Jevons was educated, not in the moral sciences, but in mathematics and in biology, chemistry and metallurgy.* In 1852, seven years before the publication of Darwin's *Origin of Species*, when he was seventeen years old he wrote in his journal:—

I have had several rather learned discussions with Harry about moral philosophy, from which it appears that I am decidedly a "dependent moralist," not believing that we have any "moral sense" altogether separate and of a different kind from our animal feelings. I have also had a talk about the origin of species, or the manner in which the innumerable races of animals have been produced. I, as far as I can understand at present, firmly believe that all animals have been transformed out of one primitive form by the continued influence, for thousands and perhaps millions of years, of climate, geography, etc. Lyell makes great fun of Lamarck's, that is, of this theory, but appears to me not to give any good reason against it.†

When he was eighteen the financial difficulties of his family led to his accepting an appointment as an assayer at the Sydney Mint, lately opened as a result of the Australian gold discoveries. In this post he remained for nearly five years. To his ambitions it was a great disappointment to leave University College half-way through his studies, and his main object in leaving Australia was to return there to complete his course for the M.A. degree. But his long period of solitary thought and slow gestation in Australia, at an age when the powers of pure originality are at their highest, had been abundantly fruitful. For soon after his return, the outlines of his principal contributions to knowledge were firmly fixed in his mind. The last third of Jevons's life after he was thirty was mainly devoted to the elucidation and amplification of what in essence he had already discovered.

The results of his solitary thinking in Australia and afterwards, which were produced in a series of studies covering a little more than the decade following his return to England at the end of 1859, fall into two distinct groups, both foreshadowed by his communications to the Cambridge meeting of the British Association in 1862—the first concerned with his inductive studies of fluctuations, and the second with his deductive contributions to pure theory. But before considering these in detail, it will be convenient to mention *The Coal Question*, his first book and the first occasion of his coming prominently before the public.

* The influence of his scientific training on his approach to economics, statistics and logic was recognized by his election (in 1872) as a Fellow of the Royal Society—the first economist so elected, I think, since Sir William Petty, and followed only by Giffen and Palgrave.

† *Letters and Journal*, p. 23.

II.

The Coal Question ; an Inquiry concerning the Progress of the Nation and the Probable Exhaustion of our Coal Mines is by no means one of Jevons's best works. It is most brilliantly and engagingly written, with nothing omitted which could add to its attractiveness and the effect of its impact. But its prophecies have not been fulfilled, the arguments on which they were based are unsound, and re-read to-day it appears over-strained and exaggerated.

It was Jevons's thesis in this book that the maintenance of Great Britain's prosperity and industrial leadership required a continuous growth of her heavy industries on a scale which would mean a demand for coal increasing in a geometrical progression. Jevons advanced this principle as an extension of Malthus's law of population, and he designated it the *Natural Law of Social Growth*. In the form in which he enunciated the principle—namely, "that living beings of the same nature and in the same circumstances multiply in the same geometrical ratio"—it is, as he said, "self-evident when the meanings of the words are understood."* Yet in spite of his warning that "even if we do not change in inward character, yet our exterior circumstances are usually changing," Jevons's extension of the truism can easily mislead. For he continues:—

Now what is true of the mere number of the people is true of other elements of their condition. If our parents made a definite social advance, then, unless we are unworthy of our parents, or in different circumstances, we should make a similar advance. If our parents doubled their income, or doubled the use of iron, or the agricultural produce of the country, then so ought we, unless we are either changed in character or circumstances.†

From this it is a short step to put *coal* into the position occupied in Malthus's theory by *corn*:—

Our subsistence no longer depends upon our produce of corn. The momentous repeal of the Corn Laws throws us from corn upon coal. It marks, at any rate, the epoch when coal was finally recognized as the staple product of the country; it marks the ascendancy of the manufacturing interest, which is only another name for the development of the use of coal.‡

It is easy to see what alarming deductions from this could be made convincing to a generation which accepted without question a crude version of Malthus. For, as Jevons pointed out, "the quantity of coal consumed is really a quantity of two dimensions,

* *The Coal Question*, p. 149.

† *Op. cit.*, p. 149.

‡ *Op. cit.*, p. 150.

the number of the people, and the average quantity used by each. In round numbers, the population has about doubled since the beginning of the century, but the consumption of coal has increased eightfold and more. Again, the quantity consumed by each individual is a composite quantity, increased either by multiplying the scale of former applications of coal, or finding wholly new applications. We cannot, indeed, always be doubling the length of our railways, the magnitude of our ships, and bridges, and factories. But the new applications of coal are of an unlimited character.”*

By this time the reader has been carried away from the carefully qualified truisms with which he began, and Jevons concludes in splendid and exciting terms :—

We are growing rich and numerous upon a source of wealth of which the fertility does not yet apparently decrease with our demands upon it. Hence the uniform and extraordinary rate of growth which this country presents. We are like settlers spreading in a new country of which the boundaries are yet unknown and unfelt.

But then I must point out the painful fact that such a rate of growth will before long render our consumption of coal comparable with the total supply. In the increasing depth and difficulty of coal mining we shall meet that vague, but inevitable boundary that will stop our progress. We shall begin as it were to see the further shore of our Black Indies. The wave of population will break upon that shore, and roll back upon itself. And as settlers, unable to choose in the fair inland new and virgin soil of unexceeded fertility, will fall back upon that which is next best, and will advance their tillage up the mountain side, so we, unable to discover new coal-fields as shallow as before, must deepen our mines with pain and cost.

There is, too, this most serious difference to be noted. A farm, however far pushed, will under proper cultivation continue to yield for ever a constant crop. But in a mine there is no reproduction and the produce once pushed to the utmost will soon begin to fail and sink to zero.

So far, then, as our wealth and progress depend upon the superior command of coal, we must not only stop—we must go back.†

Jevons, it must be confessed, meant the book to be *épatant*. For it is not, I think, unfair to attribute the striking manner in which it is written to his extreme anxiety that his ideas should not be overlooked. His highly original communications to the British Association (in 1862) had fallen flat. His diagrams for business forecasting (also in 1862), the precursor, sixty years too soon, of so many half-baked loaves, had been published at his own expense and, barely mentioned in *The Times* and the *Economist*, lost him money. His pamphlet on Gold ‡ (in 1863), though it attracted attention a little

* *Op. cit.*, pp. 150, 151, slightly abridged.

† *Op. cit.*, p. 154.

‡ *A Serious Fall in the Value of Gold ascertained, and its Social effects set forth, with two Diagrams.*

later on,* had sold 74 copies.† Yet he had a passionate sense of vocation and of having something valuable to give the world. On April 25, 1863, he wrote in his Journal:—

Now, I suppose I am low because my essay on "Gold" is out, and as yet no one has said a word in its favour except my sister, who of course does it as a sister. What if all I do or can do were to be received so? In the first place, one might be led to doubt whether all one's convictions concerning oneself were not mere delusions. Secondly, one might at last learn that even the best productions may never be caught by the breath of popular approval and praise. It would take infinite time and space to write all I have thought about my position lately. As I have even thought myself in many ways a fool, I am in no way surprised to find that many notions which I have had are ridiculous. At last I fairly allow that the one great way of getting on in this world is to get friends, and impress them with a notion of your cleverness. Send them about to advertise your cleverness, get their testimonials like so many levers to force yourself where you wish to go. How well did Shakespeare see through all these things when he wrote his sixty-sixth sonnet.

It is quite obvious to me that it is useless to go on printing works which cost great labour, much money, and are scarcely noticed by any soul. I must begin life again, and by another way, ingratiating myself where and when I can: only after long years of slow progress can one's notions be brought out with any chance of being even examined by those capable of judging of them.

Faulty as I am in so many ways, I yet feel that my inmost motives are hardly selfish. I believe they grow by degrees less so. Sometimes I even feel that I should not care for reputation, wealth, comfort, or even life itself, if I could feel that all my efforts were not without their use. Could I do it all anonymously I perhaps might consent to it. And yet the condemnation of friends and all you meet is hard to be borne, and their praise or admiration must be sweet. . . . I must go upon a different tack.‡

This time, therefore, he was determined that the public should listen to him. All the arts of showmanship are exercised to recall Political Economy from Saturn. It took Mr. Alexander Macmillan but a few days to perceive that he had been sent a best-seller.§ Within a year success was complete. He wrote in his Journal:—

* Fawcett quoted it in an address to the British Association, and Cairnes wrote to *The Times* about it. Jevons records that the *Economist* (*semper idem*) "has been induced to notice the subject in a cautious manner, and, though attributing to me some exaggeration of the matter, comes over to my conclusion substantially." *Letters and Journal*, p. 191.

† "I have just received the bill for my pamphlet on Gold, the total cost of printing, advertising, etc., is £43, and the offset by sales only £10; only seventy-four copies seem to have been sold as yet, which is a singularly small number." (Letter of July 24, 1863, *Letters and Journal*, p. 188.)

‡ *Letters and Journal*, p. 181.

§ *The Coal Question* was published (as were nearly all his subsequent books) by Macmillan, whose treatment of the young and unknown author should serve as a model of promptness to all succeeding generations of publishers. Jevons's entry in his note-book is as follows: "First attention given to the subject in 1861 or 1862. Inquiry commenced in January 1864. Chiefly carried out at Museum Library, June and July 1864. Writing completed before Christmas. Transmitted to Mr. Macmillan about 28th December. Accepted 6th January, 1865. Published during the week 24th and 30th April, 1865." *Letters and Journal*, p. 203.

Sunday Evening, 3rd December, 1865.—The work of the thinker and inventor may indeed prove for ever futile and mistaken; but even if it be in the true and successful path, it is not, and perhaps can hardly be, recognized at once. At least it is not. One of my chief reasons for the little love of society, is that in most company my hopes and feelings seem snuffed out.

14th December, 1865.—Yesterday I had a letter from Sir John Herschel, approving in the most complete manner of my *Coal Question*, which I lately had sent to him. Long periods of labour and depression have to be repaid in brief moments of such satisfaction as that letter gave me—perhaps I may say amply repaid. If the book, which was to me a work of intense interest and feeling, is read by few and understood by fewer, it has at least the endorsement of one scientific man whom I should perhaps of all in the world select as the most competent judge of the subject as a whole.*

The shrewd publisher sent a copy to Mr. Gladstone, who replied, "I think it is a masterly review of a vast, indeed a boundless subject," † and invited the author to call upon him. "My visit to Gladstone, however, was the striking event, which I shall not easily forget—as an author to meet a great minister in the height of his power." ‡ Mill drew attention to the book in Parliament in a speech "in which he urged, for the sake of posterity, the present duty of making greater efforts for the reduction of the National Debt." § Indeed, the book came opportunely as political ammunition in the controversy over the Sinking Fund. Jevons had written:—

A multiplying population, with a constant void for it to fill; a growing revenue, with lessened taxation; accumulating capital, with rising profits and interest. *This is a union of happy conditions which hardly any country has before enjoyed, and which no country can long expect to enjoy.*||

Thus it was easy to invoke the proposition that we were living on our natural capital, as a reason why the times were suitable for the rapid reduction of the dead-weight debt. Yet a little reflection might have shown that, if our demand for coal was going to increase indefinitely in a geometrical ratio, our future national income would be so much greater than our present income that the dead-weight debt would become of little account. Indeed, there is not much in Jevons's scare which can survive cool criticism. His conclusions were influenced, I suspect, by a psychological trait, unusually strong in him, which many other people share, a certain hoarding instinct, a readiness to be alarmed and excited by the idea of the exhaustion of resources. Mr. H. S. Jevons has communicated to me an amusing illustration of this. Jevons held similar ideas as to the approaching scarcity of paper as a result of the vastness of the demand in relation to the supplies of suitable material (and here

* *Loc. cit.*, p. 215.

† *Loc. cit.*, p. 219.

‡ *Loc. cit.*, p. 226.

§ *Loc. cit.*, p. 222.

|| *The Coal Question*, p. 179.

again he omitted to make adequate allowance for the progress of technical methods). Moreover, he acted on his fears and laid in such large stores not only of writing-paper, but also of thin brown packing paper, that even to-day, more than fifty years after his death, his children have not used up the stock he left behind him of the latter; though his purchases seem to have been more in the nature of a speculation than for his personal use, since his own notes were mostly written on the backs of old envelopes and odd scraps of paper, of which the proper place was the waste-paper basket.*

III.

We must now turn back to Jevons's long series of inductive studies of commercial fluctuations and of prices which began with his paper "On the Study of Periodic Commercial Fluctuations, with Five Diagrams" read before the British Association in 1862.† This brief paper of less than a dozen pages marks the beginning of a new stage in economic science. Others before Jevons had noticed seasonal changes and the alternations of good and bad business. He was not the first to plot economic statistics in diagrams; some of his diagrams bear, indeed, a close resemblance to Playfair's, with whose work he seems to have been acquainted.‡ But Jevons compiled and arranged economic statistics for a new purpose and pondered them in a new way. The significance of his method may be expressed by saying that he approached the complex economic facts of the real world, both literally and metaphorically, as a meteorologist. Most of his previous papers were in fact concerned with meteorology,§ and he begins his association with economics by the declaration:—

It seems necessary, then, that all commercial fluctuations should be investigated according to the same scientific methods with which we are familiar in other complicated sciences, such especially as meteorology and terrestrial magnetism."||

* Prof. Gregory has lately recorded the similar propensity of Edwin Cannan.

† Reprinted in *Investigations in Currency and Finance.*

‡ The *Charts of Trade*, mentioned by Jevons in the passage quoted in the footnote to p. 526 below, was doubtless Playfair's *Commercial and Political Atlas*, published in 1786.

§ He had published in Waugh's *Australian Almanac* for 1859, "Some Data concerning the Climate of Australia and New Zealand," a paper over fifty pages in length, which is best described by his closing words: "My object has been to present in an available form such accurate numerical data as are attainable, and secondly, to group together general information as to the winds, rains, rivers, floods, the geographical features of the country, and the meteorological circumstances of this part of the globe, so as to show what remarkable problems have to be solved, and what interesting connections of cause and effect may ultimately be traced and proved." (*Letters and Journal*, p. 112.)

|| *Op. cit.*, p. 4.

As we shall see subsequently, Jevons was equally at home in the simplified abstractions of pure theory. But this did not blind him to the fact that the material to be handled is shifting and complicated, and will only yield up its answer if it is arranged, compared and analysed for the discovery of uniformities and tendencies. Jevons was the first theoretical economist to survey his material with the prying eyes and fertile, controlled imagination of the natural scientist. He would spend hours arranging his charts, plotting them, sifting them, tinting them neatly with delicate pale colours like the slides of the anatomist, and all the time poring over them and brooding over them to discover their secret. It is remarkable, looking back, how few followers and imitators he had in the black arts of inductive economics in the fifty years after 1862. But to-day he can certainly claim an unnumbered progeny, though the scientific flair which can safely read the shifting sands of economic statistics is no commoner than it was.

In the first instance Jevons was primarily interested in the discovery and elimination of *seasonal* fluctuations. Indeed, the title of his early paper before the British Association is misleading if it suggests that it was concerned with the trade cycle. He points out that, although there had always been an unwritten knowledge of seasonal fluctuations in the minds of business men, he was only aware of two scientific studies of such matters—Gilbart on the bank-note circulation, and Babbage on the Clearing House statistics, published in the *Statistical Journal* for 1854 and 1856 respectively; and he then proceeds to study the seasonal movements of the rate of discount, of bankruptcies, of the price of Consols and of the price of wheat. He is not yet concerned with the larger swings, and his meteorological interests have not yet led him to sunspots. Nevertheless, his study of the monthly prices of many articles since 1844 put an idea into his head. "I was so much struck with the enormous and almost general rise of prices about the year 1853, that I was led to suspect an alteration of the standard of value."* As a result, in the next year (1863) his pamphlet on *A Serious Fall in the Value of Gold* leads him, not to cyclical, but to secular movements.

The state of the subject, when this unknown young man spent his savings on printing his notions about it, was extraordinarily backward. The Californian and Australian gold discoveries had led Chevalier (in 1859) to predict a large fall in the value of gold. But the meaning to be attached to the latter phrase and the method of measurement appropriate to the problem were involved in deep obscurity. Newmarch (in 1857) and McCulloch (in 1858) doubted the existence of any depreciation in the purchasing power of gold,

* *Investigations*, p. 16.

and subsequently in the pages of the *Statistical Journal* (1859, 1860 and 1861) Newmarch had suspended judgment. Jevons had to solve the problem of price index-numbers practically from the beginning*; and it is scarcely an exaggeration to say that he made as much progress in this brief pamphlet as has been made by all succeeding authors put together. He examines the logical and dialectical problem, the question of weighting, the choice between an arithmetic and a geometric mean, whether articles which have moved abnormally should be excluded, and, generally speaking, what classes of commodities can best be taken as representative. He then compiles a series of index numbers based on the average monthly prices of thirty-nine commodities for each of the years 1845 to 1862; and supplements and checks the results by considering a further seventy-nine minor articles. His final conclusion he expressed as follows:—

While I must assert the fact of a depreciation of gold with the utmost confidence, I assign the numerical amount of it with equal diffidence. The lowest estimate of the fall that I arrive at is 9 per cent., and I shall be satisfied if my readers accept this. At the same time, in my own opinion the fall is nearer 15 per cent. It may even be more than this. Many years, however, must pass before numerical estimates can be properly stated to possess more than a slight degree of probability.†

Finally, Jevons examined the social consequences of the change in the value of money, classifying incomes according as they suffer from depreciation, estimating its effect on the Budget and the National Debt, enquiring "Whether a remedy is needful or possible," "Ought gold as a standard of value to be abandoned?" "Have the gold discoveries added to the wealth of the world?" and concluding:—

I cannot but agree with Macculloch, that, putting out of sight individual cases of hardship, if such exist, a fall in the value of gold must have, and, as I should say, has already, a most powerfully beneficial effect. It loosens the country, as nothing else could, from its old bonds of debt and habit. It throws increased rewards before all who are making and acquiring wealth. It excites the active and skilful classes of the community to new exertions, and is, to some extent, like a discharge from his debts is to the bankrupt long struggling against his burdens. All this is effected without a breach of national good faith, which nothing could compensate.‡

For unceasing fertility and originality of mind applied, with a sure touch and unflinching control of the material, to a mass of statistics, involving immense labours for an unaided individual plough-

* As was habitual with Jevons, he took great interest in discovering and recording the work of his precursors.

† *Op. cit.*, p. 17.

‡ *Investigations in Currency and Finance*, p. 96.

ing his way through with no precedents and labour-saving devices to relieve his task, this pamphlet stands unrivalled in the history of our subject. The numerous diagrams and charts which accompany are also of high interest in the history of statistical description.

Just as Jevons's study of seasonal fluctuations had led to his detection of the secular movement of prices, so his task of analysing the latter brought to the surface the character of the cyclical movements over the same period. The analysis and elimination of the latter played, indeed, an important part in his controversial objective. For the doubt which existed as to the secular depreciation of gold was due to the movement being overlaid by the price changes of the trade cycle; those who denied the long-period change in the value of the standard, ascribing the observed movements to the familiar alternation of good and bad trade. It was, therefore, necessary for Jevons to endeavour to eliminate the effect of the latter, which led him, incidentally, to date and to measure the trade cycle with a new precision. This was to lead him at a later date to famous conclusions. For the time being his observations on the underlying causes of the trade cycle, though merely *obiter dicta*, strike deeper, in my judgment, than those which he popularized later. He summed them up as follows :—

That great commercial fluctuations, completing their course in some ten years, diversify the progress of trade, is familiar to all who attend to mercantile matters. The remote cause of these commercial tides has not been so well ascertained. It seems to lie in the *varying proportion which the capital devoted to permanent and remote investment bears to that which is but temporarily invested soon to reproduce itself.**

Were a certain definite proportion of the capital of the country set apart every year for such long-dated investments, the returns of capital which they would make would be as regular as the absorption of capital. But this is not the case. It is the peculiarity of these great and permanent works to be multiplied at particular periods.†

Jevons supported this conclusion by a graph showing annually over a period of thirty-seven years the quantity of bricks made in the United Kingdom, the loads of timber imported and the price of iron—a remarkable example (in what is merely a parenthesis) of the range of Jevons's inductive curiosity and of his intense industry at this period of his life.‡

* Jevons's own italics.

† *Op. cit.*, p. 28.

‡ This parenthesis had been originally a part of the *Statistical Atlas* which he had been working at in 1861. In a letter to his brother (April 7, 1861) he wrote: "The chief interest of the work will be in the light thrown upon the commercial storms of 1793, 1815, 1826, 1839, 1847, 1857, etc., the causes of which will be rendered more or less apparent. I find that the number of Acts of Parliament, the number of patents, and the number of bricks manufactured, are the best indications of an approaching panic, which arises generally from a large investment of labour in works not immediately profitable, as machinery, canals, railways, etc. It is truly curious how well the curve of *bricks produced*

Speaking in this place, it is suitable to mention that at this point Jevons felt himself ripe to apply for membership of our body. In his Journal of June 4, 1864, he wrote:—

I am on the point of getting myself proposed and perhaps elected a Fellow of the Statistical Society, as the use of the title F.S.S., the use of the library, and possible acquaintance with other statisticians, will be of high advantage to me.*

His next contribution, *On the Variation of Prices and the Value of the Currency since 1782*, in which he further developed his theory of index numbers and carried through the immense labour of continuing his series backwards into the eighteenth century, was read before the Statistical Society in May 1865; and in the following year he read before the Society his extensive study *On the Frequent Autumnal Pressure in the Money Market, and the Action of the Bank of England*. These papers were the beginning of a close association, which in 1877 culminated in his becoming one of the secretaries of the Society and a member of the Council. By this time he was resident in London, and frequently attended our meetings. In 1880 he was appointed a Vice-President on resigning his secretaryship.

The four years from 1862 to 1866 had been a period of intense activity of mind.† Jevons was living on the money he had saved in Australia. He had no post, and had a sense of loneliness and failure. Even in the early part of 1866, when his name had been established, his Journal shows that he suffered from anxiety and depression. So is it always. In May 1866 he was appointed Professor of Logic and Mental and Moral Philosophy and Cobden Professor of Political Economy in Owens College, Manchester. "I shall now have about £300 a year from the college," he wrote in his Journal, "and nearly £108 from my own money. What can I not do with it?" But he now had much to do besides think and write; and in 1867 he married. Nearly ten years were to pass before he again attempted a major statistical enquiry.‡

shows this, bricks and mortar being the most enduring form of product. Most of the statistics, of course, are generally known, but have never been so fully combined or exhibited *graphically*. The statistics of patents, and some concerning literature, will be quite new. The mode of exhibiting numbers by curves and lines has, of course, been practised more or less any time on this side the Deluge. At the end of last century, indeed, I find that a book of *Charts of Trade* was published, exactly resembling mine in principle; but in statistics the method, never much used, has fallen almost entirely into disuse. It ought, I consider, to be almost as much used as *maps* are used in geography." (*Letters and Journal*, pp. 157, 158.)

* *Letters and Journal*, p. 199.

† In addition to what I have recorded, his *Pure Logic, or the Logic of Quality apart from Quantity, with Remarks on System and on the Relation of Logic and Mathematics* was published in 1863.

‡ His paper *On the Condition of the Gold Coinage of the United Kingdom, with reference to the question of International Currency*, read before the Statistical Society in 1868, is of secondary importance, though ingenious and laborious.

It is often forgotten how comparatively late in his career Jevons developed the theory of solar variation as the explanation of the period of the Trade Cycle, which is immortally associated with his name. It was published in two papers read before the British Association in 1875 and 1878. The first of these papers is brief and goes little further than to suggest a matter for enquiry. In 1801 Sir William Herschel had "endeavoured to discover a connection between the price of corn and the power of the sun's rays as marked by the decennial variation of the sun's spots." * In 1861 R. C. Carrington, "in his standard work upon the sun, gave a diagram comparing the price of corn with the sunspot curve during portions of the last and present centuries." † The results of both these enquiries were negative. But Arthur Schuster, Jevons's colleague at Owens College, revived the matter by pointing out "that the years of good vintage in Western Europe have occurred at intervals somewhat approximating to eleven years, the average length of the principal sunspot cycle." ‡ Thorold Rogers' *History of Agriculture and Prices in England*, which began to appear in 1866, provided Jevons with material for analysing wheat prices over a long period. The commercial crises in his own lifetime had occurred at intervals of ten or eleven years: 1825, 1836-39, 1847, 1857, 1866. Might there not be a connection between these things? "I am aware," Jevons concluded, "that speculations of this kind may seem somewhat far-fetched and finely-wrought; but financial collapses have recurred with such approach to regularity in the last fifty years, that either this or some other explanation is needed." § Nevertheless, he soon repented of publishing what was no better than a bright idea. "Subsequent enquiry convinced me that my figures would not support the conclusion I derived from them, and I withdrew the paper from publication." ||

The virus, however, had entered into his system. No one who has once deeply engaged himself in coincidence-fitting of this character will easily disembarrass himself of the enquiry. In 1878 Jevons returned to it in his second paper before the British Association, and in an article contributed to *Nature* in which the argument was recapitulated. Three new discoveries were his excuse. In the first place, he had succeeded in carrying back the history of commercial crises at ten- or eleven-year intervals almost to the beginning of the eighteenth century. In the second place, he was now advised by his astronomical friends that the solar period was not

* *Investigations*, p. 206.

† *Op. cit.*, p. 195.

‡ *Op. cit.*, p. 195.

§ *Op. cit.*, p. 204.

|| *Op. cit.*, p. 207. The paper was reprinted posthumously in the *Investigations in Currency and Finance*.

11.1 years, as he had previously supposed, but 10.45 years, which fitted much better his series of commercial crises. In the third place, he now abandoned European harvests, the price statistics for which yielded negative results, as the intermediary through which sunspots affected business, in favour of Indian harvests, which, he argued, transmitted prosperity to Europe through the greater margin of purchasing power available to the Indian peasant to buy imported goods.*

Jevons's argument is by no means so clear as is usual with him. He produced considerable evidence for the view that commercial crises had occurred at intervals of about $10\frac{1}{2}$ years. The astronomers told him that the solar period was about $10\frac{1}{2}$ years. This "beautiful coincidence," as he called it, produced in him an unduly strong conviction of causal nexus. "I beg leave to affirm," he wrote in his article for *Nature*, "that I never was more in earnest, and that after some further careful enquiry, I am perfectly convinced that these decennial crises do depend upon meteorological variations of like period."† But he devoted far too little attention to the exact dating of deficient harvests in relation to the dating of commercial crises, which was a necessary first step to tracing the intermediate links. In his paper of 1875, when he believed his evidence to depend on European harvests, he discovered the link in the spirit of optimism produced by good crops:—

Mr. John Mills in his very excellent papers upon Credit Cycles in the *Transactions of the Manchester Statistical Society* (1867-68) has shown that these periodic collapses are really mental in their nature, depending upon variations of despondency, hopefulness, excitement, disappointment and panic.‡ . . . Assuming that variations of commercial credit and enterprise are essentially mental in their nature, must there not be external events to excite hopefulness at one time or disappointment and despondency at another? It may be that the commercial classes of the English nation, as at present constituted, form a body suited by mental and other conditions to go through a complete oscillation in a period nearly corresponding to that of the sunspots. In such conditions a comparatively slight variation of the prices of food, repeated in a similar manner, at corresponding points of the oscillation, would suffice to produce violent effects.§

But in 1878 he described this theory as a "rather fanciful hypothesis,"|| and made everything to depend on the decennial fluctuations in foreign trade consequent on cyclical crop changes in India and

* Mr. J. C. Ollerenshaw had explained in a communication to the Manchester Statistical Society in 1869 "that the secret of good trade in Lancashire is the low price of rice and other grain in India" (*op. cit.*, p. 236).

† *Op. cit.*, p. 235.

‡ Already in 1869 (in his Inaugural Address to the Manchester Statistical Society) Jevons had adopted Mills's theory of the trade cycle.

§ *Op. cit.*, pp. 203-4.

|| *Op. cit.*, p. 226.

elsewhere. Unfortunately this involved a difficulty in dating which he passes over with surprising levity :—

One difficulty which presents itself is that the commercial crises in England occur simultaneously with the high prices in Delhi, or even in anticipation of the latter; now the effect cannot precede its cause, and in commercial matters we should expect an interval of a year or two to elapse before bad seasons in India made their effects felt here. The fact, however, is that the famines in Bengal appear to follow similar events in Madras.*

Thus the details of the inductive argument are decidedly flimsy. If, however, it could be established that, generally speaking and on the average of different crops and countries, years when the world draws for current consumption on the stocks carried forward from one harvest to another alternate, in accordance with the solar period, with years when bountiful harvests serve to increase the stocks carried forward, Jevons could have linked his thesis, on the broadest possible grounds, with his forgotten theory of 1863 that the trade cycle depended on fluctuations of investment. For alternating investment and disinvestment in the aggregate stocks of the produce of the soil held in excess of current consumption might be capable of consequences closely analogous to those he had previously ascribed to fluctuations in the rate of new investment in durable goods.

Whether or not Jevons was wrong or rash in the hypotheses he framed on the basis of his inductive studies, it was a revolutionary change, for one who was a logician and a deductive economist, to approach the subject in this way. By using these methods Jevons carried economics a long stride from the *à priori* moral sciences towards the natural sciences built on a firm foundation of experience. But the material of economics is shifting as well as complex. Jevons was pursuing a singularly difficult art, and he has had almost as few successors as predecessors, who have attained to his own level of skill.

The sun-spot papers cannot be ranked on at all the same plane of genius or of achievement as *A Serious Fall in the Value of Gold*. Since his time, unfortunately for his conclusions, the astronomers have reverted to 11.125 as the average of the solar period,† whilst the trade cycles have recurred at intervals of 7 or 8, rather than of 10 or 11 years. In 1909 the problem was reconsidered in an ingenious manner by his son Prof. H. S. Jevons,‡ who argued that the harvest

* *Op. cit.*, pp. 239–40.

† Whilst this is now believed to be the *average* interval, it is not a uniform one; and over the limited period which Jevons had particularly examined the average interval actually was, as he believed, about 10.45 years.

‡ *The Sun's Heat and Trade Activity*, supplemented by his paper on "The Causes of Fluctuations of Industrial Activity and the Price-level," *Statistical Journal* (1933), vol. XCVI, pp. 545–605.

statistics could be interpreted in terms of a $3\frac{1}{2}$ -year cycle, which was combined in twos or threes to produce either 7- or $10\frac{1}{2}$ -year periods. This was followed up after the War by Sir William Beveridge's much more elaborate studies of harvest statistics, which led him to the conclusion of a complex 15.2-years period which he further analysed into sub-periods.* It is now generally agreed that, even if a harvest period can be found associated with the solar period or with more complex meteorological phenomena, this cannot afford a complete explanation of the trade cycle. The theory was prejudiced by being stated in too precise and categorical a form. Nevertheless, Jevons's notion, that meteorological phenomena play a part in harvest fluctuations and that harvest fluctuations play a part (though more important formerly than to-day) in the trade cycle, is not to be lightly dismissed.

IV.

Meanwhile Jevons was contributing with equal originality to the study of deductive economics based on simplified and abstract assumptions. His thoughts can be traced back to his period of solitary thought in Australia in 1858-9 when he was 22 or 23 years old.† By 1860, when he was working at University College, a definite theory was taking shape in his mind. On June 1, 1860, he wrote to his brother Herbert:—

During the last session I have worked a good deal at political economy; in the last few months I have fortunately struck out what I have no doubt is *the true Theory of Economy*, so thorough-going and consistent, that I cannot now read other books on the subject without indignation. While the theory is entirely mathematical in principle, I show, at the same time, how the data of calculation are so complicated as to be for the present hopeless. Nevertheless, I obtain from the mathematical principles all the chief laws at which political economists have previously arrived, only arranged in a series of definitions, axioms, and theories almost as rigorous and connected as if they were so many geometrical problems. One of the most important axioms is, that as the quantity of any commodity, for instance, plain food, which a man has to consume, increases, so the utility or benefit derived from the last portion used decreases in degree. The decrease of enjoyment between the beginning and end of a meal may be taken as an example. And I assume that on an average, the *ratio of utility* is some continuous mathematical function of the quantity of commodity. This law of utility has, in fact, always been assumed by political economists under the

* Published in articles in the *Economic Journal* in 1920 and 1921 and in the *Statistical Journal* in 1922. In the discussion at the Statistical Society serious objections were raised by Mr. Yule and others to the further analysis of the (apparent) 15.2-years period.

† In December 1862 he wrote in his Journal: "I thought what I did very clever then (*i.e.* in Sydney), but it seems foolishness to me now and my first efforts at a theory of economy look strange beside the theory which has gradually opened before me."

more complex form and name of the Law of Supply and Demand. But once fairly stated in its simple form, it opens up the whole of the subject. Most of the conclusions are, of course, the old ones stated in a consistent form; but my definition of capital and law of the interest of capital are, as far as I have seen, quite new. I have no idea of letting these things lie by till somebody else has the advantage of them, and shall therefore try to publish them next spring.*

More than two years passed by, however, before the outline of his theory was made public. Jevons sent a short paper entitled *Notice of a General Mathematical Theory of Political Economy* to Section F of the British Association to be read in his absence before the 1862 Meeting held at Cambridge, where Marshall was an undergraduate in his first year. He had no diffidence about its worth and high, though doubtful, hopes about its effect. He wrote to his brother in September 1862:—

Although I know pretty well the paper is perhaps worth all the others that will be read there put together, I cannot pretend to say how it will be received—whether it will be read at all, or whether it won't be considered nonsense. . . . I am very curious, indeed, to know what effect my theory will have both upon my friends and the world in general. I shall watch it like an artilleryman watches the flight of a shell or shot, to see whether its effects equal his intentions.†

The paper attracted no attention whatever and was not printed, the Secretary of the British Association writing to him that “a further explanation and publication of the above-mentioned theory is deferred until a more suitable period for establishing a matter of such difficulty.” Four years later it was published in the *Statistical Journal* (June 1866), where it occupies about five pages.‡ Though to a modern reader Jevons's 27 paragraphs are perfectly lucid, they are little more than an abstract or syllabus of a complete theory. But the substance of all his subsequent ideas is there. A hedonistic calculus allows us to balance the utility of consumption against the disutility of labour. The price of a commodity is determined not by its aggregate utility but by balancing the marginal utility of its consumption, or, as he here expresses it, “the *co-efficient of utility* (which) is the ratio between the last increment or infinitely small supply of the object, and the increment of pleasure which it occasions,” against the marginal disutility of its production, “labour (being) exerted both in intensity and duration until a further increment will be more painful than the increment of produce thereby obtained is” pleasurable.”§ The amount of capital is estimated by the amount of utility of which the enjoyment is deferred. . . . As labour must be supposed to be aided with some

* *Letters and Journal*, p. 151.

† *Loc. cit.*, p. 169.

‡ Reprinted (as an appendix) in the fourth edition of Jevons's *Theory of Political Economy*, edited by H. S. Jevons in 1911.

§ *Statistical Journal* (1866), vol. XXIX, pp. 283, 284.

capital, the rate of interest is always determined by the *ratio which a new increment of produce bears to the increment of capital by which it was produced.*"* In a concluding sentence the extent of his departure from the classical school is indicated: "The interest of capital has no relation to the absolute returns to labour, but only to the increased return which the last increment of capital allows."†

Another five years passed by before this abstract, which had attracted no more attention than at its first reading, was fully clothed, *The Theory of Political Economy* being published in October 1871. Prof. H. S. Jevons records‡ that "according to one of my father's MS. notes,§ the publication might have been delayed considerably later than 1871 had it not been for the appearance in 1868 and 1870 of articles by Professor Fleeming Jenkin." The book follows very closely both the order and substance of the abstract of nearly ten years before. But it carries out what was only the promise of the latter to "reduce the main problem of this science to a mathematical form," by introducing diagrams and expressing the argument in mathematical form with a frequent use of the notation of the differential calculus.

Jevons's *Theory of Political Economy* and the place it occupies in the history of the subject are so well known that I need not spend time in describing its contents. It was not as uniquely original in 1871 as it would have been in 1862. For, leaving on one side the precursors Cournot, Gossen, Dupuit, Von Thünen and the rest, there were several economists, notably Walras and Marshall, who by 1871, were scribbling equations with x 's and y 's, big Deltas and little d 's. Nevertheless, Jevons's *Theory* is the first treatise to present in a finished form the theory of value based on subjective valuations, the marginal principle and the now familiar technique of the algebra and diagrams of the subject. The first modern book

* *Loc. cit.*, p. 286.

† *Loc. cit.*, p. 287.

‡ In editing the fourth edition of *The Theory*, p. lvii.

§ This note (as nearly as I can decipher it—written, as usual, on the back of an old envelope) runs as follows:—

"In regard to this & certain other essays of Professor Fleeming Jenkin, it seems desirable that I should make the following explanation, to prevent misapprehension. My theory was originally read at the Brit. Assoc. in 1862, & printed in the Stat Journal in 1867 (*sic*). In March 1868 Prof Jenkin wrote an article for the Br. Quarterly Review (*sic*) in which he restated (?) . . . the law of supply & demand in math language. He courteously sent a copy to me and requested my opinion thereon; in replying I sent a copy of the paper mentioned above, & a correspondence ensued concerning the correctness of the theory, in the course of which curves were used in illustration by both parties.

In 1870 appeared Prof. Jenkins "Graphic Illustration (*sic*)" in which no reference is made to my previous (?).

Partly in consequence of this I was led to write & publish the Theory in 1871.

In 1872 Prof. Fleeming Jenkin published in the Proceedings of the Roy Soc Edin (?)."

on economics, it has proved singularly attractive to all bright minds newly attacking the subject;—simple, lucid, unfaltering, chiselled in stone where Marshall knits in wool. Let me open it almost at random and quote you a passage to remind you of its quality:—

The fact is, that *labour once spent has no influence on the future value of any article*: it is gone and lost for ever. In commerce by-gones are for ever by-gones; and we are always starting clear at each moment, judging the values of things with a view to future utility. Industry is essentially prospective, not retrospective; and seldom does the result of any undertaking exactly coincide with the first intentions of its promoters.

But though labour is never the cause of value, it is in a large proportion of cases the determining circumstance, and in the following way: *Value depends solely on the final degree of utility. How can we vary this degree of utility?—By having more or less of the commodity to consume. And how shall we get more or less of it?—By spending more or less labour in obtaining a supply.* According to this view, then, there are two steps between labour and value. Labour affects supply, and supply affects the degree of utility, which governs value, or the ratio of exchange. In order that there may be no possible mistake about this all-important series of relations, I will re-state it in a tabular form, as follows:

*Cost of production determines supply ;
Supply determines final degree of utility ;
Final degree of utility determines value.**

In recent times Jevons has received special praise for his Theory of Capital, inasmuch as he anticipated the Austrian School by emphasizing as two distinct dimensions the quantity of capital and the period for which it has to be employed in order to yield up its product. Nevertheless, his treatment as a whole is somewhat vitiated (as Prof. Robbins has pointed out) by echoes of “wage-fund” ideas. Capital, according to Jevons, “consists merely in the aggregate of those commodities which are required for sustaining labourers of any kind or class engaged in work.” † He prefers to say, “not that a factory, or dock, or railway, or ship *is capital*, but that *it represents so much capital sunk in the enterprise.*” “Accordingly, I would not say that a railway *is fixed capital*, but that *capital is fixed in the railway.* The capital is not the railway, but the food of those who made the railway.” ‡ On the other hand, there are admirable passages where he conceives of capital as being measured on the supply side by the amount of the present utility foregone and on the demand side by the discounted value of the future utilities expected from it.

It is somewhat surprising that even the book did not win any immediate success.§ The only reviews of importance were those by Cairnes, representing the older generation, and by Alfred Marshall,

* *Theory of Political Economy*, p. 164.

† *Theory of Political Economy* (4th ed.), p. 223.

‡ *Op. cit.*, p. 243.

§ Seven years passed before it had sold 1,000 copies.

representing the younger, in what was the latter's first appearance in print. Cairnes declared that ignorance of mathematics made most of the book unintelligible to him, but this did not prevent him from concluding that it was all wrong. Marshall's review was tepid and grudging. "We may read far into the present book," he wrote, "without finding any important proposition which is new in substance." * "The main value of the book does not lie in its more prominent theories, but in its original treatment of a number of minor points, its suggestive remarks and careful analogies." † And he characteristically concludes: "The book before us would be improved if the mathematics were omitted, but the diagrams retained." ‡ Jevons, writing to a correspondent, commented as follows: "There was indeed a review in the *Academy* of 1st April, 1872, but though more fair than that of the *Saturday Review*, it contained no criticism worthy of your notice." § So late as 1874 Jevons wrote:—

While I am not aware that my views have been accepted by any well-known English economist, there are a certain number of younger mathematicians and economists who have entered into the subject, and treated it in a very different manner. Among these I may mention Mr. George Darwin, the son of the eminent naturalist; he is a very good mathematician and an acute economist. ||

The relations between Jevons and Marshall are of some interest. Nearly twenty years later, and eight years after Jevons's death, the references to Jevons in the *Principles* are still somewhat grudging. ¶ Marshall was extraordinarily reluctant to admit that he owed anything to Jevons. There is no evidence that Jevons was aware of the authorship of the *Academy* review. He never visited Cambridge before 1874, when he first examined in the Moral Sciences Tripos. "The only time I saw him," Mrs. Marshall writes to me, "was in 1874 when he was one of my examiners and gave rise to Dr. Kennedy's lines:

"Were they at sixes and at sevens?
Oh Pearson Gardiner Foxwell Jevons." **

* *Memorials of Alfred Marshall*, p. 94.

† *Loc. cit.*, p. 95.

‡ *Loc. cit.*, p. 99.

§ *Letters and Journal*, p. 309.

|| *Loc. cit.*, p. 311 (in the same letter as that from which the immediately preceding quotation is taken).

¶ *Vide my Essays in Biography*, pp. 186-188.

** When *The Economics of Industry*, by Alfred and Mary Marshall, was published in 1879, the authors sent Jevons a copy, which is now in the possession of his son. At the beginning and at the end Jevons has pasted in letters from Marshall. In the first of these, printed in *Memorials of Alfred Marshall*, p. 371, Marshall speaks of "the results of abstract quantitative reasoning in Economics of which I recognize in you the chief author." The second responds to Jevons's acknowledgment of the book and begins: "My dear Jevons, My wife and I have often wondered what you would think of our book; we were more anxious for your good opinion of it than for anyone else's. . . ." When Marshall applied for an appointment at Bristol (1877), Jevons furnished him with a testimonial (*vide my Essays in Biography*, p. 195).

He was, of course, close friends with Professor Foxwell, with whom he frequently corresponded, and whom he again visited at Cambridge towards the end of 1880. In a letter of Jevons's to Professor Foxwell written in 1875 and again in 1879 there are echoes of talk in which Professor Foxwell seems to have been advancing Marshall's claims. In 1875 Jevons writes :—

I have been very much interested in your letter concerning my paper. It has told me much, which I had no previous means of knowing, concerning the ideas current in philosophical subjects in Cambridge. I was not aware that Marshall had so long entertained notions of a quantitative theory of political economy, and think it a pity that he has so long delayed publishing something on the subject.

It is, of course, open to you or him or others to object to the special way in which I have applied mathematics, and I should like to see other attempts in different directions, but what I contend is that my notion of utility is the correct one, and the only sound way of laying the foundation for a mathematical theory.*

And in 1879 :—

As regards the analogy of the laws of wages and rents, of course I do not know what Marshall gave in his lectures in 1869, as I neither attended them nor have seen notes, unless, indeed, the answers of some of the candidates. But I do not remember that they said anything on the matter. . . .

As regards Marshall's originality, I never called it in question in the slightest degree, having neither the wish nor the grounds. On the other hand, you seem to forget that the essential points of my theory were fully indicated as far back as 1862, at the Cambridge Meeting of the British Association. I have no reason to suppose that Marshall saw any printed report of my first brief paper; but of course, on the other hand, in my book of 1871 (*Theory of Political Economy*) I could not possibly have borrowed anything from Marshall. But these questions are really of little or no importance now that we have found such earlier books as those of Gossen, Cournot, Dupuit, etc. We are all shelved on the matter of priority, except, of course, as regards details and general method of exposition, etc.†

Jevons omits to point out that an abstract of his whole theory had been printed in the *Statistical Journal* in 1866—not a very obscure source. Indeed, it was preposterous to suggest that Jevons could have derived anything from Marshall. But for more than another decade after Jevons wrote the above, “ what Marshall gave in his lectures in 1869 ” was to be an inhibition and a taboo on the publications of others. In later years Marshall was, perhaps, a little uneasy whether a certain fundamental lack of sympathy had led him to do injustice to Jevons. The following undated ‡ fragment was found amongst his papers :—

I looked with great excitement for Jevons's *Theory*: but he gave me no help in my difficulties and I was vexed. I have since learnt to estimate him better. His many-sidedness, his power of combining

* *Letters and Journal*, p. 331.

† *Loc. cit.*, p. 408.

‡ Apparently written in 1897.

statistical with analytical investigations, his ever fresh honest sparkling individuality and suggestiveness impressed me gradually; and I reverence him now as among the very greatest of economists. But even now I think that the central argument of his *Theory* stands on a lower plane than the work of Cournot and von Thünen. They handled their mathematics gracefully: he seemed like David in Saul's armour. They held a mirror up to the manifold interactions of nature's forces: and, though none could do that better than Jevons when writing on money or statistics or on practical issues, he was so encumbered by his mathematics in his central argument, that he tried to draw nature's actions out into a long queue. This was partly because the one weakness of his otherwise loyal and generous character showed itself here: he was impressed by the mischief which the almost pontifical authority of Mill exercised on young students; and he seemed perversely to twist his own doctrines so as to make them appear more inconsistent with Mill's and Ricardo's than they really were. But the genius which enabled Ricardo—it was not so with Mill—to tread his way safely through the most slippery paths of mathematical reasoning, though he had no aid from mathematical training, had made him one of my heroes; and my youthful loyalty to him boiled over when I read Jevons' *Theory*. The editor of the *Academy* having heard that I had been working on the same lines, asked me to review the book: and, though a quarter of a century has passed, I have a vivid memory of the angry phrases which would force themselves into my draft, only to be cut out and then reappear in another form a little later on, and then to be cut out again. . . . On many aspects of economics I have learnt more from Jevons than from any one else. But the obligations which I had to acknowledge in the Preface to my *Principles* were to Cournot and von Thünen and not to Jevons.*

This passage brings to the surface a deeper cause of the lack of sympathy between these two founders of modern economics than a sense of rivalry arising out of the similarity of their approach—namely, out of their *dissimilarity* in standing, each with the deep emotion which the subject commands, on opposite sides in the still unresolved debate whether Ricardo was a true or a false prophet. In 1875 Jevons wrote to Professor Foxwell:—

“I am beginning to think very strongly that the true line of economic science descends from Smith through Malthus to Senior, while another branch through Ricardo to Mill has put as much error into the science as they have truth.”† And the preface to the second edition of his *Theory of Political Economy* (1879) concludes as follows:—

When at length a true system of Economics comes to be established, it will be seen that that able but wrong-headed man, David Ricardo,

* *Memorials of Alfred Marshall*, p. 99. To this may be added Marshall's tribute to Jevons printed by Professor Foxwell in his introduction (p. xliii) to the *Investigations in Currency and Finance*, to the effect that the great body of Jevons's work “will probably be found to have more constructive force than any save that of Ricardo, that has been done during the last hundred years,” and that “the pure honesty of Mr. Jevons's mind, combined with his special intellectual fitness for the work, have made them models for all time.”

† *Letters and Journal*, p. 344.

shunted the car of Economic science on to a wrong line, a line, however, on which it was further urged towards confusion by his equally able and wrong-headed admirer John Stuart Mill. There were Economists, such as Malthus and Senior, who had a far better comprehension of the true doctrines (though not free from the Ricardian errors), but they were driven out of the field by the unity and influence of the Ricardo-Mill school. It will be a work of labour to pick up the fragments of a shattered science and to start anew, but it is a work from which they must not shrink who wish to see any advance of Economic Science.*

The violence of Jevons's aversion to Mill, pursued almost to the point of morbidity, is well known. All Jevons's nonconformist heredity rose up against the orthodoxy which the prestige of Mill in the 'sixties and 'seventies imposed on the subject and particularly on its educational side. He wrote to a correspondent in 1874 :—

I fear it is impossible to criticize Mr. Mill's writings without incurring the danger of rousing animosity, but I hope and believe you are right in saying that I have said nothing from petulance or passion. Whatever I have said or shall say of Mr. Mill is due to a very long consideration of his works, and to a growing conviction that, however valuable they are in exciting thought and leading to the study of social subjects, they must not be imposed upon us as a new creed.†

Of the younger men with whom he was intimate, he fully converted Professor Foxwell to his point of view, and it was a bond of sympathy. But he could not forgive Edgeworth, with whom he used to walk on Hampstead Heath, by which they both lived in the last years of his life, for being "still deep in the fallacies of Mill." The aversion had some of its roots, I think, in a personal experience. In 1860, shortly after his return from Australia, he was working at University College for the B.A. degree. At this time his own theories were seething in his head.‡ In his heart he believed himself to be in embryo the only economist in the world with a conception of the truth. This was a dangerous state of mind for an examinee, and after the College Examinations in June, 1860, he has to confess :—

In political economy I had a sad reverse, such indeed as I never had before, for in spite of having studied the subject independently and originally, and having read some dozens of the best works in it, almost neglecting other classes for the purpose, I was placed third or fourth when I felt confident of the first prize. This I can only attribute to a difference of opinion, which is perfectly allowable, having prejudiced the professor against my answers. However, I shall fully avenge myself when I bring out my *Theory of Economy*, and re-establish the science on a sensible basis.§

It is interesting to record that the first prize was awarded to H. H. Cozens-Hardy, afterwards Master of the Rolls, who was,

* *Theory of Political Economy* (2nd ed.), p. lvii.

† *Letters and Journal*, p. 329.

‡ Cf. the letter to his brother written at this time from which I have quoted above, p. 531.

§ *Letters and Journal*, p. 154.

however, three years Jevons's junior, and that in the examination for the Ricardo Scholarship in Political Economy, a few months later in the same year, Jevons defeated Cozens-Hardy and was awarded the scholarship.* Moreover in the June examination in Philosophy of Mind and Logic Jevons was bracketed first (with Theodore Waterhouse). So he had not, in fact, much to complain of. Nevertheless the effect on his mind was curious. The students whom he had to teach when he became Professor at Owens College were accustomed to sit for the London examinations. As he thought it would be unfair to expose his own pupils to the rebuff he himself had suffered, his conscience did not allow him to teach them his own characteristic doctrine. His courses at Manchester were mainly confined to an exposition of Mill.† I had long ago heard this from my father, and how this repression of his own theories had brought his feeling against Mill to boiling point. A book of careful lecture notes taken down by a member of his class, which I lately came across, confirms that this was so.‡

* This and other information relating to the teaching of Economics at University College has been very kindly supplied to me by Miss C. E. Collet (who was examined by Jevons in 1880 in the philosophical subjects for the London B.A.). She tells me that the sessional examination was confined to the work done during the year under the Professor (Jacob Waley, who was more of a lawyer than an economist), and gave little scope for showing superiority outside this course, whereas the scholarship examination was wider and brought in an external examiner (R. H. Hutton in 1860, Bagehot having been the external examiner in the previous year). The actual papers set are to be found in the U.C.L. Calendars for 1860-1 and 1861-2.

† In explaining his methods of teaching at Owens College (*Letters and Journal*, p. 284) he writes: "I have generally followed somewhat the order of subjects in Mill's Pol. Econ. in perfect independence, however, of his views and methods when desirable. In the subject of currency I have always abandoned his book altogether." But this fell far short, I believe, of his venturing to teach the marginal principle and other characteristic doctrines of his own *Theory*; whilst on currency his own outlook did not differ significantly from Mill's. Cf. also *Letters and Journal*, p. 409, where many years later (1879) he defended his recommendation of Mill's *Political Economy* for the Bankers' Institute examinations on the ground that "it is one thing to put forward views for rational judgment of competent readers, it is another thing to force these views on young men by means of examinations." Miss Collet tells me that, since Political Economy was a subject only for the London M.A. degree and not for the London B.A., those of Jevons's pupils at Owens College who sat for the London examinations in Political Economy were very few indeed as compared with those who sat in Logic for the B.A. examination, and she argues that Jevons's irritation against Mill was concerned more with his Logic than with his Political Economy. But there can, I think, be little doubt as to the strength of Jevons's hostility to Mill's *Political Economy*, at least equally with his Logic.

‡ Some qualification to the above is suggested by the following note appended by Jevons in his list of his mathematico-economic books: "From about the year 1863 I regularly employed intersecting curves to illustrate the determination of the market price in my lectures at Owens College." The lecture notes referred to above do, indeed, include a sketch of a demand curve, but the accompanying text contains no reference to the marginal principle.

V.

In my memoir of Alfred Marshall I called attention to the many-sidedness which seems to be a necessary equipment for an economist.* Jevons was certainly a notable example of this. To his scientific and experimental training which led him to his inductive studies and his logical and analytical bent which led him to his deductive studies there was added an unusually strong historical, and even antiquarian, bias. From his earliest days Jevons had a native inclination to carry his inductive studies backwards in point of time, and to discover the historical origins of any theory in which he was interested. This is first apparent in the quantity of historical material with which he adorned the *Coal Question*, material much of which it would have occurred to few other authors to bring in. He carried back his series of index numbers into the eighteenth century. When he came to study solar variations, he traced back the history of the trade cycle to the beginning of the eighteenth century and examined harvest statistics over many centuries. Thus in the field of economic history he made himself a pioneer in the history of prices and of trade fluctuations.

In the history of economic thought and theory he was even more deeply interested. In every branch of the subject that he touched he sought out the unknown or forgotten precursors of his favourite theories. His most brilliant contribution in this field was his discovery of the work and significance of Cantillon; whilst his most substantial contribution was his pioneer work in economic bibliography summed up in his hand-list of "Mathematico-Economic Books, Memoirs, and other published Writings," printed as an appendix to the second edition of his *Theory of Political Economy* and in his handlist of writings on monetary problems appended to the *Investigations in Currency and Finance*.

Beyond this, Jevons was a born collector, the first of the distinguished tribe of economic bibliomaniacs who have contrived to set a fashion amongst librarians which has entitled the booksellers to run the obscurest fragments of economic literature up to fancy

* There are many passages which show Jevons's own awareness of the complex qualities required by an economist. Vide *Letters and Journal*, p. 101 (also pp. 116-18): "*Economy*, scientifically speaking, is a very contracted science; it is in fact a sort of vague mathematics which calculates the causes and effects of man's industry, and shows how it may best be applied. There are a multitude of allied branches of knowledge connected with man's condition; the relation of these to political economy is analogous to the connection of mechanics, astronomy, optics, sound, heat, and every other branch more or less of physical science, with pure mathematics. . . . There are plenty of people engaged with physical science, and practical science and arts may be left to look after themselves, but thoroughly to understand the principles of society appears to me now the most cogent business."

figures. Jevons invented the collecting of obscure economic books and pamphlets; though it was, of course, Lord Macaulay who first drew attention to their importance as historical sources. Professor Foxwell* first caught the affliction from him; though Jevons never paid high prices or proceeded to the extremest stages where condition and collector's "points" are paramount,—his was primarily a far-flung working library for which any usable copy would do. Nevertheless, there are entries scattered through his letters tantalizing to the modern collector. On April 8, 1879, he writes to his wife from The Three Swans, Salisbury:—

I have done a great stroke in book-buying, having bought a remarkable collection of nearly five hundred economical and political pamphlets at about a halfpenny each. Some of them are evidently valuable and rare. One of them contains copperplate diagrams of prices for some centuries. One or two are by Robert Owen. I also got a carefully-written list of them all, as good as a catalogue.†

In 1881 he writes from Paris:—

A large part of my time has been taken up in book-hunting on the banks of the Seine. I have secured almost a trunkfull of books on economics, of much scientific and historic value, but often at ridiculously low prices.‡

His wife records:—

On a leisure afternoon he thoroughly enjoyed making a round of several old bookshops, and his kindly, courteous manners—as courteous always to his inferiors in position as to those of his own station—were fully appreciated by the owners. At two at least of the shops which he most frequented he was regarded as a friend, and the booksellers took a pleasure in looking out at the sales they attended for the books they thought might suit him, reserving them from their other customers until he had seen them.§

By the end of his life he had accumulated several thousand volumes, lining the walls and passages of the house and packed in heaps in the attics, an embarrassment to his wife and family both then and in their subsequent removals. These latter led to the gradual dispersal of the books. In 1907 the Library of Owens College, Manchester, was given the first choice to take what they wanted and some 2,400 volumes are incorporated in that library with a special label. After

* "Why," said Jevons to Foxwell one day, "don't you walk sometimes down Great Portland Street" (then a centre of the secondhand booksellers, especially where it joins the Euston Road, as it is to-day of secondhand cars), "there are few days I don't find something there." And that, Prof. Foxwell tells me, was the beginning. In 1881 he wrote to Prof. Foxwell: "I hear of you at the booksellers' occasionally, and fancy you must be getting a good collection of economic books," a remark which has remained a *propos* any day in the fifty-five years since then.

† *Letters and Journal*, p. 397.

‡ *Letters and Journal*, p. 428.

§ *Letters and Journal*, p. 436.

that the Library of University College, London, was given the opportunity to take some hundreds. Out of the residue his son, Prof. H. S. Jevons maintained a working collection, mainly of the more modern books, which he added to the notable economics library which he had built up at the University of Allahabad, when he gave up his Professorship there. Jevons also had a collection of old bank-notes which he described as "such a collection as probably hardly anyone else has."*

VI.

We have now traversed Jevons's outstanding contributions to Economics and Statistics. But we are far from having surveyed the whole of his work. During his lifetime the reputation of Jevons as a logician stood nearly as high as his reputation as an economist. The English school of Logic of the post-Mill period has not held its own in the judgment of modern opinion, and the interest of Jevons's work has declined along with that of his contemporaries. But during the second phase of his work from about 1866 to 1876 logic occupied a large part of his time and thought, and also (so long as he was at Owens College) of his teaching duties. More than half of the books published during his lifetime related to logic. One of them, *The Principles of Science, A Treatise on Logic and Scientific Method*, is his largest work, and was widely used for many years. Nevertheless, the part Jevons played in the development of logic is in no way comparable to his position in the history of Economics and Statistics. It is, however, no part of my present task to review his contributions to knowledge in that field.

In the last decade of his life he discovered in himself a remarkable aptitude for writing in a simple, clear and interesting style the elementary outlines of his favourite subjects. Apart from numerous editions printed in America and in six or seven foreign languages, there have sold up to the present time 130,000 copies of his *Elementary Lessons in Logic* (published in 1870), 148,000 copies of his *Primer of Logic* (1876), and 98,000 copies of his *Primer of Political Economy* (1878). Another elementary book, though on a somewhat larger scale, his *Money and the Mechanism of Exchange* (1875), has sold about 20,000 copies in this country, apart from large sales in America, where there was at one time a cheap pirated edition. For a period of half a century practically all elementary students both of Logic and of Political Economy in Great Britain and also in India and the Dominions were brought up on Jevons. His little books involve few perplexities, are never dull, and give the effect of lucidity and certainty of outlook without undue dogmatism,—indeed ideal for the

* *Op. cit.*, p. 421.

purpose. Simple and definite examination questions can be set upon them;—no blame to them in the eyes of Jevons, who was, rightly, a great believer in the system of examinations which was one of the great contributions of his generation to education and administration. The conclusion of his article on “Cram,” published in *Mind* (1877), is worth quoting:—

I should not venture to defend University examinations against all the objections which may be brought against them. My purpose is accomplished in attempting to show that examination is the most effective way of enforcing a severe and definite training upon the intellect, and of selecting those for high position who show themselves best able to bear this severe test. It is the popular cry against “Cram” that I have answered, and I will conclude by expressing my belief that any mode of education which enables a candidate to take a leading place in a severe and well-conducted open examination, must be a good system of education. Name it what you like, but it is impossible to deny that it calls forth intellectual, moral, and even physical powers, which are proved by unquestionable experience to fit men for the business of life.

This is what I hold to be Education. We cannot consider it the work of teachers to make philosophers and scholars and geniuses of various sorts: these, like poets, are born, not made. Nor, as I have shown, is it the business of the educator to impress indelibly upon the mind the useful knowledge which is to guide the pupil through life. This would be “Cram” indeed. It is the purpose of education so to exercise the faculties of mind that the infinitely various experience of after-life may be observed and reasoned upon to the best effect. What is popularly condemned as “Cram” is often the best-devised and best-conducted system of training towards this all-important end.*

Finally, in the last period of his life Jevons became much interested in the relation of the State to the economic life of the community. On the side of morals and sentiment Jevons was, and always remained, an impassioned individualist. There is a very odd early address of his, delivered to the Manchester Statistical Society in 1869,† in which he deplores free hospitals and medical charities of all kinds, which he regarded as undermining the character of the poor (which he seems to have preferred to, and deemed independent of, their health). “I feel bound,” he said, “to call in question the policy of the whole of our medical charities, including all free public infirmaries, dispensaries, hospitals, and a large part of the vast amount of private charity. What I mean is that the whole of these charities nourish in the poorest classes a contented sense of dependence on the richer classes for those ordinary requirements of life which they ought to be led to provide for themselves.” Perhaps it would brace us and strengthen us if we could feel again those astringent sentiments, and face that vigorous East wind, believing so firmly in the future as to make almost anything tolerable in the present.

* Reprinted in *Methods of Social Reform*, p. 99.

† Reprinted in *Methods of Social Reform*.

For the feeling behind this Victorian hardness was grand. "We cannot be supposed," Jevons concludes, "yet to have reached a point at which the public or private charity of one class towards another can be dispensed with, but I do think we ought to look towards such a state of things. True progress will tend to render every class self-reliant and independent."

Nevertheless, considerations of expediency influenced Jevons, as time went on, to move just a little to the Left, though never to nearly the extent that Mill had moved before the end of his life. He had always advocated a large public expenditure on education (for this, unlike medical attention apparently, would improve the "characters" of the poor), and on the right kind of museums.* His essay on "Amusements of the People" † follows Aristotle in thinking it a public duty to provide good music for universal consumption. The Hallé orchestra, which he attributed to the presence there of "a large resident, well-cultured German middle-class population," was for him the best thing in Manchester. In the London of his day, he writes, "one craves sometimes the stirring clang of the trombones, the roll of the drums, the solemn boom of the diapason, and the exciting crescendo of a great orchestra." It is evident that, whatever Jevons felt about the hospitals, he would have acclaimed the B.B.C. He became, moreover, exceedingly interested in State Trading, as exemplified in the Post Office, and wrote more than once concerning the criteria of policy towards the parcels traffic and telegrams. The last book published in his lifetime, *The State in Relation to Labour* (1882), takes up a cautious, intermediate position. "The all-important point," he explains in the preface, "is to explain if possible why, in general, we uphold the rule of *laissez-faire*, and yet in large classes of cases invoke the interference of local or central authorities. . . . The outcome of the inquiry is that we can lay down no hard-and-fast rules, but must treat every case in detail upon its merits."

It may be interesting to put on record the circulation up to the present time of Jevons's publications, ‡ apart from the popular text-books already mentioned:—

Pure Logic (1863), 1,000.

The Coal Question (1865), 2,000.

The Theory of Political Economy (1871), 7,000.

The Principles of Science (1874), 9,000.

Studies in Deductive Logic (1880), 6,000.

* His essay on *The Use and Abuse of Museums*, reprinted in *Methods of Social Reform*, deserves to be read to-day.

† Reprinted in *Methods of Social Reform*.

‡ Kindly supplied to me by Messrs. Macmillan.

The State in Relation to Labour (1882), 9,000.

Methods of Social Reform (1883), 2,000.

Investigations in Currency and Finance (1884), 2,000.

Principles of Economics (1905), 1,000.*

Of the outward facts of his life there is little more to record. In 1876 he succeeded to the Professorship of Political Economy at University College, London.† He took a house high up in Hampstead at the edge of the heath. In 1880 increasing uncertainty of health and a great preference for writing rather than lecturing caused him to resign his professorship. He planned to spend three or four years in Switzerland completing his projected *Principles of Economics*, of which a fragment was published posthumously in 1905. On a Sunday morning, August 13, 1882, he was overcome by faintness while bathing off Galley Hill, between Bexhill and Hastings, and was drowned. He left three children, a son and two daughters. His son, Herbert Stanley Jevons, was, like his father, educated in science—in his case geology and chemistry—but found his way by natural bent to economics, and has successively occupied the chairs of economics at Cardiff, Allahabad and Rangoon. Jevons's wife survived him nearly thirty years until 1910.

Although Jevons died, greatly lamented by his own world, at the early age of forty-six, I think that his work was done. It was in the decade of his youth from 1857 to 1865 that he had genius and divine intuition and a burning sense of vocation. His flame was paler and less steady at the close.

VII.

What sort of man was Jevons in himself? There is no strong personal impression of him which has been recorded, and 54 years after his death it is not easy to find a definite imprint on the minds of the few now left who knew him. My belief is that Jevons did not make a strong impression on his companions at any period of his life. He was, in modern language, strongly introverted. He worked best alone with flashes of inner light. He was repelled, as much as he was attracted, by contact with the outside world. He had from his boyhood unbounded belief in his own powers; but he desired

* The last three of these were published posthumously.

† Miss Collet writes to me: "It was (I believe) through Mill's own views that Political Economy was never even an optional subject in the University examinations until after graduation in Arts or Science. From 1835 (when McCulloch retired) to 1853, when Jacob Waley began to lecture, the subject was dropped at University College. Waley lectured until 1866, when Cairnes succeeded him [until 1872; then Leonard Courtney 1872-1875; Jevons 1875-1880; Foxwell 1881-1928]."

greatly to influence others whilst being himself uninfluenced by them. He was deeply affectionate towards the members of his family, but not intimate with them or with anyone. When he was 27, he wrote the following about his own state of mind at the age of 16 :—

It was during the year 1851, while living almost unhappily among thoughtless, if not bad companions, in Gower Street—a gloomy house on which I now look with dread—it was then, and when I had got a quiet hour in my small bedroom at the top of the house, that I began to think that I could and ought to do more than others. . . . My reserve was so perfect that I suppose no one had the slightest comprehension of my motives or ends. My father probably knew me but little. I never had any confidential conversation with him. At school and college the success in the classes was the only indication of my powers. All else that I intended or did was within or carefully hidden. The reserved character, as I have often thought, is not pleasant or ovely. But is it not necessary to one such as I? *

In Australia he lived almost entirely by himself, and was reluctant to join in the social events of colonial life. In 1857, when he was 22, he wrote home to his sister the following analysis of his own powers :—

I have scarcely a spark of imagination and no spark of wit. I have but a poor memory, and consequently can retain only a small portion of learning at any one time, which great numbers of other persons possess. But I am not so much a storehouse of goods as I am a machine for making those goods. Give me a few facts or materials, and I can work them up into a smoothly-arranged and finished fabric of theory, or can turn them out in a shape which is something new. My mind is of the most regular structure, and I have such a strong disposition to classify things as is sometimes almost painful. I also think that if in anything I have a chance of acquiring the power, it is that I have some *originality*, and can strike out new things. This consists not so much in quickness of forming new thoughts or opinions, but in seizing upon one or two of them and developing them into something symmetrical. It is like a kaleidoscope; just put a bent pin in, or any little bit of rubbish, and a perfectly new and symmetrical pattern will be produced.†

In 1865, not long before he married, he wrote in his Journal :—

At intervals success rewards me deliciously, but at other times it seems but to oppress me with a burden of duty. More and more I feel a lifelong work defined beforehand for me, and its avoidance impossible. Come what will, I cannot but feel that I have faculties which are to be cultivated and developed at any risk. To misuse or neglect them would be treason of the deepest kind. And yet the troubles are not slight which such a high and difficult work brings upon me. One duty, too, seems to clash with others. My idea seems to involve contradictories. I would be loved and loving. But the very studies I have to cultivate absorb my thoughts so that I hardly feel able to be what I would in other ways. And, above all, poverty is sure to be my lot. I cannot aid others as I would wish. Nor in a money-making and loving world is it easy to endure the sense of meanness and want which poverty brings. And if I could endure all this myself, I could not expect nor

* *Letters and Journal*, pp. 12, 13 (see also p. 85).

† *Letters and Journal*, p. 96.

hardly wish for a wife nor any relative to endure it. Half my feelings and affections, then, must be stifled and disappointed.*

After his marriage (his wife had private means) his disposition was not radically changed. He went out very little. He had only a few intimates. Music, which was almost a necessity of life to him,† bathing and solitary walks were his favourite relaxations at all times. He was not an easy man to live with, a little irritable towards the interruptions of family life, excessively sensitive to noise, liable to depression and valetudinarianism, without much conversation. But it is recorded that "his hearty laugh was something unique in itself and made everyone the happier who heard it."‡ From an early age he was liable to attacks of liverishness and dyspepsia and constipation, which latterly became so acute as to overshadow everything and interrupt his work, suggesting perhaps some deeper cause.

He was a reluctant and unsuccessful lecturer. "Sometimes I have enjoyed lecturing," he wrote on his retirement from University College, "especially on logic, but for years past I have never entered the lecture room without a feeling probably like that of going to the pillory."§ The value of his lectures was impaired by his resolution seldom to introduce any of his own ideas but to retail mainly the purest milk of Mill, which he believed to be poison. He never, so far as I know, bred up a worthy pupil; though he was in close touch, at the end of his life, with his two younger contemporaries, Foxwell and Edgeworth.|| Almost every Sunday when he was in London, Foxwell would call on him in Hampstead for a long walk on the Heath; and Edgeworth, who lived close by, was his frequent companion. When I talked of Jevons the other day to Professor Foxwell, recalling these days, "he did not talk much," he said, "there never was a worse lecturer, the men would not go to his classes, he worked in flashes and could not finish anything thoroughly," and then after a pause with a different sort of expression, "the only point about Jevons was that he was a genius."

A photograph of him in later life, which is prefixed to the *Letters*

* *Letters and Journal*, pp. 213-14. † *Op. cit.*, p. 451. § *Op. cit.*, p. 421.

† Jevons was an enthusiastic concert-goer who never missed a chance of hearing classical music, an early Wagnerite, an admirer of Berlioz. He had a small organ built into his house at Hampstead.

|| Also (Miss Collet adds) with Philip Wicksteed. Jevons may have played a significant part in drawing both Wicksteed and Edgeworth to economics. Both had been educated in classics. Edgeworth began his academic work by lecturing on English Language and Literature at Bedford College and on Logic at King's College, and I have no evidence that his interest in economics antedated his contact with Jevons. Wicksteed, Edgeworth and Foxwell may be considered Jevons's offspring, but his contact with all three came some time after they had taken their degrees. The memoir of Jevons in Palgrave's *Dictionary* is by Wicksteed, *q.v.* for W.'s impression of his conversation.

and *Journal*, is familiar. With crinkly beard, curling hair, a broad brow and square face, full nostrils and a full, somewhat protruding lower lip his countenance was almost, one might say, of a Jewish cast, as Professor Foxwell confirms, explicable, doubtless, by his partly Welsh descent, *Jevons* being a variant of *Evans*. His complexion was florid, his hair a darkish brown, and his eyes bluish-grey. It is a powerful, but not a brilliant face. He would pass for a Victorian banker of high standing. There is also a photograph of him (reproduced, facing p. 516), when he was 22 or 23 years old. This is much more interesting, exceedingly strong, keener, clearer, clean-shaven, with a straight lean nose, fine eyes and look, and a tangle of dark unbrushed hair standing back from a high, wide forehead,—a genius then and not at all a banker. These two photographs confirm one's impression that the greatness of Jevons was in his youth.

I have frequently quoted from his *Journal*, which he kept from 1852, when he was 17, up to the time of his marriage at the end of 1867.* This *Journal* is of the highest interest both in itself and for the light which it casts on his nature. I wish I could have had access to the complete text and had not been limited to the extracts published by his wife in her selection of *Letters and Journal*. The volumes are believed to be extant in the possession of his children, but their present whereabouts is uncertain and they are not accessible. This *Journal* received all his confidences and the fruits of his introspection, of his excessive introspection. The *Journal* often, as we have seen, records depression but also the delight of a creative mind in moments of illumination. In March 1866, for example, he writes: "As I awoke in the morning, the sun was shining brightly into my room. There was a consciousness on my mind that I was the discoverer of the true logic of the future. For a few minutes I felt a delight such as one can seldom hope to feel." But he quickly adds: "I remembered only too soon how unworthy and weak an instrument I was for accomplishing so great a work, and how hardly could I expect to do it." †

DISCUSSION ON MR. KEYNES'S PAPER

MR. H. S. JEVONS: I have great pleasure in rising to thank Mr. Keynes for his most interesting and, to me, very personal paper. I was most pleased when several months ago I heard who was to give this paper on the centenary of my father's birth. I felt that no one could have been chosen who was better fitted and more likely

* At least, there are no extracts from it in the *Letters and Journal* after this date.

† *Letters and Journal*, p. 219.

to give a complete and fair review of his life and work. Mr. Keynes is not only familiar with all aspects of statistics and economic theory, but also, by contact with his father, knows a great deal about logic.

Mr. Keynes has referred to the many-sidedness which is an essential attribute of an economist, and I certainly think that, on reviewing the work in the various subjects to which my father contributed some advancement of knowledge, we may say that he had that essential variety of equipment. He began in natural science and he devoted himself with tremendous energy to daily meteorological observations in Sydney; he carried on these observations continuously for two years. He was the only person in the State of New South Wales conducting meteorological observations, and so these observations have gone down in history and will remain as part of the permanent record of the climate of New South Wales. He also wrote much on this subject; as, for example, his paper on "The Deficiency of Rain in an Elevated Rain Gauge."

In his papers on Statistics, with which Mr. Keynes has dealt, he introduced new methods of permanent value; and in his writings on economic theory and logic he followed the methods of precision of conception and definition with which he was familiar in natural science. I might also refer to his invention of a logic machine in which the influence is mechanically performed. Two examples were made, one of which is to be seen in the museum of scientific instruments attached to the Bodleian Library at Oxford.

My father was also interested in the social applications of economics, the first definite indication of that being his "Social Survey of Sydney" carried out probably in his last year there. That has never been published in this country, but a summary of it was published in Australia in recent years. Unfortunately the map of the survey was lost, and I have never seen it. Then there are his articles on social reform, many of which were printed in *Methods of Social Reform*.

The Coal Question comes amongst the economic books; and personally I think the most interesting and far-seeing of the chapters of that book is that on the "Trading Bodies," in which he tries to develop the first effects of the rising cost of coal. There is a paragraph in which he refers to the effect of the Morill tariff then recently imposed in America, and to the growing tendency of nations toward fiscal protection and self-sufficiency. He foresees a bad period for England in the future if that tendency develops whilst we have to contend with the continual deepening of the coal mines and consequent high price of coal and difficulty in competing with foreign manufactures. Then he goes on to say after that forecast that he cannot believe that people will not be wiser than to build up these closed economic systems.

Mr. Keynes has dealt most fairly with the question of the indebtedness of Marshall to my father, and vice versa. I think it is interesting to speculate what would have been their relations if my father's life had lasted much longer, and he had been able to read the *Principles*. Surely that would have brought them together, and the effect upon each of them might have been great.

If I might say so, I think there was one observation made by Mr. Keynes which I could not altogether endorse. He spoke of the similarity of approach by Marshall and Jevons; but to my mind there is no similarity of approach. Personally I regard the mathematical treatment of economics as the application of a particular method. True, in this respect their methods were similar; but if you look at the fundamental assumptions and the real basis of treatment, I think they are quite different. My father's approach might be said to be derived from Bentham, the founder of the psychological economic school to which he essentially belonged. Extensive quotations from Bentham are to be found in the *The Theory of Political Economy*.

My father also acknowledged a great debt to Senior. This psychological school was carried on by various writers in this country, and developed by the Austrian school; and it appears to me to be a perfectly distinct school of thought from the Mill-Marshall school.

Just a word about the connection of trade fluctuations with solar variations. That, of course, is a most difficult and controversial subject even at present; but personally I cannot help feeling that if people should discuss my father's work a hundred years hence, they might well think that this was one of the most remarkable discoveries or suggestions that he made. The more I have studied this particular subject, the more do I come to believe that there is a very close dependence of many human affairs upon fluctuations of solar radiation, and that that fluctuation is not a definite cyclical variation. Anyone familiar with the literature of the natural sciences in recent years will be struck by the extraordinary number of biologists, botanists and agriculturists who are studying these cyclical variations; as, for instance, in the distribution of animals and plants over the earth's surface, which of course is dependent upon the fluctuations of climate. The results of these researches are being connected up with certain variations which meteorologists have been able to trace, and which are particularly evident in certain parts of the world; and these are being traced back to fluctuations in the sun's radiation.

In the last few months we have had the very striking discovery that short-wave wireless transmission is greatly affected by solar radiation, varying in tune with the sun-spots. Owing to its great practical importance, one hopes that this subject is now going to be thoroughly investigated.

I must take no longer time, but I may observe that Mr. Keynes has not mentioned my father's political activities, which, it is true, were very narrow; but they are rather interesting as indicating his point of view. It appears to have been solely in Manchester that he took any particular interest in politics. There he started a debating Society, the minute book of which I came across some time ago. The Society consisted mainly of members of the staff of the College, and a few students, and lasted only one session or a little longer; but shortly afterwards my father got up a petition which I still have, and which it was intended to present to the Prime Minister, protesting against the title of "Empress of India" having been conferred upon

Queen Victoria. He obtained six signatures of members of the staff of the College; not being able to get more, the matter dropped.

I should like to say again how much I have enjoyed listening to Mr. Keynes's paper in his well-known graceful and easy style, and I have much pleasure in proposing a hearty vote of thanks to him.

DR. BONAR: We have two distinct advantages to-day when we are celebrating here the centenary of the birth of William Stanley Jevons. First, the presence of our friend Professor Jevons, son of the great Jevons, and himself a man of no mean reputation. Secondly, we have Mr. Keynes to speak to us. To take a phrase of Carlyle's, if we were to "riddle creation" I do not know that a better qualified man could be found. You may judge for yourselves, could you have the case better put to you than it has been put to-night? I cannot fancy it very easily. Mr. Keynes has an affinity with Jevons; he is not only an economist but he is a statistician, and moreover he has a large versatility which approaches that of Jevons. I know a little of the extent of Mr. Keynes' versatility, but I do not know whether it extends like that of Jevons to meteorology; quite possibly it does.

It was a little sad perhaps to find the critical element figure so very largely in Mr. Keynes's review. Yet we should not have welcomed a biography that only picked out excellences and left out blemishes; and we have had a pretty frank account from Keynes of Jevons's various attempts, in which he sometimes succeeded and sometimes failed, but which on the whole hardly ever brought him to the top of the mountains he was climbing. On the whole we are left with a slight impression of failure. But it is the failure of a pioneer who does not succeed in persuading all those he is trying to persuade, but will in the end persuade very many.

I am impressed with the risk we run, which was pointed out by Professor Jevons just now, of fancying that Jevons's work had been completed, and was not cut short by his death. Mr. Keynes takes the view that we really had had the best of Jevons, and need not complain; but, when you think of it, forty-six or forty-seven is a very early age for a man like him to end his career. It makes me think of the saying in the "Wisdom of Solomon" which I hope I shall quote correctly: "He being made perfect in a short time, fulfilled a long time."* That, freely interpreted, applies to Jevons; his work goes on though the man ceases to live on this earth.

Some "higher critics" say "He left no perfect work. Why speak of perfection in his case?" They say, many of them, with far less discrimination than Mr. Keynes has used, that Jevons always attempted what he could not quite succeed in doing, and that he was a man of parts—parts which he could not put together into a whole. How many men have done more?

I am more vexed by his policy in college lectures. Jevons, in lecturing at Owens College, well knowing of the great desire of the authorities that the men should pass their examinations, took care that they should, by expounding to them John Stuart Mill. If he

* Which the Great Queen chose for the epitaph on her Prince Consort in 1861.

had expounded his own views instead, they might all have been "ploughed." Was he justified in that or not? I leave that to casuists to decide.

As to Mill himself, I want to tell you a little incident in connection with our own Society. It once occurred to me that John Stuart Mill must have attended meetings of this Society. The Staff were good enough to humour me by making a search in the records to find out if John Stuart Mill had ever sought Fellowship.

No trace could be found of his ever having even tried to become a member; and, if it were ever a question which of the two deserved commemoration more, I vote for Jevons against John Stuart Mill!

I heartily support the motion of thanks to Mr. Keynes for a paper worthy of himself, his subject, and the Society.

SIR WILLIAM BEVERIDGE said he would like to deal with three points arising out of the paper. First of all, he thought he was expected to say something about sun-spots. As far as he was concerned, he had always held that sun-spots had nothing to do with the trade cycle, with big fluctuations of trade and employment and all the rest that went on in the nineteenth century. In the first thing he had ever written about this subject, twenty-eight years ago, he had pointed out that the trade cycle had had very variable periods, while the sun-spot period had not varied. He was afraid that last part was not quite true; the length assigned by astronomers to the sun-spot period had varied from time to time. He thought, however, that it was true that there was no real evidence of a connection, and no probability of a connection, between the sun-spots and harvests and the main cyclical movements in industrial countries.

When one considered the other point, as to whether fluctuations in solar radiations could have any influence upon terrestrial happenings, which would be in turn reflected in economic statistics, one was on entirely different ground.

It was unreasonable to suppose that the sun, which affected so many other phenomena of the world, had no effect upon the growth of crops. That was the particular point that he, personally, started to investigate, and still felt bound to go on investigating, because it produced a cycle of 15·2 years, which Mr. Yule, when criticizing all other sequences, said he did not see could fail to be real as the statistical argument was so strong. That had led him into price history, but in preparing that history, he had deliberately avoided any further study of weather cycles, so that he might not have anything in his mind to influence him as to what he would like the prices to show.

Sir William thought that in the end Jevons would be proved right, not in suggesting that commercial fluctuations were related to physical phenomena, but in suggesting that economic data could be used to throw light upon physical happenings.

The work of Jevons with which he was most familiar was that on the history of prices; that was a study worth following up, and showed Jevons both as an inductive and a deductive economist—the kind of economist that everyone ought to be. Sir William held a fairly

definite opinion that one did not get anywhere by pure deduction; whether one got anywhere by pure induction, he could not say. The greatness of Jevons was that he combined those two things in such a high degree, and therefore it was to be hoped that he would have a large number of successors in the economists of the future.

Sir William concluded by saying how enormously grateful anybody who listened to anything Mr. Keynes had to say, must always feel, and he joined in the vote of thanks that had been proposed.

MR. R. G. HAWTREY said he would like to join in the tributes paid to Mr. Keynes for giving this excellent and vivid paper—for some purposes more than the equivalent of a two-volume biography.

The side of Jevons that especially interested him was his contribution to economic analysis in *The Theory of Political Economy*. One of Jevons's outstanding characteristics was a capacity for intellectual pleasure, the emotion that animates scientific research and investigation, and is associated with the urge to express oneself and to convey to the world the ideas that have given the emotion. Jevons freely admitted that there were some economists who had anticipated his system of analysis in one way or another. But they had failed to make any impression upon the world, and one of the important characteristics of Jevons was that this urge to express took effect in an unrivalled power of expression. A striking feature of his *Theory of Political Economy* was the great amount of ground covered in a most convincing and brilliant way, in a relatively short space, so that it remained in the mind. That faculty which he displayed in it, and which established those ideas as an essential part of political economy ever afterwards, was comparable to the genius of leadership in practical affairs, the quality which enabled a man to gather together his contemporaries to concentrate upon an object. Leadership was the characteristic of great statesmen and great generals, and this analogous faculty of bringing ideas home and giving them a momentum in the minds of other people was one of the characteristics of the great scientists. That was why Jevons need not fear counter-claims of originality in his ideas in this field; it was he who really introduced the ideas into economics. There were contemporaries as well as predecessors who played a great part in introducing the ideas—Marshall, for example—but, to Mr. Hawtreys mind, Jevons had that faculty in a more concentrated form than Marshall. Marshall was addressing, in a way, a narrower field than Jevons, and introducing less energy into the establishment of this tradition of ideas. The same energy and power of exposition to support ideas could be traced in the numerous other fields to which Jevons contributed, his work had remained in the public mind, even in that of people who did not accept his conclusions, but who maintained their interest in what he said. All his ideas remained alive in a remarkable degree.

Mr. Hawtreys said he would like to add one fact which had escaped mention. Jevons entered the Manchester Statistical Society before entering the Royal Statistical Society; he contributed to the Manchester Society at an earlier time, and was its President before

he came to live in London. He therefore came to the Royal Statistical Society with an established position as a leading statistician.

PROFESSOR GREENWOOD said that as time was passing he must put the vote to the meeting, but before doing so he would first give the usual ritual warning to Mr. Keynes that it was not necessary for him to reply to any criticisms, as he would have ample space in the *Journal*; he felt he was only expressing the feeling of every one present when he said that if Mr. Keynes had doubled the length of his paper they would all have been delighted, because its charm had appealed to every one of them.

Mr. Keynes's psychological study had particularly interested him. One small point he would take first. The unconscious antipathy of Marshall for Jevons in early years might perhaps be motivated by the unconscious scorn of the professional for the amateur. Marshall was a very young man; he could not but have been aware that his mathematical training was wider than that of Jevons, and he might well have detected, or thought he detected, some lack of elegance or expertness in Jevons's use of mathematical technique. Perhaps that was what he meant by the reference to David in the armour of Saul.

A much wider question was of Jevons's temperament. That he was introverted was true, but vague. Perhaps Jevons never became on the conative side fully adult. A failure of emotional development to keep pace with intellectual growth was perhaps typical of some forms of genius. The complete balance of a Goethe was rare even within the class of what all would describe as that of genius. Another hero of this Society, William Farr, retained into late life a lack of practical common sense in some directions which was remarkable. Jevons's moments of intense exaltation and his refusal to teach his own students what he himself regarded as truths of the greatest importance, were suggestive. It was not easy to believe that an emotionally adult man with considerable experience of teaching and examining, could really have thought that teaching his pupils what he believed to be the truth would prejudice them in their undergraduate examinations. But the child or adolescent who, finding that others did not share his enthusiasm for something, withdrew into himself, was a very common type. Perhaps Mr. Keynes might consider this diagnosis.

The motion was that a hearty vote of thanks be accorded to Mr. Keynes for his paper.

MR. J. M. KEYNES, in reply, said: I am very much obliged for the interest you have shown in my paper. It has been a special pleasure to read it in the presence of Jevons's son and of his granddaughter, who is also, I am told, an economist.

It may be a rash thing to say that Jevons's work was done; I may very likely be wrong. Certainly what he was doing at the end of his life was good and interesting. But I have lately gone through the experience of reading nearly all Jevons wrote more or less in the order in which he wrote it, and the strong impression left on my

mind is that, while his later work is very good and interesting, it is not the work of brilliant genius that his early work is. There is a brilliance about his early work which surpasses almost anything in economic literature. I am much interested in Professor Greenwood's suggestion as to his emotional immaturity, but I cannot find much corroboration of that in other directions. I would say that he was of the introspective type that is inclined to nurse a grievance rather than get rid of it. He did not get rid of his grievance by breaking out and teaching his own thoughts; he nursed it, which is a quality of the introspective mind. The suggestion that a part of Marshall's feeling was that of the professional towards the amateur may be true.

[Since the paper was read Mr. Keynes has added some particulars about the teaching of economics at University College on the basis of information supplied to him by Miss Clara Collet.]

As a result of the ballot taken during the meeting the candidates named below were elected Fellows of the Society :—

Richard Kenneth Auten.
Lajpat Rai Dawar, M.A.
Harold William George Gearing.
Y. D. Keskar.
Duncan William Mackintosh.
Raphael Lawrence Tiruchelvam.
