APPENDIX 1

Letter by W. Stanley Jevons, printed in *The Athenaeum*, Volume 66, No.2676, 8 February 1879, p. 188. The letter was followed by an editorial response, beginning with three asterisks, which is also included here.

SUN SPOTS AND COMMERCIAL CRISES

Hampstead, Feb. 4, 1879.

I do not like to see it stated in the *Athenaeum* of the 1st inst. (p.155) that I have impugned some of the data of Dr. Wolf. I trust that you will allow me to state that, as regards the purely physical phenomena of the solar period, I am only repeating the conclusions of a most careful and eminent meteorologist, namely, Mr. J.A. Broun, these conclusions tending to confirm the prior results of Dr. Lamont and others. My interest in the matter arose from the study of the decennial commercial crises, which for some time I tried to explain in accordance with Dr. Wolf 's period of 11.1 years (subsequently altered by him to 11.07 years).

In common with many other persons, I supposed that Dr. Wolf had proved this to be the exact average length of the solar period. Finding, however, that I could not really make the solar and commercial periods agree, I was led to make some slight inquiries regarding the solar variation, and I then fortunately became acquainted with the admirable memoir of Mr. J.A. Broun, `On the Decennial Period in the Range and Disturbance of the Diurnal Oscillations of the Magnetic Needle and in the Sun-spot Area,' printed in the *Transactions* of the Royal Society of Edinburgh for 1876, vol. xxvii. pp. 563-594. The more I have read this memoir, and some minor papers by the same author, the more I have become impressed with the sound judgement and the careful attention to facts which Dr. Broun manifests. That the Royal Society (of London) highly esteem his labours is shown by their recently presenting him with a medal.

Now, by the elaborate comparison of magnetic, auroral, and sun-spot data, Mr. Broun appears to show conclusively that the solar period is not 11.1 years, but about 10.45, this last estimate confirming the earlier determination of Dr. Lamont. The fact is that Dr. Wolf overlooked a small maximum in 1797, and was thus led to introduce into his curve an interval of seventeen years, an interval quite unexampled in any other part of the known solar history. Mr. Broun shows, moreover, that the 11.1 period fails to agree with all the earlier portions of Dr. Wolf's own data, which yield a period varying between 10.21 and 10.75 at the utmost.

Almost more serious as regards the credibility of Dr. Wolf's results is the fact that Mr. Broun gives good reasons for believing that the year 1776 was a year of maximum sun spots, whereas Dr. Wolf sets that very year down as one of mimimum sun spots. The following is the conclusion to which Mr. Broun is led (p. 579): 'there are no means of testing the earlier epochs of Dr. Wolf; but no long period given by him will be satisfied by them. If I have already shown good grounds for substituting a maximum in 1776 for Dr. Wolf's minimum, a similar change in some of the epochs of the preceding century and a half may be quite possible'. Now a highly scientific writer in *The Times* has condemned the theory of decennial commercial crises, because the dates assigned will not agree with those of maximum and minimum sun spots, taken, no doubt, according to Dr. Wolf's estimates, and an eminent French statist has rejected the theory on the same ground.

I think I am entitled, therefore, to point to the doubts which Mr. Broun's careful inquiries throw upon the accuracy of Dr. Wolf's 'relative numbers'.

I will even go a step further, and assert that in a scientific point of view it is a questionable proceeding to dress up a long series of 'relative numbers,' purporting to express the number of sun spots occurring during the last century, with the precision of one place of decimals. As Mr. Broun has pointed out, there were no regular series of observations then, and results deduced from the occasional observations of different astronomers cannot be reduced into one consecutive series without a large exercise of discretion. As Mr. Broun says (p. 574), 'Dr. Lamont has criticised some of the epochs which Dr. Wolf considers certain ('*sicher*'), and has shown that they depend on few observations. He remarks that old observers directed their attention chiefly to large sun spots, so that Flangergues (one of the principal observers during the period in question) saw the sun frequently without spots, when many were seen by other observers'. The true scientific procedure would have been that which Prof. Loomis has pursued in regard to auroras, namely, to place in a table all the recoverable observations, carefully distinguishing those by different observers, so that there should be the least possible admixture of Dr. Wolf's own 'personal equation.' The results obtained by Mr. Broun, as explained above, are not such as to give us implicit confidence in the judgement of Dr. Wolf.

In any case it will be sufficiently obvious that I have not impugned Dr. Wolf's results upon mere '*on dits*' or 'hazardous reasonings'. It is a disagreeable task to depreciate in any way the labours of one so zealous and industrious as Dr. Wolf has long been, but it is Mr. Broun, not I, that has performed the duty. The interests involved in a right comprehension of this mysterious solar variation are so momentous that it would be absurd to allow personal considerations to interfere. My own inquiries upon the course of commercial fluctuations have now been continued during many years, and they rest upon a wide groundwork of facts. I must respectfully decline to acquiesce in a condemnation of the results founded on a comparison with numbers which, when carefully tested, are found to give a minimum where a maximum should be.

W. STANLEY JEVONS

*** Prof. Jevons seems to attach great weight to the length of the average sun-spot period; but if the average length of the period between commercial crises during a couple of centuries were shown to be identical with, or to differ but slightly from, the average period of sunspots, this would be but a small step towards proving connexion between the two phenomena. The separate periods of minima must be shown to correspond with the successive crises, and the curve also must be proved to be of the same character.

Prof. Jevons does not appear to be aware that Dr. Wolf has in the forty-third volume of the *Memoirs* of the Royal Astronomical Society given a list of the MS. and printed authorities from which he derives his data. Similar but fuller information is supplied by Dr. Wolf in the pages of his *Astronomische Mittheilungen*, a periodical too little known to English meteorological theorists. Dr. Wolf does not pretend to equal accuracy for all the periods, but there can be little doubt with regard to the sun-spot periods which have occurred during this century, and according to Prof. Jevons there seem to be serious discrepancies between these and the periods of commercial depression.

APPENDIX 2

Review of Henry Dunning Macleod, *The Principles of Economical Philosophy*, Second Edition. Volume I, Longmans Green, Reader and Dyer, London 1872, published in the *Manchester Guardian*, 20 June 1873, p. 7.
Editorial Note: Two changes have been made to the text as printed. Paragraphs have been numbered to facilitate the preceding discussion of the review. Footnotes have also been added, primarily to identify the relevant sections of Macleod's text, which is referred to as 'Macleod' with the relevant page references.

PRINCIPLES OF ECONOMICS

[1] There is much difficulty in knowing how to regard and characterise the economical works of Mr. Macleod. No doubt can exist as to the extraordinary earnestness and perseverance with which he has followed up his studies of political economy in the face of little or no encouragement from other English economists. He has published a large, and in some respects useful, treatise on the 'Theory and Practice of Banking'. He has undertaken single-handed a 'Dictionary of Political Economy', of which the first volume has been published, and the second is in progress. Although in France, and even in Belgium, large dictionaries of the kind have long been in use, in England, which is *par excellence* the country of economists, Mr. Macleod is the only one who has tried to supply a like want. In 1858, he brought out his 'Elements of Political Economy', and now we are presented with the first volume of a second edition of the work, under the somewhat formidable title 'The Principles of Economical Philosophy'. When we add that this first volume contains 676 rather closely printed pages, the industry of the writer will be apparent.
[2] To what is it due that Mr. Macleod is practically ignored by English economists, and has to seek for approval across the Channel, where his reputation is much greater than in his own country?[i] In the first place we shall be doing a service to Mr. Macleod in suggesting that he injures himself by his own self assertion.[ii] A treatise on a science must stand upon its own merits, and it is none the better because Mr. Macleod's father was a Scotch landed proprietor, or he himself was employed by the Royal Commission for forming a digest of the law of England. We trust that no one will imitate Mr. Macleod in the style of his preface, which contains a sketch of his past history and labours, together with a selection of testimonials which he apparently obtained when a candidate for the political economy chair in Edinburgh, now held by Dr. W.B. Hodgson. Testimonials are sufficiently distressing documents to all parties concerned, when applied to their intended purpose; but we hope never again to see them republished for the edification of readers in general.
[3] But to come to the merits of the work itself. How is it that Mr. Macleod's economical views have obtained so little currency in England? One possible reason is that he is in dire opposition to Mr. J.S. Mill. No small part of this volume is devoted to a bold and unsparing criticism of Mr. Mill's political economy. He quotes, for instance, Mr. Mill's remark that it is no purpose of his treatise to aim at metaphysical nicety of definition where the ideas suggested by a term are already as determinate as practical purposes require; and that every one has a notion sufficiently correct for common purposes of what is meant by wealth.[iii] He then proceeds to adduce from several parts of Mill's treatise apparently different and inconsistent statements as to what constitutes wealth. In one place it is 'everything which has power of

purchasing', a definition which Mr. Macleod himself accepts as satisfactory and in harmony with the ancient definitions of Aristotle and the Roman jurists. Nevertheless, in a later page Mr. Mill distinctly asserts that by wealth he understands only material wealth; that it must be extracted from the soil, and have a certain permanence and capability of accumulation. Are, then, a man's faculties wealth, for they can be hired out and exchanged, though they do not agree with the other conditions laid down by Mr. Mill? To quote the words of Mr. Macleod, Mr. Mill

> Defines wealth to be anything which has power of purchase. In speaking of credit, he says that it is purchasing power and therefore wealth by his own definition. He then says that bank notes, bills, and cheques are of the same value as money and perform all the functions of money; and are therefore wealth by his own definition; and he several times calls bank notes productive capital. Now, are bank notes material, and extracted from the materials of the globe? * * But we have placed before our readers enough to show them the contradiction of Mr. Mill's ideas in different passages on the meaning of wealth, and to show that every one has not a sufficiently correct notion of what wealth is.[iv]

[4] Mr Macleod comes to the conclusion that labour, materiality and permanence, or durability, are not essential to the nature of wealth, but rather accidents of it: and we should be so far inclined to agree with him. He adopts exchangeability as the criterion of what is and what is not wealth. But it is impossible to agree with him when he endeavours to show that utility has nothing to do with the matter. When subsequently treating of value (page 318), he points out satisfactorily that labour, materiality, and some other circumstances, are not essential to the existence of value, and then attempts to get rid of utility on the ground that it is a fluctuating and totally uncertain element. The same thing is of use in one place and not in another:

> An eight-oared outrigger is a very useful and valuable thing on the Thames; but of what use, or value, would it be in the Sahara? So however a useful thing it may be in itself, an excess of quantity may deprive it of value. Thus the common illustration of water. Nothing is more necessary and useful; but its excessive quantity deprives it of value. Corn is also most necessary; but it has often happened in agricultural countries which had no means of communication with others, that an excessive quantity of corn has been produced in some years, and has rotted in the ground for want of some people to eat it.[v]

[5] He comes to the conclusion that utility is so vague an expression that it cannot be made the basis of value[vi] and he proposes to substitute the notion of demand:

> Hence it is quite clear that we have now got the true source, or origin, or cause, of value. It is demand. Value is not a quality of an object, but an affection of the mind. The sole origin, source, or cause of value is human desire. When there is a demand for things, they have value * * It is because some people demand cigars that among them cigars have value; and because other people do not demand them, that among them cigars would have no value.[vii]

[6] This may be quite true, but then what gives rise to demand; a thing is not demanded unless there be some reason to desire its possession, and this desire implies the existence of utility in the object with respect to the person. Mr. Macleod, in fact, passes over altogether the ultimate analysis of the circumstances on which the desire of possession depends. He does not see that a true theory of economy must take account of these natural laws relating to the

intensity and degrees of satisfaction of human wants. He expressly disclaims any intention to enter upon such subjects:-

> Some persons indeed consider that it is an inadequate account to say value originates in demand, but that the economist should go further, and investigate the causes of demand. But this would be a great error. This would introduce the whole of psychology into economics * * An economist, *qua* economist, has no more to do with the causes which operate on the mind to produce demand or value, than an astronomer, qua astronomer, has to do with the metaphysical cause of gravity.[viii]

[7] This is a plausible way of avoiding the difficulty and it is one which Mr. Mill also adopted in asserting that consumption of wealth has nothing to do with the laws of economy, that the laws of consumption can be nothing but the laws of human happiness in general. But the fact is that the variations of demand cannot be understood unless the variations of human wants or happiness, summed up in the expression utility, are understood; and as there is no other science supplying the requisite information, the economist must himself investigate the subject.

[8] A large part of Mr. Macleod's work is occupied with the consideration of incorporeal property, under which he includes various kinds of rights, credit, or property in the produce of the future.[ix] His views would greatly delight Mr. Edward Herford, who convulsed the Manchester Statistical Society some years ago by insisting that in the wealth of the country must be included the whole of the incorporeal rights recognised by law.[x] Mr. Macleod enters into some interesting speculations as to the analogy between debt and credit and the negative and positive signs in algebra. He also enters upon the question raised by Peacock, the celebrated algebraist, whether that mysterious entity the square root of a negative quantity might not have some meaning in economical matters, deciding the question however in the negative.[xi] We do not think that Mr. Macleod has conceived the matter quite correctly. He takes the product of past labour to be positive, that of future labour to be negative.[xii] But in reality he ought to take all possessions to be positive, and all claims to what is not in possession to be negative. This would often include the produce of future labour, because if a man does not possess that which is due from him he must labour to produce it.

[9] In this, as in so many other questions, we consider that the value of Mr. Macleod's book rather consists in raising theoretical questions of great interest and importance, than in the answers which he has given, these answers being often, as it seems to us, very wrong-headed. In this point there is a profound difference between the books of Mr. Mill and Mr. Macleod. In Mr. Mill's 'Principles of Political Economy' the reader is presented with a most interesting and luminous discussion of all the principal theories of political economy as applied to questions of the day, and he closes the book with the feeling that it is hopeless to attempt to improve upon doctrines which have been stamped with approval of Ricardo and Mill, and embodied once for all in so able a treatise. There is an air of finality about all the works of Mr. Mill, and, as regards the theory of value, he expressly asserts that there is nothing left for any future writer to discover. Now, Mr. Macleod shows that the whole question is still an open one, and that there are matters of theory in which the utmost inconsistencies are current. We confess that in our opinion Mr. Macleod's attempted solutions of difficulties are very unsatisfactory as a general rule. There can hardly be worse fallacies than to confuse capital and labour as he does; his notions concerning capital seem to be entirely wrong; nevertheless he helps to keep the ball rolling. Truth more often emerges, as the old saying has it,

from error than from confusion. The errors of Mr. Macleod are usually too clear to mislead any reader the least acquainted with the subject. His reasoning is close and lucid and usually logical, his information is extensive, and the volume contains incidentally a great mass of new illustrations of economic truths, drawn from the Roman jurists, the Greek and Roman classics, cases in modern law, &c. Mr. Macleod is always independent, vigorous, and often highly original; and we are far from feeling sure that some of his heterodox notions may not ultimately have to be admitted. One such independent writer, although often wrong-headed and absurd in his opinions, may do more good to science than ten slavish commentators who cannot believe that there is any truth beyond the works of the master they are following.

[10] In conclusion we will add that this work would prove quite useless or worse than useless to those who do not already possess an acquaintance with political economy. They would merely be perplexed and repelled from the science by the tedious discussion of difficult scientific questions. But we consider that no one who professes to have an acquaintance with the theories and literature of political economy should ignore the writings of Mr. Macleod. They are full of suggestive remarks, acute criticisms, and abundant learning; and however full also of vagaries, will serve to stir up inquiry and direct the reader's thoughts to points requiring solution. Mr. Macleod can acutely criticise others, though still more open to criticism himself; and he can ask difficult and pertinent questions, though his own answers are usually to be rejected.

Notes

[i] See Macleod (1872), pp. v-vi.

[ii] For the rest of this paragraph, see Macleod (1872, pp. vii-xxii).

[iii] These are almost direct quotations from Mill (1909 [1987], pp. 1, 2) as cited by Macleod (1872) at p. 147. Macleod's critique of Mill on wealth is at pp. 147-52.

[iv] This is a slightly altered quotation from Macleod (1872, p. 152). The reviewer has corrected Macleod's punctuation in a number of places and Macleod's 'shew' becomes 'show' here. Asterisks indicate omitted words that are inconsequential in this case.

[v] Macleod (1872, p. 320).

[vi] Here, 'so vague ... value' is a direct quotation from Macleod (1872, p. 321).

[vii] Again, the reviewer has corrected Macleod's expression and the quotation does not capture Macleod's excitable style, as shown in this extract from the quotation: 'Hence it is quite clear that we have now got the true Source, or Origin, or *Cause*, of Value. It is DEMAND. Value is not a quality of an object, but *an affection of the mind*. The sole Origin, Source, or Cause of value is HUMAN DESIRE' (Macleod 1872, pp. 323-4).

[viii] Macleod (1872, p. 337). Again, the quotation gives no indication of Macleod's excitable style.

[ix] See, for example, Macleod (1872, pp. 144-6).

[x] The reference is to Herford (1868). When that paper was published in the *Transactions* of the Manchester Statistical Society, it was prefaced with the following: 'This paper is printed in the Transactions at the special request of the author. It is only just to the Society to state that, in the discussion to which it gave rise, no support was given to the views of the writer by any member present'.

[xi] See Macleod (1872, pp. 453-69, especially pp. 465-6). Macleod referred to Peacock's (Dean of Ely) *Algebra*, first edition, Article 447, p. 366.

[xii] Macleod (1872, p. 471).