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Chasing a Few Hares
A.W.H. Phillips and his times

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Chasing A Few Hares
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"[A.W.H. Phillips'] personality was as fresh as his mind was creative. The world of economics was enriched by his restless originality; to his colleague was to be his friend."

E.H. Phelps Brown's *Obituary* of A. W. H. Phillips, **The Times**, 6th March, 1975[2]

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[1] A *Review Article* (RA) of **A Few Hares to Chase - The Economic Life and Times of Bill Phillips** by *Alan Bollard*, Oxford University Press, Oxford, 2016 (referred to as *Hares*, in the rest of this essay –see Leeson (2000; editor, p. 28 of *Brian Silverstone*'s contribution for the source of this phrase). This RA is written in *homage* to my former teacher, mentor and friend, the late **Professor Björn Thalberg**, who - at the very beginning of my education and life as an economist, forty-five years ago - introduced me to the fundamental writings of Phillips by giving me reprints of his two fundamental essays on stabilisation policies in non-linear macrodynamic models (Thalberg, 1971a & 1971b). It is, felicitously also the 50th anniversary of Thalberg's own doctoral dissertation (Thalberg, 1966), of which also I still own the presentation copy he gave me - which introduced me to the remarkable - but almost as 'few' as Phillips' - works of *Richard Goodwin*. Sadly, it is also the third anniversary of his death and, in fact, I started writing this RA on exactly the day Phillips died, forty-one years ago.

[2] Quoted in *Hares*, p. 214 (but incorrectly referred to as being in **The Times** 'the day following his death' - a trivial error, but - alas - one of many that mar this interesting, engaging, yet also irritating book, infested with typos, incorrect attributions, conceptual, technical and factual claims that cannot be substantiated against knowledge and evidence).

§ 1. By Way of a (Personal) Introduction

> "I did not do very much. I just put out a few hares for other people to chase."
> *Hares*, p.v [& p. 234]

Dr. Alan Bollard has written an absorbingly readable biography of the economic life and times of Bill Phillips' - but it is more than just of the '*economic* life and times'; the book is also about the '*life and times*' of an innovative and humble man, who achieved greatness of a kind that has rarely been the lot of many to reach.

The author is a distinguished New Zealander, who is eminently qualified to write this biography - having spent a considerable number of years as the Governor of the Reserve Bank of New Zealand, but, most importantly, as an economist and a craftsman in the mould of Phillips, as not only the architect of the re-assembling of the 'No. 1 [Phillips] machine donated by the LSE', but also as the person responsible who 'arranged to have it ... shipped to Wellington [in New Zealand]' and to make sure that 'it is in working order and on display in the Reserve Bank [of New Zealand's] Museum'.

The small antipodal country of New Zealand is distinguished for many things - but, surely, one of its great achievements was to produce three of the greatest individuals of the last century: *Lord Rutherford*, *Sir Edmund Hillary* and *Sir Richard Hadlee*. As a young Physics student, I absorbed with wide-eyed interest, Ernest Rutherford's discovery of the concept of the radioactive half-life, the notions of alpha and beta radiation, of the proton and, above all, as the Director of the Cavendish Laboratory, in being the 'father' of the 'splitting of the atom'. I was an equally wide-eyed young boy of six, growing up in old Colombo, who followed with absolute fascination, the fortunes of Edmund Hillary (cf. *Hares*, p. 128) and his resourceful Sherpa, Tenzing Norgay, in 'conquering' Mount Everest[3]. As for Sir Richard Hadlee, a scion of the famous New Zealand cricketing Hadlee family, it was natural that I almost hero-

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[3] Which we, Saivaite-Hindu Tamils of old Colombo, referred to as *Kailasa Malai* (கைலாச மலை, *Mount Kailash*), the abode of Siva and his consort, Parvati. Incidentally, 'conquering' the ascent to the peak of Mt. Everest, was one of six wishes in the list that the great Cambridge Mathematician, G. H. Hardy formed (**Nature**, 22nd May, 1948). At least one - possibly two - other items in this 'New Year wish list' have since been achieved. Mussolini was 'murdered' (assassinated?) by the Partisans, in *Dongo* (directly opposite Dervio, where I had my home for over two decades, on the 'Manzoni side') on the *Lake of Como*, on the 28th of April, 1945 - this is the sixth in Hardy's 'wish list'. The second in that list was to make 211, *not out*, in the fourth innings of an Oval (cricket) test; Sunil Gavaskar scored 221, in India's fourth innings at the Oval, against England, on 4th September, 1979!!

worshipped him, in the hopes that the small Indian Ocean Island of Ceylon (now, Sri Lanka) would produce a great cricketing all-rounder in the mould of Richard Hadlee[4]!

To add A. W. H. Phillips – *Bill Phillips*, henceforth - to this trio of New Zealand greats, would not be incongruous at all. He did not live long enough to be knighted or ennobled but he, surely, would have been, had he lived even the expected 'half-life' of a normal human being, as we reckon today.

The professional, academic, economist is, of course, well aware of the *Phillips curve*, even if less than 'it' should about its origins in the hands of Bill Phillips ; a subset of these scholars, and some others, are also aware of the **Phillips Machine, MONIAC[5]** (*Monetary National Income Analogue Computer* - as the Phillips machine was 'christened' by Abba Lerner). Much fewer know about the role Phillips played in formulating a macroeconomic model of *stabilisation policy* where the triptych of *Integral*, *Proportional* and *Differential* Policy regimes could be framed, in the Keynesian context of Post WW II policy debates. Only a negligible fraction of serious economists seem to be aware of the pioneering role Phillips played in advancing *continuous-time modelling of economic dynamics*.

All this - and more, much more is elegantly, passionately - but also *carelessly* - discussed and described, with what may felicitously be referred to as immense respect for, and admiration of, the life and *economic times* of Phillips, in *Hares*. The next section summarizes the contents of the book, in the sequence with which the author has chosen to narrate a fascinating story.

However, the 'carelessness' that permeates *Hares* - in the form of simple typos, incorrect attributions, unnecessary claims, many of which cannot be substantiated in any coherent or meaningful way - make it a difficult book to enjoy, which – surely –must have been one of the aims the book was supposed to achieve. Moreover, it is unfair to the memory of the humble genius, who was preoccupied with accuracy, to the best of *his* ability and engineering

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[4] It was with 'mixed feelings' I read that the WISDEN ranked Sri Lanka's Muttiah Muralitharan as the greatest bowler of all time, and Richard Hadlee as *second* only to that spin wizard! I suppose, as an all-rounder, too, he would be ranked behind the great West Indian, Sir Garfield Sobers – '*second best*', again!

[5] Supposed to rhyme with those other well known (main frame) *digital* computers, ENIAC & MANIAC, although the **MONIAC** (by which it will be referred to, in this essay) is an *analogue* computer.

precision[6]– otherwise, how could he have built the MONIAC, with the meshing of cut gears, flow of water, the circuitry, all supposed to be synchronized to 'tolerable' perfection – but a 'tolerance' that was specifiable. Much of this is interspersed with the descriptive material in §2, as are my own 'reflections and ruminations' of Phillips' contribution to macrodynamic modelling, to its methodology, to his stance on stabilization policy and, above all to what I consider to be his most fundamental and original contribution: the construction of what came to be known as the MONIAC – the theoretical principles (both applied mathematical[7] and macroeconomic) underpinning its construction, working, and the possibilities it made feasible for teaching the complexities of implementable policies (both monetary and fiscal).

The final, concluding section, is an attempt to weave the threads that made up §1 and §2, into a patterned fabric that could at least serve to outline a way to appreciate and interpret the work of a truly humble, modest, genius.

My work in the intellectual world I was fortunate to live in, teach and do some research, was dominated by interests in the theory of economic policy, short-run aggregate fluctuations in macrodynamic models, capital theory, simulation, computation, dynamical systems theory and the history of economic theory. I do not think it is an exaggeration to say that in all these interests, I was inspired by my two important teachers: *Björn Thalberg* in Lund, first, and then *Richard Goodwin* at Cambridge. They introduced me, both via their teaching and research, to what I consider to be the seven Phillips classics (Phillips, 1950, 1954, 1957, 1958, 1959, 1961 & 1962) – and to the MONIAC. In particular, Richard Goodwin's physical demonstration of the mechanism, workings and policy basis of the MONIAC was illuminating and converted me to a lifelong interest in the actual construction of computing machines[8].

It was, therefore, natural that I – with the willing collaborative support of my friend and colleague, Professor Stefano Zambelli and my (then) graduate students, Selda Kao and Ragu

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[6] This author's first degree from the faculty of engineering, department of mechanical engineering, at Kyoto University was from the division of *Precision Mechanics*!

[7] By this 'old fashioned' term I mean the mathematics of classical mechanics, fluid dynamics, electrical engineering and elementary classical theory of differential equations.

[8] The latest 'escapade' along this line was my successful construction, with the decisive and sterling help and imagination of my 11-year old daughter, of a functioning LEGO Turing Machine. As a young boy in old Colombo, I was given Meccano Sets of increasing 'complexity', as birthday presents, from the age of 6 to 11 (so, I was perplexed by Swan invoking continuity and differentiability of factor inputs into an abstract, aggregate, production function, using the distinctly discrete metaphor of Meccano set parts and constructions).

Ragupathy – organized a two-day conference to commemorate the 60th anniversary of the construction, display and theoretical underpinning of the MONIAC, at Trento, in December, 2010 (Quadrio Curzio, 2011).

Previously, in the second semester of the academic year 1971/72, in the department of economics advanced course on Macroeconomics, Björn Thalberg had introduced me to Phillips (1954, 1957, 1958, 1961 & 1962[9]).

As for (dynamic) continuous-time estimation *theory*, quite apart from my eternal interests in simulation, computation and dynamical systems theory, there was also my deep and long friendship with Giancarlo Gandolfo and my (surely, inadequate) attempts to come to terms with, and an understanding of, the work he, and his associates[10], had done, inspired by Phillips

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[9] All via the original Phillips classics, but the *Phillips Curve* also via Evans (1969, particularly chapter 10), which was one of the key textbooks of that course. Of course, I still own the copy I bought in Lund, in April, 1972, heavily marked and underlined, especially chapters 10 & 11. Of course, the classics by Phillips (1954, 1957, 1961 & 1962) were supplemented by Thalberg (1971, 1971a) and Allen (1967), especially chapters 17-20. Baumol (1961) was also included in the course reading-list and was introduced critically. As for the underpinning of the economic writings of Phillips, in the theory of *servomechanisms*, I need only to mention that my Lund Master's dissertation, supervised by Professor Thalberg, and submitted in January, 1973, was on *Some Cybernetic Approaches to Macroeconomics*, heavily influenced by Allen (1956; 1959;1967) and the reviews by Phillips (1954), Goodwin (1955a) and Tizard (1957) of Tustin (1953) and Lange (1970), all – needless to add – introduced by Thalberg. I should add that Sir Roy Allen was my gentle and generous external examiner for the PhD thesis I wrote under Richard Goodwin, at Cambridge, in November, 1979. He was charmingly disarming, when I was examined telling me, as I entered the room, nervous to the hilt: 'We have no questions; do you have any?' Of course, he had many and good questions – as well as concrete suggestions for publishing some of the chapters of the theses. Incidentally, Tizard was already an important figure in the Cambridge to which I came, in 1973, as the enlightened Senior Tutor at Churchill College, promoting the admission of women to the College. But, to the best of my knowledge, Tizard did *not* 'go on to have an eminent *academic* career' (Hares, p. 150; italics added), at Cambridge; although he did have a distinguished *administrative* career at Churchill College.

[10] One distinguished member of that group is the current Minister of Finance in the ruling government of Italy, Pier Carlo Padoan. My own attempts in this direction was reported in Velupillai (1982) and Velupillai & Zambelli (2015) – an interval of 33 years between the two which, I hope, gives substance to the use of the word 'eternal', above! In this connection I would like to add that the approach pioneered by Phillips is being advocated, currently, for example, by Dixon & Parmenter – and, in any case, I do not think Laidler's reason (Laidler, 2002), for the demise of this method is even remotely correct. The Phillips method, in the hands of Dixon and his associates (in Australia) refers to *Computable General Equilibrium* (**CGE**) in the sense of Leif Johansen's model of multisectoral growth (with putty-clay models, as in Bergstrom's development of Phillips' work on these lines – cf., Allen, 1967, chapter 20). The

(1959). This RA is written, therefore, with an appreciative background, stretching over the whole of my life as an economist, in the remarkable – if not extensive, *mercifully* – contributions of Phillips.

There is one final 'confession' I have to make. I was one of the so-called 'anonymous readers' the distinguished publisher contacted with a request for a 'report', which I happily supplied, with optimistic comments, but also pointing out some necessary corrections of gross errors. My comments, moreover, were confined to some of the contents of what has become 'Part II' of *Hares*. I am afraid that these 'suffered' the fate of the proverbial 'water off of a duck's back'.

I objected to being referred to as an 'economic philosopher' (p.116) – not that I was averse to such a description of myself[11], but my 'objections' have obviously been ignored.

This reminds me of a recent episode. In June 2012, I was walking down Herschel Road, in Cambridge, towards the Clare Hall flats, where my wife and I were staying. From the other side, an 'elderly' Gentleman, on a bicycle - even more 'elderly' - fully attired for safe cycling in the East Anglian rain (helmet, cycle clips, green rain coat and so on), turned into Herschel Road from Wilberforce Road. He saw me, promptly stopped, got off the bicycle, and asked me: 'Can I help you – are you lost?'; I was just about to say, 'Geoff, how are you,' because I recognized him immediately as Geoff Harcourt. Instead I said: 'Geoff, don't you recognize me? I am Vela.' He stared at me, and then said: 'Oh, I thought you were some lost West Indian cricketer.' I replied: 'Geoff, all my life I have wanted to be a 'West Indian cricketer' – or be mistaken for one!'

I am, alas, neither an 'economic philosopher', nor a 'West Indian cricketer', although I wished

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newclassical notion of CGE is quite different and the computational model underpinning it is completely *ad hoc* – i.e., no consistent attempt to estimate continuous-time models with discrete data. I can easily substantiate this, mathematically (as I have done in numerous writings).

[11] I still have my copy of Samuelson's **Foundations of Economic Analysis** (Samuelson, 1947), bought and read when I worked as a labourer at a cement factory, in Limhamn, in Southern Sweden, forty-five years ago. I can read the pencilled note under the title of that classic, even now: 'My *magnum opus* would be titled *Philosophical Foundations of Economic Analysis*!' Needless to say, now – forty-five years alter - *I am still writing it*! It is unfortunate that this classic by Samuelson is badly confused with that best-seller, Samuelson (1955), in *Hares* (for example, p. 114).

to have been, one or the other – or both (simultaneously)!

The book is replete with such mistaken allusions, often much more 'dangerous' ones. However, the prize typos – I hope *only* that, but I am not sure – were the reference to a 'J.**K**. Hicks' and the repeated spelling of '*Denis*' as one of the forenames of Sir **Dennis** Holme Robertson – Alan for Allan is also a particularly sad 'typo', simply because McRobie is a good friend of mine!

§ 2. The Chase by an 'Economic Hound'

> "There has been an increasing use in economic theory of mathematical models, usually in the form of difference equations, sometimes of differential equations [12], for investigating the implications of systems of hypotheses. However, those students of economics *who, like the present writer, are not expert mathematicians*, often find some difficulty in handling these models effectively."
> Phillips, 1950, p. 283; italics added.

Thus began Phillips, in his first famous published article, with that characteristic humility for which he was known–, and which is repeatedly - and justly - emphasised by Dr. Bollard, in this book[13]. Dr. Bollard 'confesses' (*Hares*, p. vi):

> "I have largely[14] avoided graphs and avoided equations.'

I am of the opinion that this is a laudable aim, especially if the 'economic times' of this humble genius is described with reasonable fidelity, and provided a good, fair, list of references are also given, so that anyone whose appetite is whetted, may proceed to tackle the more technical papers dealing with the kind of issues that were broached by Phillips. I think Dr. Bollard

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[12] I don't think this is an accurate statement of mathematical economics – micro or macro – game theory or any other kind of economics, even in 1950. Macrodynamic models were – with the exception of so-called period models of the 'Swedish' or Robertsonian variety – mostly of *differential equations* (Ramsey, 1928; Tinbergen, 1931; Harrod 1936, 1939; Kaldor, 1940; Goodwin, 1949); *partial differential equations*, *mixed difference-differential equations* (Kalecki 1933; Frisch 1933) and also simple *stochastic* dynamical systems (Bachelier, 1900). To the best of my knowledge, *Tâtonnement* was always modelled in terms of differential equations.

[13] The late Richard Goodwin, never ceased to emphasise what a nice and humble man Phillips was - and Goodwin should know: he was the custodian of the Cambridge Phillips Machine, now resurrected and maintained with loving care by Dr. Allan McRobie, at Cambridge. The original Cambridge Phillips Machine, used in class by Richard Goodwin, during his Principles lectures at the Faculty of Economics and Politics, used to 'leak' profusely and malfunction often. Goodwin told me that every time he rang Phillips, he would come by train and repair the machine, with absolutely no hesitation and with immense humility (see Chapter 7 of this book and Kuczynski, 2011).

[14] 'Entirely' would be a more appropriate word to use, here!

succeeds, 'largely', in achieving the aim he set himself, but not 'entirely' satisfactorily, especially not in part II.

Approximately a third (74 out of 232 pages of the main text) of *Hares* tells the story, in that outmoded grammatical mood of the *subjunctive*, of the first 23 years of Phillips' pre-economic life of 60 years, in Part 1[15]. Thus the first four chapters are liberally sprinkled with phrases such as, 'would have', 'would be', 'would also have', 'could have', 'may have', 'we can only speculate', 'suggest', and so on. Thus, this – at least the first part – is a plausible reconstruction of that part of Phillips' life, spent largely in the Antipodes, East and South East Asia. The author's knowledge of the New Zealand landscape is superbly invoked in describing the kind of life that may have moulded this quiet, increasingly self-sufficient, man who refrained from any kind of complaining of whatever hardship he, or his family, had to endure – and there were copious instances of them, as poignantly narrated in the engaging first part of *Hares*.

Apart from the time Phillips spent in a Japanese Prisoner of War camp, and the so-called British Institute of Technology courses[16], I have no especial knowledge or expertise on any of the topics discussed, broached and narrated – even if in a subjunctive mood – in part I. I shall, therefore, simply note some of the salient points of that part of Bill Phillips' life before his arrival in London, 'nearly' around 'Christmas 1937' (*Hares*, p. 43).

The evoking of the way the independent spirit of a New Zealander – native or immigrant – may have been inspired by the natural setting of the country is described, almost *sotto voce*, in *Hares* (p.8):

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[15] Bill Phillips was born on 18 November, 1914, in Te Rehunga and died on 4th March, 1975, in Auckland, both in New Zealand. I think the sub-title of the book, as *Life and Economic Times of Bill Phillips*, may have described the contents of the book more accurately.

[16] Among the many infelicities in Wulwick (1989) – many of which have been competently discussed in Leeson (1994), but see also Wulwick (1994) - there is the blatantly inaccurate 'assertion' in the opening line of the article (*ibid*, p. 170; italics added):

"A. W. H. Phillips received a *degree* from the *London Institute of Electrical Engineers* in 1938 …. ."

Phillips 'applied for and was granted *Associate Membership of the Institute of Electrical Engineers* [known in the British influenced countries as the **AMIEE**], as correctly pointed out in *Hares* (p. 43). Phillips *never* 'received a degree' in *electrical engineering* from any academic or higher institution, ever; but, of course, he was a competent electrical *engineer*, as the achievements of his whole life – even including the 'economic times' – testifies (and, in particular, as a Prisoner under Japanese captivity in Java, for part of WW II).

> "The southern half of New Zealand's North Island is bisected by a high mountain range, craggy windswept rocks near the top descending into steep ridges and bush-clad valleys. Pre-European Māori inhabited the lower altitudes. At the lower end of the mountain range, the Manawatu river cut a gorge through the hills and this provided a route for the Māori tribes who would hunt in the forests and fish on the coast."

And, again (*Hares*, pp. 9-10; italics added):

> "Bullocks, horses, and steam engines dragged the big trees out of the bush into the [saw]mill on old tram lines, later to form the foundations for many of the local roads. Included amongst them was the Kumeiti Road, the two-mile way that led from the back of the Ruahine Range towards the sea, and Topgrass road running along the front of the ranges. The junction of Topgrass and Kumeiti roads marks the farm [where the core of the house] where Bill Phillips would be born and raised …. , and it *still stands today*."

This landscape, so different from Clapham, in London (where Marshall was born), Harvey Road in Cambridge (where Maynard Keynes was born), Erode in the Madras Presidency (where Ramanujan was born), perhaps not dissimilar to the birthplace – Brightwater, in the South Island of New Zealand - of one of the other geniuses from New Zealand, Ernest Rutherford, or Swanage, in Dorset (where James Meade was born), may well be a testimony to the irrelevancy of nature's bountiful endowments to the fostering of intellectual greatness.

The early and growing life of Bill Phillips, spent in the almost idyllic natural surroundings of the spectacular North Island of New Zealand, cannot – surely – be more different from a POW camp in Java or 'digs' in London! But these 'idyllic surroundings' were the backdrop of the harshness of life, the overcoming of which may have cultivated the resilience, the almost single-minded determination to resolve any problem with which he was confronted, that may have been the hallmark of the remarkable achievements of Bill Phillips.

There are several examples of the innovative ways Bill Phillips came to terms with, and overcame, the difficulties of the limited resources of a rural life – however idyllic the environment was – and the hard realities of a POW camp imposed, on his ingenuity. The three, of numerous in this part of the life of Bill Phillips, I think that deserve mention, especially because they reflect his demeanour, attitude and determination, in the face of adversity are as follows.

Firstly, like many budding geniuses, his thirst for knowledge, growing in a rural community, Bill Phillips, his daily journeys to school was nothing short of an ordeal, at least in terms of the

time and the various modes of transport he had to resort to – cycling, walking and a goods train ride, capped by another 'brisk walk uphill three-quarters of a mile to the high school' (*ibid*, p. 25) - to go from home, and return home, early and late, respectively. As described in characteristic undertones in *Hares* (p. 25), Phillips found:

> "The time he was wasting while biking worried Bill, and he pondered how to address this problem. At last he hit on an answer: he constructed a book stand and fixed it to the handlebars of his bicycle. That way he could read and study as he pedalled[17]."

And, then: (*ibid*, italics added)

> "After a year or two now aged about 14, he found another solution. Bill bought the wreckage of ab old truck from a neighbor for five pounds. He painstakingly took it apart, found out how it worked, repaired the body, and sorted out the mechanics. Being used to driving a farm tractor, he soon *taught himself* to drive the truck. Next step was to drive it to school. …. Of course, there was no driving licence, no registration, and there were no seat belts. The staff at Dannervirke High School were rather disturbed – it was unheard of for a pupil to drive a motor vehicle to school in those days and *Bill was banned from doing it*. But *he simply ignored the ban* making sure to park a few streets away so that no teachers would see the truck and its underage driver, and this arrangement seemed to be tolerated."

These noble characteristics, mastering the mechanism of a useful machine, teaching himself a skill, whether cerebral or technological, obediently breaking inconvenient rules and making sure the circumvention was done in a way that made it possible for the 'enforcers' of an inconvenient law to ignore the offender, all at age 'about 14', stood him in good stead in the years to come, in difficult, good and better times.

His personal exploits and feats, under the most difficult and ignominious captivity by victorious Japanese forces in South East and East Asia, in his personal case, in the Indonesian Island of Java, have become legendary. They are too well known for me to comment on Bollard's sympathetic description of the ordeals and scars that Bill Phillips underwent during the years as a POW.

The negative remarks on Laurens Van der Post in *Hares*, and the South African's pitiless way of disregarding the important role played by Bill Phillips, in those dark, final, days at the POW camp, receive the kind of caution and opprobrium that it deserves (*ibid*, note 15, p. 240):

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[17] I miss the subjunctive mood here – surely, Bollard should have (sic!) written *would have* 'worried' Bill and he *may have* 'pondered', etc.! More humorously, what shall we think of this characteristically innovative rural solution, for roads not heavily trafficked, in these days of risking prosecution for using mobile phones while driving a car!

> "Even though he obviously knew his name, the *egotist* van der Post *may have deliberately excised Bill's name from his account to keep the focus on himself.*"[18]

More importantly, the almost fiercely hostile opinion expressed by the mild-mannered Bill Phillips of this South African fellow POW (*ibid*, p. 69) seems to confirm this:

> "Commenting later to both Carol [his sister] and his wife, Bill said he thought van der Pot was something of a pseud. Many years later in a letter to Valda [his wife] he [Bill] wrote 'Reading the official biography of Van der post at the moment by Jones. Seems to have been a habitual liar on a grand scale."[19]

Finally, on part I, Bill Phillips' father, Harold ('known by his contemporaries as Housego, his mother's maiden name', later 'inherited' by Bill Phillips, *ibid*, p. 7):

> "[W]as said to have been very adept at mathematics and reading. Reading Shakespeare would become a life-long interest."

Harold Housego was also adept at adapting technology to make electricity available at the home – '14 years before there was central power supply available' (*ibid*, p. 19), was innovative in introducing modern livestock breeding methods, and an enthusiast of outdoor sporting activities. Many of these traits were, of course, those which passed on to Bill Phillips, seamlessly (it seemed), except – perhaps – 'reading Shakespeare' and any enthusiasm for sporting activities'.

I come now to part II, which is divided into seven chapters, the classification of chapters 6 to 10 largely spanned by the eight path-breaking contributions by Phillips, from 1949 to 1962 - the exceptions being the fifth and the eleventh (last) chapters of the book, *Post-war London* and *China and an ending*, respectively. There are also a brief, 13-point, summary *Annex* and a ten-page *Endnote* section on each of the chapters of the whole book. Alas, with the possible exception of point eight – of thirteen – all other claims in the *Annex* are demonstrably false. It may well be true that Bill Phillips was '*one of the first* mainstream economists to study China – 1968' (the thirteenth point of the Annex), but this claim needs to be seriously qualified by the meaning of 'mainstream economics' and 'China – 1968'. After all, there was Leontief's one-year visit to China, in 1928, to advise its Ministry of Railways and Joan Robinson's

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[18] It is to the lasting credit of Robert Leeson to have 'forced' van der Post to acknowledge Phillips (*Hares*, 68).

[19] I don't know whether the constant switching between '**V**an' and '**v**an' is one of the many infelicities in *Hares* or not!

sustained efforts to learn and understand 'modern China', at least from about the mid-1950s (Robinson & Adler, 1958[20]), after her first visit to post-Mao China in 1953.

On the other hand, in a *unified* consideration of Bill Phillips' other contributions, he is easily shown to have been one of the most versatile, original, macroeconomists, with special interests in continuous-time estimation of the parameters that may be defining elements in mathematical modelling of disequilibrium macroeconomics, for stabilization purposes.

Chapter 5 describes, in a very general way, the two years of Bill Phillips' life, between finding 'himself back in London in early 1946' and the end of the glorious 'Compton-Edrich'[21] summer of 1947 – a period of momentous changes in society, and in the way Phillips himself began to fashion an interesting academic life, although with serious 'birth pangs'. It is a well-written chapter, with the general social, political and economic background to the world[22] in which Bill Phillips may have found himself, so that this qualified and experienced electrical engineer's decision to pursue a sociology degree at the LSE, with increasing interest in economics, might make some sense.

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[20] This important – and rare – Fabian tract was published in September, 1958, with a foreword by Harold Wilson, a little over half a decade later the labour party Prime Minister of Great Britain. Sol Adler, who this author met in Beijing, in 1988, was fluent in Mandarin – in reading, writing and speaking. He was the US Treasury Representative in Chongqing, in the early 1940s and fro the early 1960s till his death in 1994, lived in Beijing. He wrote his M.Sc dissertation (on *Wicksell's Theory of Interest and its Influen*ce) under Lionel Robbins, at the LSE, in 1932, and his external examiner was Dennis Robertson. I own both, a copy of the dissertation and Dennis Robertson's examiner's report, given to me by Sol Adler, during my visit in 1988.

[21]Edrich is not mentioned in *Hares* (p. 93; italics added), and what is suggested about that summer weather is, fortunately, not true:

> "In 1947 Denis Compton was in the headlines with his new cricketing record for runs scored in the cricket season, *a triumph of talent over the weather*."

I do not recall any of the cricketing literature of that period – primarily the *Wisden*, but also the nascent *Playfair Cricket Annual* - ever referring to anything other than the 'Middlesex twins.'

[22] Strangely, that other momentous event of the times, the independence, and the unspeakable horrors of partition, in the Indian subcontinent, nor Sukarno's proclamation of independence for Indonesia, from the colonial clutches of the Netherlands, are mentioned at all. Surely, these events, especially the latter, must have interested a sensitive man who had been a POW in a cruel Japanese camp in Java? Nor do the significant events in Greece and Italy receive any attention – but Churchill's 'Iron Curtain' speech at Fulton, Missouri, does, as if it may have been headline news at the time (which it was not). Indeed, the phrase had even been used by Churchill, in the House of Commons, when he was still the Prime Minister, in letters to Harry Truman, as well as in the British house of commons (not to mention the use of the phrase by Goebbels!).

The chapter also documents the linguistic abilities of Bill Phillips – fluent or proficient (at least with reading knowledge), apart from English, in Chinese, Russian, French[23], Dutch, Malay and German.

Two significant points, in this reviewer's opinion, raised in this chapter deserve some attention. One, the contradictory interpretation by Leeson and Sleeman on the importance – or not – of the wartime experience on his choice of Sociology (*Hares* note 5 to chapter 5, p. 242). The other is the unfortunate penchant of the author of Hares to 'indulge' in unnecessary, unfair and inaccurate 'Cambridge bashing' (despite his own Cambridge 'pedigree', *ibid*, note 1, p. 240).

First of all, 'unlike the *fellow travelers of Cambridge University*', the author writes (*ibid*, p. 92, italics added), 'the conversation around the LSE corridors *would have* reflected all shades of views'. Secondly, on the same page of *Hares* (p. 92), one reads:

> "Newspaper headlines trumpeted the arrest of spy scientist Klaus Fuchs, and the defection of spy diplomats Guy Burgess and Donald Maclean, rocking *the Cambridge establishment*."

These are trivially irrelevant, ideological, assertions that do not deserve any mention, especially in the artificial and concocted contexts that *Hares* emphasizes. The LSE economics department was not the bastion reflecting 'all shades of views', nor is there anywhere an identifiable 'Cambridge establishment' that was rocked. The 'British establishment' – not even Trinity College – was the one to have been 'rocked'. Moreover, the Fuchs, Burgess and Maclean 'affairs' did not become 'Newspaper headlines' till the 1950s, well outside the interval of time discussed in this chapter.

Surely, it was not to be a 'fellow traveler of [a] Cambridge University' that was the home of a Dirac and a Hardy, a Cartwright and a Littlewood, a Wittgenstein and a Moore, and a Faculty of Economics and Politics which had as members Kahn and Robertson, the Robinsons and Stone, Sraffa and Dobb[24] - even Harry Johnson, in the same situation as Bill Phillips, and supervised by Dobb, was elected as an *Apostle* (*before* Keynes – who was, of course, an *Apostle*

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[23] I am, now, prepared to believe that Phillips (1958a), presented at *Le symposium de Zurich et les concepts de base de la cybernétique: entropie comme mesure de la liberté sociale et économique*, wrote it in French!!

[24] In a personal conversation with me, in November 1980, Piero Sraffa told me that it was Robertson who 'took Dobb and myself to Trinity'!

– died)? I don't think the author of Hares has done 'serious homework' before making these flippant comments – as evidenced by many examples, some of which will be highlighted in the sequel.

Chapter 6, titled *Hydraulic Machine*, is the story of the MONIAC, how and why it was conceived, constructed, implemented and displayed, with mathematical and theoretical foundations in mechanics, hydraulics and macroeconomic theory. It is an important story and I doubt anyone else than the author of *Hares* can tell it better or more forcefully[25]. That, of course, does not mean the chapter's contents are without blemish.

Before I continue with a discussion of chapters 6 to 9 there is one point I wish to emphasise. There is no evidence whatsoever that Bill Phillips, or – indeed – the British Institute of Technology course in electrical engineering that he took, were aware of the burgeoning developments in non-linear (electrical) circuit theory, at least at the end of the 1930s, and for many years later. Nor did any economist at the LSE had any knowledge of non-linear modelling of trade/business cycle theories[26], at that time. Without acknowledging this particular technical 'gap' in Bill Phillips' knowledge base, there is a risk of untenable claims and assertions about his contributions to macroeconomic dynamics and stabilization policy.

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[25] In note 18 to this chapter (*Hares*, p. 243, italics added), the author writes:
   "*I* carried out much of the assembly on the New Zealand [MONIAC] machine.'
Even more importantly he notes (*ibid*, p. vi; italics added):
   "*I* spent hours many hours in an old garage puzzling over how to assemble [the MONIAC]; and in doing so learned something of the genius of the designer."
No one who has constructed or assembled a machine, to function as it was designed to do, knows how much one learns in doing so and the kind of skill that such a 'learning by doing' activity entails. Above all one learns the *limitations* of such a machine, too.

[26] John Hicks was in Oxford, Richard Goodwin at Harvard, Paul Samuelson first at Harvard, then at MIT and Jan Tinbergen in the Netherlands; but Kaldor had developed his non-linear model of the trade cycle (Kaldor, 1940), essentially following Kalecki (1936). He left no legacy of this work at the LSE, at least in the period that Bill Phillips spent at that august institution. None, except Richard Goodwin and, to some extent Jan Tinbergen and Ragnar Frisch, were even remotely aware of van der Pol (1924, 1930) and von Kármán (1940). Richard Goodwin, Nicholas Georgescu-Roegen (1951, chapter V) and Paul Samuelson (1947, p. 340) were aware of Le Corbeiller (1933), but the non-linear dynamical implications for economic modelling of aggregate fluctuations of this classic was worked out, first, in Goodwin (1949, 1951). Cartwright's (1964) important remarks on the origin of non-linear circuit theory in the British context should be noted (especially in the context of the courses on electric circuit theory offered by the British Institute of Technology in the years during which Bill Phillips took them).

This chapter is the longest in the book, and justifiably so. In a way, it is the beginning and the foundations upon which Bill Phillips' remarkable life as an economist developed. There is, however, nothing in the way of its relationship to the differential analyzer of Vannevar Bush, although in sporadic and not very clear ways it is pointed out that the MONIAC was designed to 'solve' differential equations (essentially the *initial value problem – ivp –* of such equations), assuming implicitly the *Peano existence theorem* and some kind of Lipshitz continuity.[27]

It is in this context that Robertson's perceptive query should be understood (*Hares*, p. 115; italics added):

> "Professor Robertson corresponded with Bill after the publication of his 1950 article. Robertson apparently questioned whether Bill have handled the model through more basic *difference equations*. *Bill responded* to these in a letter of September 1950, *clarifying his argument*.'

How did Bill Phillips clarify 'his argument'? There is no indication in *Hares* on the contents of Bill Phillips' 'letter of September 1950'. Did Phillips acknowledge that the MONIAC was a special differential analyzer, which could handle *only differential equations*? Robertson's (and Lundberg's) period-analysis models (of the trade cycle) were (at best) piecewise linear – i.e., nonlinear – difference equation systems and the MONIAC would not be able to 'handle them' without *ad hockeries*. As Richard Goodwin (1950, footnote 6, p.319) pointed out, almost at the same time that non-linear macrodynamic models in continuous-time were being framed, in his remarkable review of the piecewise linear model of the trade cycle in Hicks (1950):

> "Combining the difficulties of difference equations with those of nonlinear theory, we get an animal of a ferocious character and it is wise not to place too much confidence in our conclusions as to behavior."

Yet, a persistent reader can easily understand how Bill Phillips went about constructing the MONIAC, how he underpinned the mechanics of the working machine in the macroeconomic theory of the times (with the help of Walter Newlyn), and how his background in electrical engineering would have helped him in putting together the electro-mechanical dynamics of an essentially hydraulic machine – all this by reading this chapter carefully, weeding out the infelicities.

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[27] Hence, perhaps, his gradually increasing interest in continuous-time estimation problems.

But 'weeding out the infelicities' will not be easy – for, the chapter is interspersed with technically incorrect claims, appalling infelicities in references of absolute classics, and a complete misunderstanding of the meaning of *optimal* control theory[28], all amidst the most convinced portrayal of the genius that Bill Phillips was, in conceiving of the MONIAC.

Let me give some examples of these 'dangerous' (for the serious reader) infelicities.

Several of the assertions about Irving Fisher's *Hydraulic Machine* are wrong – about when the initial machine was built (p. 96), the cisterns were not connected by 'levers' (p. 96), note 2, to this chapter (p. 241) refers to Fisher (1939) quite irrelevantly in the sense that what the author claims can be found in this article about the hydraulic machine is not true, the reference to Fisher (1892), in the reference list, is both incomplete and incorrect; but above all, there is 'sin by omission'! Fisher's equilibrium mechanism for the hydraulic determination of equilibrium prices was underpinned by an appeal to what is known as *Pascal's Principle* – and this is a fundamental difference with the MONIAC.

The claims for Leontief (1991), in *Hares*, pp. 96-97, are simply wrong[29]; Leontief (*ibid*, p. 204), in fact, discusses 'the fundamental difference' between the flow of water in a river and the flow of goods in an economy, as well as the drawing of 'erroneous conclusion' from a 'false analogy' (between the two flows).

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[28] Brian Hayes (2009) in otherwise admirable article on the MONIAC and Bill Phillips' concern with stabilisation policies, goes too far in stating (p. 188; italics in the original):
> "Beginning in the 1960s, modern control theory introduced a new computer-intensive methodology … . This collection of techniques, known as optimal control identifies the control law that comes closest to satisfying a given criterion."

This may apply to *dynamic programming* techniques – increasingly used in orthodox mathematical economics with a computational slant, it is, however, not true for that part of *Optimal Control Theory* coming down the tradition of applying traditional calculus of variation methods, emanating from Ramsey (1928), and now part of very standard mainstream macroeconomics. Hayes is also incorrect in claiming that (ibid, p. 191):
> "[The 'Lucas critique'] had the collateral effect of dampening enthusiasm for application of control theory in macroeconomics."

As even a casual perusal of, say, Romer (2012), Woodford (2003) or even Sargent (1987) would show, 'optimal control' (in terms of the Hayes definition) is 'alive and well' in almost every kind of macroeconomics.

[29] There is a trivial typo on the page numbers of this article – 18-212, should be 181-212!

In note 5 to this chapter, p. 242, the reference to the title of the second edition of Allen (1956) is unfortunately, incorrect. The composition of the 'Cambridge Circus' group (p. 104), did *not* include Maynard Keynes, but did include James Meade. The claim that Hayek's *The Road to Serfdom* 'would later help win him the Nobel Prize' (p. 105), cannot be substantiated. Alas, both statements about the two modern classics by Hicks (1939) and Samuelson (1947)[30], on pp. 113-114, are hopelessly wrong. There was no 'third edition of *Foundations*' (p. 114) in which 'Samuelson synthesized a quasi-Keynesian Hicksian framework[31]. Bill Phillips could not 'have been exposed to the intellectualism and policy interest of' Kaldor, at the LSE (p. 114) – simply because he [Kaldor] had left its department of economics by the time Phillips arrived there. It is claimed in *Hares* (p. 116) that this reviewer pointed out that the MONIAC 'would not pass *the Turing test* for being an analogue of the real world'! This is an absurd claim, untrue theoretically and factually; theoretically because 'the Turing test' is the basis for a kind of test for what has come to be known as Artificial Intelligence; factually, because I deny ever having made such a preposterous statement. The Skidelsky (2006) story (p. 117, italics added) about Marty Feldstein who 'used the machine to explain the Keynesian circular flow of income', although amusing, should never have been rehashed the way it is done in *Hares*! Skidelsky adds a qualifying remark (italics added), that Feldstein's explanation was 'based on an actual machine *Alec Cairncross had caused to be constructed at the LSE*'! In any case, how could 'Ramsay McDonald and the other politicians around at this time' – i.e., 1929-1931 – understand 'the principles of [MONIAC]', when Keynes himself was still in the process of writing the *General Theory*! Machlup was *never* at Harvard (p. 122).

Finally, least innocuously, there is no clear indication of the importance of a flexible, non-linear, accelerator, and a dynamic multiplier, jointly generating and maintaining aggregate fluctuations; instead, almost all the discussion is against the backdrop of a linear accelerator. I believe this was partly due to Newlyn's influence on Bill Phillips and the former's untenable assertion (Newlyn, 2000, p. 37; italics added):

> "[The] inclusion [of the accelerator] in the Mark II machines is the element which gave it the dynamic feature *which stimulated the work of Richard Goodwin* - a far cry from being a teaching aid!"

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[30] The dating of this reference in the Bibliography (p. 256) is wrong.

[31] In fact, that famous 'synthesis', which came to be (infamously) known as the 'neoclassical synthesis' appeared first in Samuelson (1955), motivated by the need to 'get McCarthy off my [i.e., Samuelson's] back' – and not due to any meaningful 'synthesis' between neoclassical *microeconomics* and Keynesian *macroeconomics* (Clower, 1972).

It was, in fact, the other way about!

Chapter 7, on *Stabilization and Computing*, is only a page shorter in length than the previous one, but is as informative and interesting , although far less marred by the kind of diverting infelicities of chapter 6 and its notes. It is about the 'interregnum' professional years between the construction of the MONIAC, the successful beginnings of the adventures as an academic economist at an outstanding Institution of learning, the enrichment of a personal life via a romance which led to a marriage and a lifelong, typically loving and devoted partnership, and the next stage in a research career that blossomed in a natural way into work that became pioneering, with many ramifications in the theoretical, empirical and applied worlds of macroeconometrics, dynamic macroeconomics and continuous-time estimation.

On the whole, I think a title such as *Stabilization, Servomechanism and Linear Dynamics* would have been a more accurate descriptive title of the contents of the chapter. The two key contributions by Bill Phillips are the classic *Economic Journal* articles of 1954 and 1957, *Stabilisation Policy in a Closed Economy* and *Stabilisation Policy and the Time-Forms of Lagged Responses*, respectively. But also his review of Kalecki (1954)[32] and that of Tustin (1954) belong to this period[33], as should Phillips (1958a).

But before I continue discussing the dynamic stabilization policy results derived by Phillips, two other important events – one academic, and the other, personal need to be mentioned

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[32] Much of what is written in *Hares* (p. 132) about Kalecki (1939, 1954) is simply incorrect, especially that the latter was not a 'reprint' of the former; nor was the former 'written just after [Kalecki] had been at the LSE and Cambridge.' I wish the author of Hares had read at least the Forward by Kalecki to his 1954 'reprint', and also the Foreword to Kalecki (1966), as well as Part 3 of Kalecki (1990). Both the review by Bill Phillips and the summary of the review in *Hares* leaves much to be desired; they both would have benefitted greatly from the review of this Kalecki book by Goodwin (1956) – especially the observation (p. 509), that:
> "There are in fact two ways of explaining the maintenance of oscillation-shocks and non-linearities."

Phillips correctly notes this, but with a slightly different terminology; the remark about Allan McRobie's exercises with the MONIAC (ibid, p. 132) is partly incorrect and with the qualification that he was using a piecewise linear differential equation, it would be wholly incorrect.

[33] These four contributions by Phillips are grouped together in Part III, *Dynamic Stabilization and Optimal Control*, in Leeson (2000), with an introductory article for the four by Adrian Pagan which is titled *The Optimal Control Articles*. None of the four papers by Phillips have anything whatsoever to do with *Optimal Control* (not even under the broader definition given by Hayes, 2009, mentioned above, in footnote 28).

(*Hares*, pp.138-9 & pp. 130-1[34]). As happily described (*ibid*, pp. 138; italics in the original):

> "On 10 December [1953] Bill was examined by Sir John Hicks[35] on his thesis entitled *Dynamic Models in Economics*. …. On 26 January [1954] the Academic Board of the University of London awarded Bill's PhD degree; ….. . That month there was more good news: Bill was to receive the Hutchinson Medal for excellence in research work by a student, awarded for the best thesis across all LSE disciplines."

Then, as if to celebrate these honours (*Hares*, p. 131; italics added):

> "On an autumn day in September 1954, Alban William Housego Phillips married Beatrice Valda Bennett at the Kensington Registry Office. … . It was a low-key start to what would prove to be *a low-key but enduring marriage*."

The subsection on *Personal and academic life* (pp.150-155) is a relaxed and generous description of the domestic life of Bill and Valda Phillips and the academic duties and burdens of an increasingly successful academic economic career of Bill Phillips, culminating, on this front, with his appointment as the *Tooke Professor of Economics[36]* at the LSE.

To return to the five classic contributions mentioned above, by Bill Phillips (of 1954, 1954a, 1954b, 1957 and 1958a), two preliminary comments need to be made. In referring to Phillips (1958a)[37], Bollard writes (*Hares*, p. 149):

> "In 'Cybernetics and the Regulation of Economic Systems' [Bill Phillips] recounted some of his 1957 results, bringing together his thinking on what *optimal control* models could offer the problem of regulation. This time the policymaker did not have to rely on trial and error feedback rules, because Bill was moving from classical feedback

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[34] Strangely, the two events are reported in reverse order of occurrence in *Hares*!

[35] Hicks was knighted only in 1954! The incongruence in referring to Keynes, Robbins, Robertson, Kaldor, Phelps-Brown and others *without* their titles and to use it for Hicks, fully almost ten years before he received the honour, remains a mystery to me (especially also because the other references in *Hares* are not to Sir John Hicks!

[36] 'During the *1950s* Friedrich von Hayek left for Chicago, *as did Ronald Coase*." (*Hares*, p.154; italics added). Hayek left the LSE in 1950 and Coase did not settle down in Chicago till 1964. Moreover, surely the author means James Mill, when he writes John Stuart Mill (ibid, p. 155). While on such irritating infelicities, it might amuse the reader that John von Neumann is referred to as one of 'a number of brilliant Hungarian *economists*' who had 'moved to the West' (*ibid*, p. 156)! Surely, it behoves the author of a biography of a humble, unassuming, genius, to be more careful in weeding out such pointless errors of fact – at least!

[37] I have always referred to this paper as the '*Zurich Conference Contribution*' by Bill Phillips. It was there he met Dennis Gabor, the inventor of holographs, Nobel Prize Laureate in Physics (in 1971) and, above all, the inspirer of Norbert Wiener's additions to the revised, 1961, edition of Cybernetics. An English 'translation' appears as chapter 41, in Part IV of Leeson (2000), but I think it should be the last chapter of Part II, or the chapter after the review of Tustin, i.e., preceding the review of Kalecki (1954).

theory to *optimal control* theory."

I doubt very much the author of *Hares* has read this important article by Bill Phillips very carefully or that he understands the difference between classical and optimal control theory (see also footnote 28); none of the claims about *optimal control* and *optimal control theory* in can be substantiated. Phillips' Zurich Conference paper remains a very good contribution – not a pioneering one – to the literature on Cybernetics, which was taking a different direction from Optimal Control Theory (itself being codified in those very years – and some years earlier – by Rufus Isaacs, L. S. Pontryagin and his associates, Richard Bellman and Rudolf Kalman).

Incidentally, the implicit criticism of the National Physical Laboratory's focus being 'too theoretical', implying thereby also a critique of the work being done by Bill Phillips 'on the analogue computer' (p. 150), is, at best, amusing. A decade, or so, earlier, Alan Turing suffered the same fate as Bill Phillips, but this time the NPL – under its head, Sir Charles Darwin (the grandson of the 'great man') – work focused on numerical exercises, not necessarily underpinned by computability or any other kind of mathematical theory (cf., Dermot Turing, 2015, chapter 8). Also, the 'radically advanced new digital computer, the Automatic Computer [sic!] [38] Engine (ACE)' (p. 146) that Turing designed – incorporating the idea of an 'endogenous' stored program[39], quite independently of the work of von Neumann - operated on the principles of the 'concept of the universal computing machine' – now known as the Turing Machine!

Before, finally, moving on to the 'stabilisation' problem, supposedly pioneered by Bill Phillips, within a servomechanism, or negative feedback, framework, it will be useful, first of all, to remember that the following assertion in *Hares* (p. 134; italics added) is meaningless (hence the second sentence of footnote 38):

> 'In his early formulations Bill used servo-mechanism feedback theory, calculating in *discrete time on analogue computers*. Gradually he would move to optimal control theory, calculating in *continuous time, on digital computers*."

The author knows that the opposite is – and was, in the case of Bill Phillips – the fact (for example, *Hares*, pp. 145-6): analogue computers were – and are – utilized in continuous time

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[38] **ACE** stands for *Automatic **Computing** Engine*. I make this nit picking remark because I am not sure the author of *Hares* has mastered the meaning of computation, whether by an analogue or a digital computer.

[39] Hence, eventually a learning machine and, then, intelligent machinery.

problems and discrete time, or discrete data, problems are natural repositories of digital computers. Bill Phillips, late in his economic modelling life, struggle to find a technical solution to the problem of continuous time estimation on digital computers. In modern parlance, it is about reconciling scientific computing and (traditional) computability[40] theory,

Secondly, both Herbert Simon (1952[41]) and Richard Goodwin (1951, 1951a) pioneered the use of servomechanism theory in economics, long before Bill Phillips. Moreover, Bill Phillips was, unfortunately, comprehensively wrong[42] to state the following in what he wrote to Charles Holt in October, 1956 (*Hares*, p. 145):

> "The analogue machines are, I think, essential if we are to go beyond linear models with a small number of relationships and deal with non-linear models with a fairly large number of relationships."

Thirdly, it was Goodwin (1951a) who pioneered the evaluation of the *dynamics* of policy stabilization, using short-run aggregative models of fluctuation, *in the Anglo-Saxon literature*.[43]

This observation, and footnote 43, set the stage for the final point I wish to raise here, Thalberg (1971a) on *Phillips' Elementary Conclusions on the Problems of Stabilization Policy*. I wish it

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[40] The one use of the word *computability* in *Hares* is incorrect; so is the use of *computational complexity* (p. 189 & 141, respectively).

[41] Who acknowledges, handsomely (ibid, p.247), the independent work of Goodwin (1951a).

[42] As is the author of *Hares*, when he writes (bottom, p 148):
> "This – i.e., Phillips (1957) – was the world's first example of such an economic model being simulated on a computer, and the first sophisticated calculated policy results for stabilizing the economy."

To avoid repeating my dissatisfaction with this kind of unwarranted claims of 'the world's first' this and that, in *Hares*, not only in this chapter, by Bollard, Pagan and Turnovsky, let me simply say that they – and many others – are suffering from what Myrdal (1939, pp. 8-9) called 'the attractive Anglo-Saxon kind of unnecessary originality, which has its roots in certain systematic gaps in the knowledge of' various non-English languages and a narrow conception of mathematics.

[43] The *Balanced Budget Multiplier* literature of the 1940s, was a forerunner to this and as Evans (1969b, p. 14; italics added; see also Evans, 1969, chapter 20) correctly observes ,:
> "Earlier literature on the balanced budget multiplier generally concluded that, far from being unity, this multiplier could range anywhere from plus to minus infinity *depending on the model constructed and the values of the parameters assumed*. What at first seemed to be a useful approximation …. disintegrated under a barrage of *unrealistically simple models* many tailored to advance the author's own viewpoint."

Needless to say, I was introduced to this literature in Thalberg's advanced course on Macroeconomics in the Spring semester of 1972. Thalberg ws too gentle, too mild-mannered, to point out that the italicised phrases applied to Phillips (1954, 1957) and to Baumol (1961).

had been emphasized, in Hares, that Phillips' *elementary conclusions* on policy dynamic or not, was based on an ultra-simple, *linear* model, of the economy. As I pointed out earlier, whether he was motivated by his electrical engineering training, or his nascent interests in servomechanism theory, Bill Phillips was unfortunately ill-informed about the non-elementary conclusions on dynamic stabilization policy intrinsic to nonlinear circuit theory and nonlinear dynamics, both of which had been copiously used in mathematical macrodynamics. Moreover, coupled to this, was his complete unfamiliarity of the geometric theory of dynamical systems – now very much at the frontiers of the interface between computability, scientific computing and algorithmic dynamics.

After a thoroughly modest, and fair, summary of the methodology and conclusions in Phillips (1954, 1957), Thalberg points out:

> "Apparently, Phillips' studies give a rather gloomy picture of the possibilities of fiscal stabilization policy. Quotations from his articles are also often accompanied by warnings that attempts to stabilize might easily make things worse. However, one objection is that Phillips' studies are not wholly satisfactory from a methodological point of view, since his analysis is not based on models which produce *sustained* cycles. …. Also he does not, even in the case of non-stable solutions, introduce non-linearities in the fore of limits on production. It therefore seems relevant, as Phillips himself stressed, to extend his principal analysis by studying the properties of models 'in which non-linear relationships, growth trends, multiple objectives and multiple disturbances are incorporated' [Phillips, 1957, p. 277].
>
> [W]e attempt to pursue the discussion … basing our analysis on a type of trade cycle model which contain non-linearities and which produces self-generating persistent cycles."

Thalberg, then, concludes (ibid, pp. 405-6; bold italics added), as modestly as Phillips may have:

> "As maintained above, Phillips' analysis is open to criticism from a methodological point of view, since while he bases his discussion on comparative dynamics studying alternative paths for real income, ***his model did not describe sustained cyclical fluctuations.*** … The analysis … is based on [the type of model where inherent forces tend to produce anti-damped movements, but where the *non-linearities* of the system keep the movements within relevant limits …. .
>
> If we, as Phillips did, evaluate the performance of the economy by real indicators only, ***a central result of our incorporation of non-linearities into Phillips' analysis*** is that the ***timing requirement of stabilization policy does not appear to be nearly as demanding and critical as Phillips suggested***. As a rule an increase in the *strength* of the policy was found to lead good results, while a decrease in the *speed* with which is is adjusted implied a loss in the efficiency of the policy. However, ***the negative effects of a slower adjustment were*** …. ***usually surprisingly small***."

Amen!

'Ultimately', claims Dr. Bollard (Hares, p. 170), 'the Phillips curve article is about a statistical relationship.' Yet, the previous section[44] (the second of this chapter), which begins with the Laidler (2002, p. 223) quote that:

> "Every economist has heard of Bill Phillips, most of them for the wrong reason."

is supposed to have drawn 'primarily on Lipsey (2000)', as the author states in endnote 2 to this chapter (*Hares*, p. 245). I am afraid the contents of this chapter show no evidence whatsoever that either Laidler (*op. cit*), or Lipsey (*op.cit*) have been properly read – they are just haphazardly quoted.

First of all, had Dr. Bollard read the Laidler piece carefully, most of the claims on optimal control theory could have been avoided – but not all, because Laidler himself adds another dangerous comment on the topic (Laidler, *ibid*, p.226; italics added):

> "These articles [Phillips, 1954, 1957] do *not* deal with questions of optimal control, as the title of Adrian Pagan's otherwise exemplary introduction [in Leeson, 2000] to the first two of them misleadingly suggests … . It was only later, in the 1960s, [Phillips, 1961, 1962] that Phillips became explicitly concerned with optimal control, as Pagan (p. 131) does indeed make clear."

The second sentence in the above quote is not correct[45].

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[44] The first section of *Phillips Curve* most unfortunately (cf. footnote, 16), 'draws on material from Wulwick (1989)' – as the author declares in the first endnote to this chapter (*Hares*, p. 245).

[45] Laidler adds what I can only consider a gratuitous comment, which is both inaccurate and irrelevant, that (p. 228; italics added):
> "The [Phillips] curve was presented in (1954) as an adjustment equation describing the *out-of-equilibrium* behaviour of the price level, *not* as a structural equation of *the steady state system*, and *that is also how*, with suitable substitutions of variables, its *money-wage unemployment version would also be presented in (1958),* albeit quite tersely."

It was *always*, in 1954 as well as in 1958, described and presented, by Bill Phillips, as the *disequilibrium* behavior of a relation, embedded in a model of the business, or trade, cycle, that *not* was able to self-adjust to an(y) equilibrium. In this he shared with Clower, and many other distinguished Keynesians and Post Keynesians, one characteristic, defining, feature of the GT – although I have nowhere, in any of Bill Phillips' writings on economics, found any evidence of the Wicksell-Keynes skepticism of the relevance of Say's Law, especially in the context of short-term dynamics of an advanced industrial economy. '*Out-of-equilibrium*' refers to the *traverse* of a Neo-Austrian dynamic system towards a 'new' steady state equilibrium (Amendola & Gaffard, 1998).

Secondly, Laidler's observation (*ibid*, p. 228), that

> "The idea of the curve came from Phillips' reading of Bent Hansen's (1951) *Theory of Inflation* .. ."[46]

leads on, almost seamlessly, to the important Lipsey (2000, pp. 238-9; bold italics added) report on Bill Phillips' own view of what the curve that bears his name *should* mean:

> "My belief that I was reflecting Phillips' own interpretation of his curve is based on the following considerations. *First*, I was in close contact with Phillips during the year that I was working on my article. If he had thought my interpretation was at variance with his, I would have known it. Indeed, when I tried to work with *a market-clearing interpretation* in which each point on the curve was generated by the intersection of relevant demand and supply curves, *Phillips told me forcibly that he thought I was on the wrong track because his curve was a disequilibrium phenomenon. Second*, he constantly referred to Bent Hansen's *Theory of Inflation* as an antecedent of his work, and, in particular, to *Hansen's reaction function which related excess demand to changes in the price* level. *Third*, his abiding interest was in short-run stabilisation policy, as shown by his Ph.D. thesis .. and his first two major published articles … . He saw his wage curve as an empirical underpinning of the curve he used to close his stabilisation models. The latter clearly was a disequilibrium reaction function relating excess aggregate demand or supply to the price level. … [T]hose who interpret Phillips Curve on the basis of *this article alone[47]* often fail to read the earlier two pieces on stabilisation policy, although *all three articles need to be seen as a unit*."

To the credit of the author of *Hares* (pp. 169-170), all three points Bill Phillips raised with Lipsey, are handsomely acknowledged – although without mentioning the underpinning in Bent Hansen's work. To this I shall now turn, for a moment.

Bent Hansen's *Study* had its own underpinnings in Lindhal's – hence that of the 1930s Swedish followers of Wicksell (primarily Lindahl, Myrdal, Hammarskjöld, Alf Johansson, Lundberg and Svennilsson – but *not* Ohlin or Plander) – *method* (Hansen, ibid, p. vi), not Keynes'; to that extent, the *disequilibrium dynamics* that was the backdrop for the construction of the MONIAC

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[46] David Laidler chided me for not knowing the exact title of Robertson (1915), where the reference was to '*Fluctuation*' and not '*Fluctuations*'. I suppose I should 'reciprocate' now by pointing out that the exact title of Hansen (1951) is **A Study in The Theory of Inflation!**

[47] As Gilbert (1976) does – and continued to do, in the subsequent thirty-five years (as far as I know). In passing I must mention that Gilbert was considered the resident econometrician in the department of economics at the University of Trento, where we were colleagues. At an advanced staff & visitors seminar, which I chaired, Gilbert told the speaker that '30000 data points were preferable to 10000 because the former was *closer to infinity* than the latter, and this fact (sic!) was important in limit processes of statistical estimation and inference.' If this kind of understanding of 'infinity' informs any estimation or inference process in econometrics, what are we to make of 'rigour'?

and which formed the basis for the 'three articles [that] need to be seen as a unit' is Lindahlian than Keynesian[48].

The other important point emphasised in *Hares* (169; italics added), in connection with the geometric form of the relation that came to be called the Phillips Curve, is the following:

> "[I]t was a distinct improvement on the old textbook treatment, with its *sharp dichotomy* between stable prices and inflation."

This should be coupled with the Lipsey (1978, p. 49; italics added) observation:

> "Phillips wrote down the relation that subsequently became famous as the 'Phillips curve' and built it into his early models in order to remove [the classical dichotomy]. ... Although Phillips regarded the shedding of the dichotomy as crucial to the development of useful models of stabilization policy, he did not think it important to go further than just to write down a relation that captured what to him seems so obvious. .... .
>
> *The now famous curve made its debut in 1954 in Phillips' first major published paper, 'Stabilization Policy in a Closed Economy'.*"

The idea that the three articles by Bill Phillips of 1954, 1957 and 1958 'need to be seen as a unit', I would add Phillips (1950) – and the part played by his background in electrical engineering in the construction of the MONIAC[49]. No engineer worth his salt would try to construct a hydraulic model with a 'sharp dichotomy'! How would liquid flow be even 'reasonably smooth' – which was imperative if the differentiabilty and continuity properties of the differential equations that underpinned his model of the machine had to be satisfied?

It was the usual mix of common sense, pragmatism, policy relevance and theoretical basics that characterized all his work that was manifest in the adoption of the form of the Phillips

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[48] In a personal letter to me, of January 2, 1985, Bent Hansen wrote me as follows (italics added):
> "Concerning the problem of whether Lindhal had read <u>The General Theory</u> before he started on his Keynes paper, I think the solution should be found along the lines indicated by you. …. The possibility of a critical review of Keynes' <u>General Theory</u> came up (I think it was me who suggested it) and then came the famous remark that *he had never read the book*."

[49] I interpret, on 'my side', the *Hares* reference to Alford's story (p. 161):
> "Colleague Roger Alford said that Bill's interest in the relationship between unemployment and wage rates had develop when he was working on the MONIAC in 1949. He had found it difficult to model the Keynesian supply function in a way that could be incorporated into the model, and he was looking for a more suitable relationship."

Curve by Bill Phillips.

The 'Friedman connection' is, rightly, pointed out in this chapter, because it was, in many ways, the launching pad for what came to be the dominant kind of Macroeconomics at the frontiers today. Moreover, Dr. Bollard, in *Hares* (p.178), was perceptive in reporting that:

> "Friedman argued [that] the [Phillips] curve should have been stated in real not nominal wages, and Friedman's recollection is that Bill was persuaded of this."

Couple this with the *long-run* nature of the Bent Hansen model and the 'need to be seen as a unit' all five of the Phillips contributions, from 1949 to 1950 – eventually, also, Phillips (1961, 1962) – it becomes evident that a 'complete' Phillips model of the dynamics of an advanced industrial economy should – would – incorporate a consistent interaction between the short-run dynamics of aggregate fluctuations and long-run growth. It was this that was elegantly provided by Goodwin (1967), where the one non-linearity that generated the dynamics between wage shares and unemployment was a *real Phillips curve*.

Finally, much is made in this chapter of Friedman's indebtedness to Bill Phillips for the adaptive expectation hypothesis, which underpinned his expectations-augmented Phillips curve in that famous 1967 address (Friedman, 1968). Obviously, none of the worthies mentioned in this chapter, nor the author of Hares, not even Bill Phillips and, surprisingly, Friedman, seem to have read the famous, canonical, Muth (1961) carefully[50]. Had they done so, at least by Dr. Bollard, then they would have seen that the adaptive expectation hypothesis was intrinsic to the cobweb model of the cycle (Sargent, 1987, chapter IX, § 7)!

Alas, this chapter, too, is marred by a plethora of infelicities. Let me give *some* examples. Tinbergen (1952), on p. 160, should be Tinbergen (1951); everything about Samuelson (1947) – i.e., **Foundations of Economic Analysis** – on p. 171 of *Hares*, is incorrect[51]; I have never heard of Edmund – Ned to his friends – Phelps been referred to as '*Ed* Phelps' (p. 178), but I am, of course, not omniscient; either there is some mythical creature called 'Fabo Schaparelli', or the reference is to Fabio Schiantarelli, a labour economist at Boston University, with a PhD from the LSE (endnote 5 to this chapter, p. 245); then, there is, endnote 3, to the final chapter,

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[50] Although the Cagan (1956) model antedates Muth (1961), the adaptive expectations hypothesis was hypothesised by Goodwin (1947), as handsomely acknowledged by Muth (ibid).

[51] Obviously, therefore, endnote 8 to this chapter (p. 245), cannot be a reference to the **Foundations of Economic Analysis**!

which gives the wrong reference (Leeson, 1997a, rather than Dorrance & Leeson, 1997 – which was published 'eons ago'), and, in substance, incorrect about the claim on Meade (*Hares*, p. 246):

> "Apparently Meade himself was not feeling comfortable at Cambridge where there were destructive arguments underway with Joan Robinson and others. Meade actually resigned his own Chair there in 1967 and considered returning to LSE (Leeson, 1997)."

No such substantiation for the claim can be found in Dorrance & Leeson, for one thing; and what does Bollard mean with 'destructive arguments'? It was, after all, the heyday of the Cambridge Controversies in Capital Theory with Meade and his neoclassical followers on one side, and Piero Sraffa, Joan Robinson, Nicky Kaldor, Luigi Pasinetti, Geoff Harcourt and many other Cambridge economicst – theye were not all 'Keynesians' – on the other. Who won the intellectual argument? Not Meade and his followers. This is another example of Bollard's pointless Cambridge bashing, which is groundless.

Chapters 9, 10 and 11 are, at best, innocuous descriptions of Bill Phillips' life and work during the last decade and a half of times spent in London, Australia (Canberra) and, finally, back in New Zealand (Auckland). The odyssey of the return to the Antipodes, now committed to developing his almost lifelong interest in China, thwarted by an unkindly shortened life, first by illness, then by death, is narrated with compassion and sadness by Dr. Bollard.

In passing I would like to point out that there is a fine analysis of the formalism of Phillips (1961), in Allen (1967, chapter 20, especially § 20.2). Allen subjects it to crystal clear local stability analysis.

I must, however, point out that the claims of priority or originality for the work by Bill Phillips on growth cycles[52] and continuous time estimation are slightly exaggerated[53], as well as due to unfamiliarity of either terrain by the author of *Hares* (and many of the 'authorities' invoked). The chapters, at least 10 and 11 are liberally sprinkled with the, by now, familiar infelicities – research in mathematical growth theory, in the US, was being led by Evsey Domar, *Hares*, p. 188, testifies, sadly, to the unfamiliarity of the literature by Dr. Bollard; bracketing Mundell

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[52] Growth cycles, in a Schumpeterian framework, with Keynesian demand elements, was pioneered by Goodwin (1953, 1955).

[53] I myself think that Bill Phillips' preoccupation with the identification problem, as defined and characterised by the econometrician, was misplaced. He would have found the framework of Simon (1977) much more congenial.

with the other distinguished Professors of MIT is a typical mistake, of which there are, as indicted earlier, many; more over, endnote 1 to chapter 10 is puzzling in a book otherwise devoid of any kind of mathematical 'hieroglyphics' – especially since the reader was forewarned already on p. vi!

I must add that the one time I was shaken by a claim by the usually careful and modest Bill Phillips was his bracketing of Wicksell with Walras and Marshall, in Phillips (1962, p. 3). Obviously Bill Phillips was not too well versed in Wicksell's macroeconomic monetary writings, nor that this great Swede had rejected Say's Law decades before Keynes and disputed precisely the self-adjustment capacities of a 'monetary-production' system.

Alas, the index is appalling, and the reference list woefully proof-read.

§ 4. Reflections and Ruminations

> "Bill's 1954 and 1957 papers were both very well received by the profession for their originality and economic advance. Apart from his famous Phillips curve paper, these two publications would become the most widely cited of Bill's career."
> *Hares*, p. 149

This pithy characterization is, in this reviewer's opinion, a sad reflection of the preoccupations and ideological stances of the 'profession'. Bill Phillips' distinguished fellow New Zealander, Ernest Rutherford, is reputed to have said (Collins, 2006, p. 60; italics added): '*a theory that you can't explain to a bartender is probably no damn good*'. The MONIAC, in its transparent working, was – is – able to 'explain' macroeconomic theory 'to a bartender', or anyone else, with or without an economics background.

In constructing a LEGO model of a working Turing Machine, with my daughter, I was able to explain the notion of computability, the meaning of the Halting Problem for Turing Machines, even an outline of the *Entscheidungsproblem* – almost one of Gödel's incompleteness theorems.

When Arthur Porter built a differential analyzer with Meccano Set parts, for Douglas Hartree (Wilkes, 1984, p. xi)[54], and it 'proved unexpectedly successful', it played the same role for

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[54] In note 7, p. 244, Bollard observes:
> "[T]he differential equation solver [was] constructed mainly of meccano at Cambridge University in 1935 … . It is now on display at MOTAT in Auckland .. ."

This important fact would have gained more verisimilitude had the author also referred to Wilkes (*op.cit*), mainly because it would have put in correct perspective the 'derivative' nature

British boys, that the LEGO Turing Machine did for my 11-year old daughter, in the former case with differential equations and their solutions, in the latter with computability theory; and what the MONIAC did to demystify some of the macroeconomic controversies of the times (and, similarly, what Irving Fisher's hydraulic machine of 1892 did for equilibrium price determination in 'free' markets).

Above all, both Bill Phillips and Irving Fisher stressed the importance of transparency and teaching economic principles, macroeconomic fundamentals in the one case, utility-based microeconomics, in the other case. Indeed, as Phillips (1950, pp. 283-4; italics added)[55]:

> "Fundamentally, the problem is to design and build a machine the operations of which can be described by a particular system of equations which it may be found useful to set up as the hypotheses of a mathematical model, in other words, a calculating machine for solving differential equations. Since, however, the machines are intended for exposition rather than accurate calculation, a second requirement is that *the whole of the operations should be clearly visible and comprehensible to an onlooker. For this reason hydraulic methods have been used in preference to electronic ones which might have given greater accuracy and flexibility, the machines being made of transparent plastic (" Perspex") tanks and tube*s, through which is pumped coloured water. The accuracy obtained depends on the precision with which the machines are constructed, but there is no difficulty in keeping it within about + 4 per cent[56]."

Unfortunately, Bill Phillips' noble name will forever by associated with the Phillips Curve (Phillips, 1958). Many will also consider the ostensibly original introductory contributions on proportional, derivative and integral policies for stabilizing and unstable macroeconomy[57], developed by means of simulation in models that were underpinned by servomechanism theory, as pioneering – as, indeed, they were, to some extent. Still others may make sporadic references to Phillips (1961, 1962) and to Phillips (1959).

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of the Cambridge construction, and its improvement over the original Manchester meccano model.

[55] Irving Fisher's Hydraulic Machine was built with the same purposes as described by Bill Phillips – but he used the Pascal Principle which obviated the need for any use of plastics (the first man-made plastic was patented by Alexander Parkes in 1856 and made public at the Great International Exhibition in London, in 1862). I am not sure the material was commercially available at a reasonable price (sic!) for Fisher to use it as the material for his cisterns, which were made of glass, and the tubes connecting them (presumably) of some kind of (natural) rubber.

[56] Why is it not '± 4 per cent'? I cannot imagine such a machine with error bounds in only one direction.

[57] Incidentally, I was surprised that there is no reference to chapter 18, on *Economic Regulation*, of Allen (1967), in *Hares*, especially also because Tizard (1955) is referred to in the solution (by Laplace Transform methods) of (linear) Multiplier-Accelerator models.

But it is my opinion a unified consideration of the MONIAC and the four macroeconomic classics of Phillips (1950, 1954, 1957, 1958), with some consideration of Phillips (1961, 1962), is the way to pay homage to this humble giant of a theorist. Even within these, it is the construction of the MONIAC that would be – should be – considered the jewel in the crown of the contributions by Bill Phillips; but that will not be.

It gave me particular pleasure to read this book by Dr. Bollard, 'warts & all', simply because – in the end – I believe that is the main message of this book, too.

I am reminded of some lines in Auden's poignant *homage* to Yeats, when I think of the greatness of this New Zealander of simple, but significant originality – of thought, of action, of concern:

"You were silly like us; your gift survived it all:

….

Follow, poet, follow right
To the bottom of the night,
With your unconstraining voice
Still persuade us to rejoice;

In the deserts of the heart
Let the healing fountain start,
In the prison of his days
Teach the free man how to praise."

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